joint land use study

& camp grayling joint maneuver training center alpena combat readiness training center

final submittal | january 2019

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acknowledgments and key partners

Northeast Michigan Council of Governments
Michigan DNR (Gaylord)
Michigan Dept of Transportation (Gaylord)
US Forest Service
Michigan Dept of Environmental Quality (Gaylord)
US Fish & Wildlife Service (Alpena)
Headwaters Land Conservancy
USDA Natural Resource Conservation Service (Gaylord)
Huron Pines (conservation) (Gaylord)
Crawford County
City of Grayling (Crawford Co)
Grayling Twp (Crawford Co)
Lovells Twp (Crawford Co)
Maple Forest Twp (Crawford Co)
Frederic Twp (Crawford Co)
Beaver Creek Twp (Crawford Co)
South Branch Twp (Crawford Co)
Crawford County Road Commission
Otsego County
Chester Twp (Otsego Co)
Otsego Lake Twp (Otsego Co)
Bagley Twp (Otsego Co)
Hayes Twp (Otsego Co)
Otsego County Economic Alliance
Bear Lake Twp (Kalkaska Co)
Garfield Twp (Kalkaska Co)
Au Sable River Property Owner's Association
Anglers of the Au Sable
Mason-Griffith Founders Chapter of Trout Unlimited
Upper Manistee River Association
Michigan Association of Timbermen
Weyerhaeuser
Arauco
AJD Forest Products
Jays Sporting Goods
Alpena Regional Airport
Alpena County
City of Alpena (Alpena Co)
Alpena Twp (Alpena Co)
Maple Ridge Twp (Alpena Co)
Wilson Twp (Alpena Co)
Green Twp (Alpena Co)
Ossineke Twp (Alpena Co)
Sanborn Twp (Alpena Co)
Long Rapids Twp (Alpena Co)
Village of Hillman
Target Alpena
Alpena Chamber of Commerce
Michigan Sea Grant/MSU Extension
Northern MI Unmanned Aerial Systems Consortium
Thunder Bay National Marine Sanctuary
US Coast Guard
Thunder Bay Audubon Society
NOAA
Michigan United Conservation Club – Region 4
Camp Grayling and Alpena CRTC
Michigan Economic Development Corporation
Grayling Chamber of Commerce
Michigan Works!
Briley Twp (Montmorency Co)
Roscommon County
Lyon Twp (Roscommon Co)
Posen Twp (Presque Isle Co)
Krakow Twp (Presque Isle Co)
Metz Twp (Presque Isle Co)
Higgins Twp (Roscommon Co)
Antrim County

This study was prepared under contract with the Northeast Michigan Council of Governments, with financial support from the Office of Economic Adjustment, Department of Defense. The content reflects the views of the Northeast Michigan Council of Governments and all of the JLUS project stakeholders and does not necessarily reflect the views of the Office of Economic Adjustment.

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acronyms and abbreviations

A

AADT	annual average daily traffic
AAF	Army Airfield
ADNL	average day/night sound level
AFB	air force base
AFFF	aqueous film forming foam
AFI	Air Force Instruction
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
ANG	Air National Guard
ANGH	Air National Guard Handbook
APN	Alpena County Regional Airport
APZ	accident potential zone
AR	Army Regulation
ARNG	Army National Guard
ATCAA	air traffic controlled assigned airspace
ATFP	antiterrorism force protection

C

CAADT	commercial annual average daily traffic
CAB	combat aviation brigade
CACTF	Combined Arms Collective Training Facility
CAS	close air support
CEO	chief executive officer
CTRC	Combat Readiness Training Center
CZ	clear zone

D

DA	Department of the Army
DART	Dial-A-Ride Transportation
DASR	digital airport surveillance radar
dB	decibel
DOD	Department of Defense
DRMO	Defense Reauthorization and Marketing Office
DSL	digital subscriber line

E

EA	environmetnal assessment
ECP	entry control point
EPA	Environmental Protection Agency

F

FAA	Federal Aviation Administration
FAMCAMP	Air Force family campground
FCC	Federal Communications Commission
FMU	Forest Management Unit
FS	FIghter Squadron
FY	fiscal year

G

GIS	geographic information system
GSI	groundwater-surface water interface

I

I	Interstate
ICEMAP	Installation Complex Encroachment Management Action Plans
ICRMP	Integrated Cultural Resources Management Plan
IDP	Installation Development Plan
IED	improvised explosive device
IMP	installation master plan
INRMP	Integrated Natural Resources Management Plan
IRP	installation restoration program
ISR	intelligence, surveillance and reconnaissance

J

JLUS	joint land use study
JMTC	Joint Maneuver Training Center
JTAC	joint terminal attack controller

K

K	thousand

M

M	Michigan state highway designation
M	million
MATES	Maneuver Area Training Equipment Site
mbps	megabytes per second
MDARD	Michigan Department of Agriculture and Rural Development
MDEQ	Michigan Department of Environmental Quality
MDHHS	Michigan Department of Health and Human Services
MDNR	Michigan Department of Natural Resources
MDMVA	Michigan Department of Military and Veterans Affairs
MDOT	Michigan Department of Transportation
MEDEVAC	medical evacuation
MIANG	Michigan Air National Guard
MIARNG	Michigan Army National Guard
MiCorps	Michigan Clean Water Corps
MMRP	Military Munitions Response Program
MOA	military operations area
MOUT	military operations on urban terrain
MSA	munitions storage area
MSL	mean sea level
MTR	military training route
MUASC	Michigan Unmanned Aerial Systems Consortium

N

NACo	National Association of Counties
NATO	North Atlantic Treaty Organization
NEMCOG	Northeast Michigan Council of Governments
NGB	National Guard Bureau
NGR	National Guard Regulation

NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System

O

OEA	Office of Economic Adjustment
ONMS	Office of National Marine Sanctuaries
ORV	off-road vehicles
OSD	Office of the Secretary of Defense

P

P3	public-private partnership
Pam	pamphlet
PASER	Pavement Surface Evaluation and Rating
PC	policy committee
PEAS	Pollution Emergency Alerting System
PFAs	per- and polyfluoroalkyl substances
PFC	perfluorinated compounds
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
ppt	part per trillion

R

RA	restricted airspace
RPDP	Real Property Development Plan
RPX	real property exchange
RPZ	runway protection zone

S

SME	subject-matter expert
SOP	standard operating procedure
STEM	science, technology, engineering, and mathematics
SUA	special use airspace
SWOT	strengths, weaknesses, opportunities, and threats

T

TAG	The Adjutant General
TC	technical committee
TMDL	Total Maximum Daily Loads

U

UAS	unmanned aerial systems
UFC	Unified Facilities Criteria
UO	urban operations
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordinance

V

VFR	visual flight rules

es

executive summary

Introduction

The military and residents of Northeast Michigan have co-existed for a century. Collaboration among all groups calling the region home is critical to preserve the military mission and the residents' quality of life. Camp Grayling Joint Maneuver Training Center (JMTC) and Alpena Combat Readiness Training Center (CRTC) are home to one of the largest military training exercises in the country, bringing thousands of military personnel to the region each summer.

A joint land use study (JLUS) is intended to look at the ways the civilian and military life intersect and to help ensure an optimal experience for both sides. Safety for residents while ensuring the military can train soldiers and airmen is paramount, but through the suggested strategies in this plan, partnerships can be forged to help all parties thrive. Incompatible development across the study area is addressed to resolve existing and future conflicts.

This study looks at the areas immediately surrounding the boundaries of Camp Grayling JMTC and Alpena CRTC. This area of Michigan is largely rural, with few urban centers and many large tracts of forest land. Natural resources, such as those forests and Lake Huron, are treasured and used often for recreation. Although there is little risk of significant land development near the installations due to the rural setting, encroachment can also take other forms in the sense of traffic, utility capacity, physical trespassing, and natural resources.

The JLUS process involves stakeholders from the military and the public from beginning to end. Public meetings identified community concerns, informed stakeholders of the project's progress, and provided an arena for them to share their thoughts. The resulting information was refined into an "action plan" of suggested strategies. This JLUS is not a regulatory document, and thus it can't mandate action; it is meant to serve as a guide for local entities as a way to continue the positive relationship between the military and the local population going forward. **Success in ensuring compatibility into the future depends on diligent and ongoing efforts from stakeholders in the form of the JLUS implementation team.**

This plan was funded by the Office of Economic Adjustment (OEA), part of the Department of Defense (DOD), and the Northeast Michigan Council of Governments (NEMCOG) is the sponsoring agency. This summary is intended to provide a broad overview of the study process and the local area for a wide variety of readers and users.

JLUS Implementation Team Action Plan

Through the public involvement process, compatibility issues were brought forth for consideration. The JLUS project team refined a detailed set of strategies to solve those issues, which are described in more detail in Section 4 and Appendix D of the document.

In order to ensure the strategies are tracked and implemented as it is possible, it is suggested that a JLUS Implementation Team be convened, comprising members of the JLUS technical committee (TC), policy committee (PC), NEMCOG, local governments, other agencies, and the military.

For both installations covered by this JLUS and the surrounding communities, a series of key actions has been proposed as the JLUS Implementation Team Action Plan. Each key action in the plan satisfies a number of the strategies. Members of the Implementation Team should be able to roll these actions into their existing programs as funding and resources dictate.

Figure ES.1 | JLUS "Toolbox"

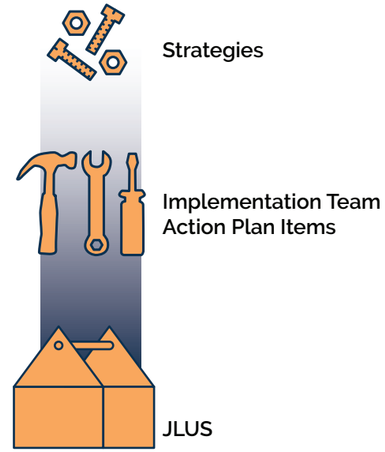

Table ES.1 | JLUS Implementation Team Action Plan Items

CAMP GRAYLING JMTC	ALPENA CRTC
Create Sensible Military Overlay Zones around Camp Grayling JMTC	Create a Military Overlay Zone
Commission a Joint MDNR and Camp Grayling JMTC Landscape Plan	Conduct an Air Installation Compatible Use Zone (AICUZ) Study
Conduct a Noise Study	Alpena CRTC Community Outreach and Alpena CRTC Community Council
Commission a Camp Grayling JMTC Installation Master Plan	Commission a Thunder Bay Environmental Impact Study
Update Grayling Area Transportation Study	Economic Impact, Tracking and Incentives: Conduct an Economic Impact Study
Camp Grayling JMTC Community Outreach and Camp Grayling Community Council	Commission a Joint NOAA/Alpena CRTC Bathymetric Survey
Commission a Water Resources Plan for Northeast Michigan	Formalize Thunder Bay Interagency Cooperation
Fire Protection Services Agreement	Update the Alpena Area-wide Comprehensive Transportation Plan
Economic Impact, Tracking and Incentives: Conduct an Economic Impact Study	

Note: Pages ES-3 through ES-6 are meant to be used as two-page standalone brochures to summarize the project status and key recommendations for both military installations covered by this JLUS.

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what is the JLUS program?

The Joint Land Use Study (JLUS) process promotes and enhances civilian and military communication and collaboration, serves as a catalyst to sustain the military mission, and promotes public health, safety, quality of life, and economic viability of a region. Source: Department of Defense (DOD) Office of Economic Adjustment (OEA), http://oea.gov/what-we-do/compatible-use

where are we in the process?

The JLUS and the JLUS Public Participation Plan have been completed. Please consult the JLUS website at **http://www.discovernortheastmichigan.org/jlus.asp** to view the report and associated information.

what happens next?

NEMCOG will collaborate with JLUS Implementation Team members to begin working on compatibility strategies and action plan items.

JLUS implementation team

This is a critical piece of the success of this JLUS. The team should include membership from each participating agency, the project technical committee (TC), the project policy committee (PC), and military personnel. The strategies developed throughout the JLUS process should allow local government leaders and military personnel to roll JLUS recommendations into their existing programs.

A communications plan, zoning tools, and long-range planning are some cost-effective solutions that are part of the action plan presented in Section 4 of this JLUS. This is not a regulatory document and thus cannot mandate action, only propose solutions. Success in implementing the strategies described in this plan depends on dedicated efforts from the stakeholders in the coming years.

This JLUS is meant to be a living document, so certain strategies may need to be revisited in the future as the local situation and applicable laws evolve.

camp grayling joint maneuver training center
alpena combat readiness training center

joint land use study

camp grayling JMTC

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more project information

Additional project information and the full JLUS report can be found at

http://www.discovernortheastmichigan.org/jlus.asp

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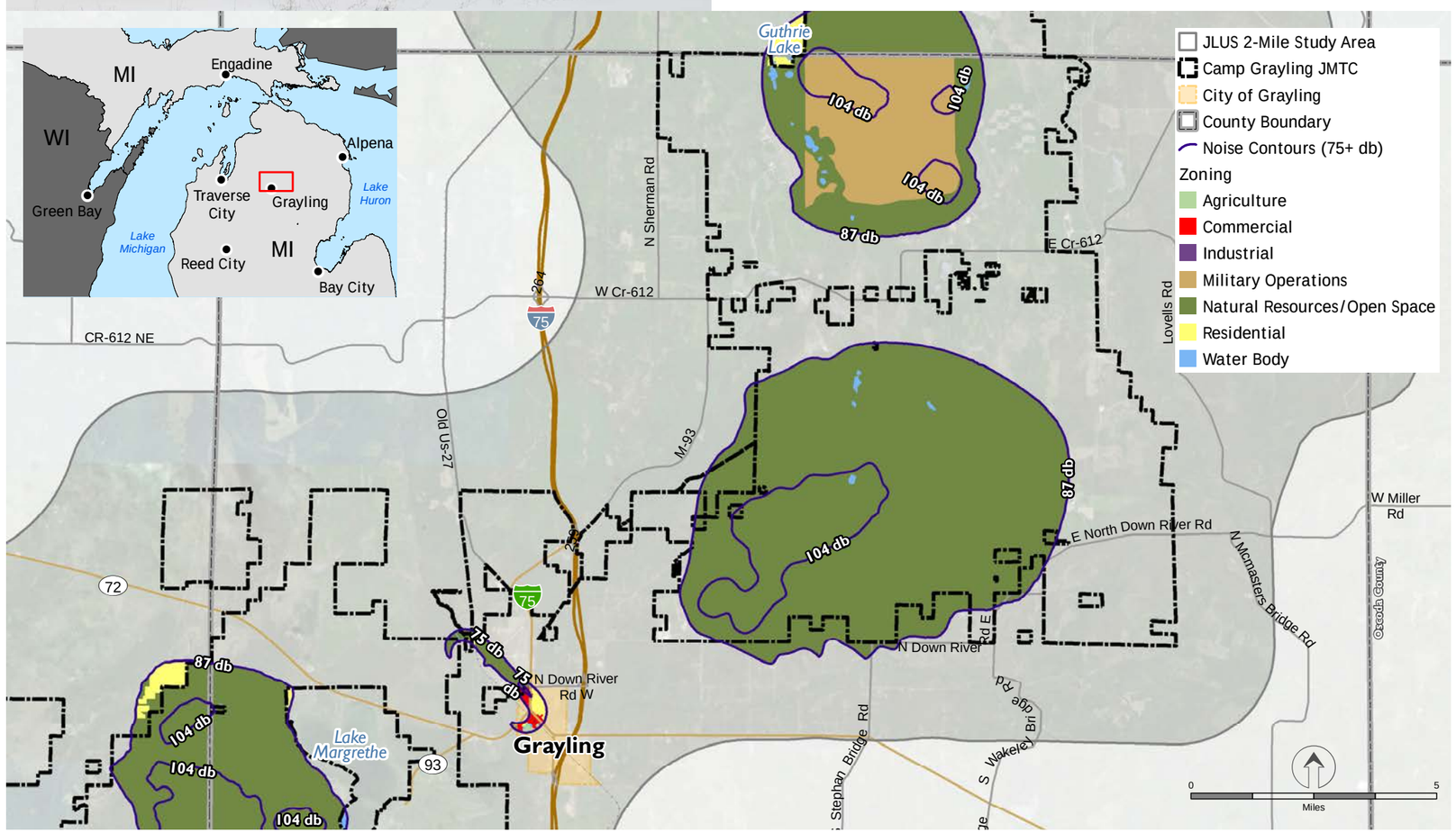
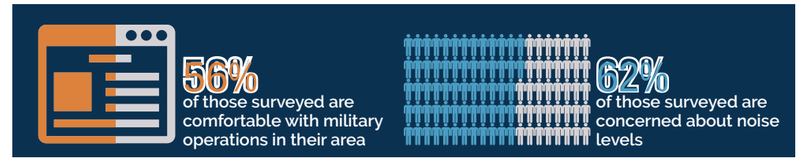
about camp grayling JMTC

Camp Grayling JMTC is the largest National Guard training center in the country, encompassing 147,000 acres. It supports a wide cross-section of military personnel, including active-duty and National Guard forces. It provides a large ground training area, an air-to-ground range, and a large airspace all in the same complex. Nonmilitary organizations as well as international partners also use the ranges and other facilities there.

about the surrounding area

Camp Grayling JMTC is located in the largely rural north-central portion of Michigan's Lower Peninsula. This study focuses on the installation itself and a two-mile buffer around the boundary. Compatible land use analysis was limited to the study area. Though encroachment issues are few due to the low surrounding population, it is critical that the military and the public coexist.





top issues

Public meetings, an online survey, and one-on-one interviews were some of the methods used to collect public input and determine the largest positive and negative aspects of military operations in the area. The issues that repeatedly came up in the Camp Grayling JMTC area were:

- **NOISE AND MILITARY OPERATIONS:** Several residential areas are in or near noise contours from military operations, and most of the heart of the City of Grayling lies in the accident potential zone from Grayling Army Airfield.
- **ROADS:** Public perception links degraded roads with military activity, when weather, logging, and other traffic may have an impact on road condition.
- **WILDFIRE DANGER:** Wildfires occur frequently in this heavily wooded region. Communication about controlled burns and fire mitigation activities by the Michigan Department of Natural Resources doesn't always reach the public.

JLUS implementation team action plan

Many of the JLUS strategies have actions that overlap. To capture the best use of plan implementation, overarching actions have been defined that will ultimately serve more than one strategy. The JLUS Implementation Team would be charged with tracking these items. See Section 4 of the JLUS for more information.

ACTION	STRATEGIES
Create Sensible Military Overlay Zones around Camp Grayling JMTC	1a.4, 1a.5, 2a.1, 2a.2, 2d.1, 2d.2, 5b.4, 6a.1
Commission a Joint MDNR and Camp Grayling JMTC Landscape Plan	1b.1, 1b.2, 1b.3, 4e.1
Conduct a Noise Study	1a.1, 1a.2, 1a.3, 2a.2, 2c.1, 2c.2, 2c.3
Commission a Camp Grayling JMTC Installation Master Plan	2c.2, 2c.3, 2d.1, 2d.2, 3d.1, 3f.2, 4a.1, 4a.2, 4c.1, 4d.1, 5b.5, 6b.4
Update Grayling Area Transportation Study	4d.1, 4d.2, 4d.3, 4d.4, 4e.1, 4f.1, 4f.2, 5b.5
Camp Grayling JMTC Community Outreach and Community Council	2b.1, 2c.1, 3a.1, 3b.1, 3e.1, 3f.1, 3f.2, 4e.1, 5a.1, 5a.2, 5a.3, 5a.4, 5b.1, 5b.2, 5b.3, 5b.4, 5b.5, 6a.1
Commission a Water Resources Plan for Northeast Michigan	3a.1, 3b.1, 3c.1, 3c.2, 3f.1, 3f.2
Fire Protection Services Agreement	3e.1, 6b.1
Conduct an Economic Impact Study	6a.1, 6b.1, 6b.2, 6b.3, 6b.4, 6c.1, 6c.2

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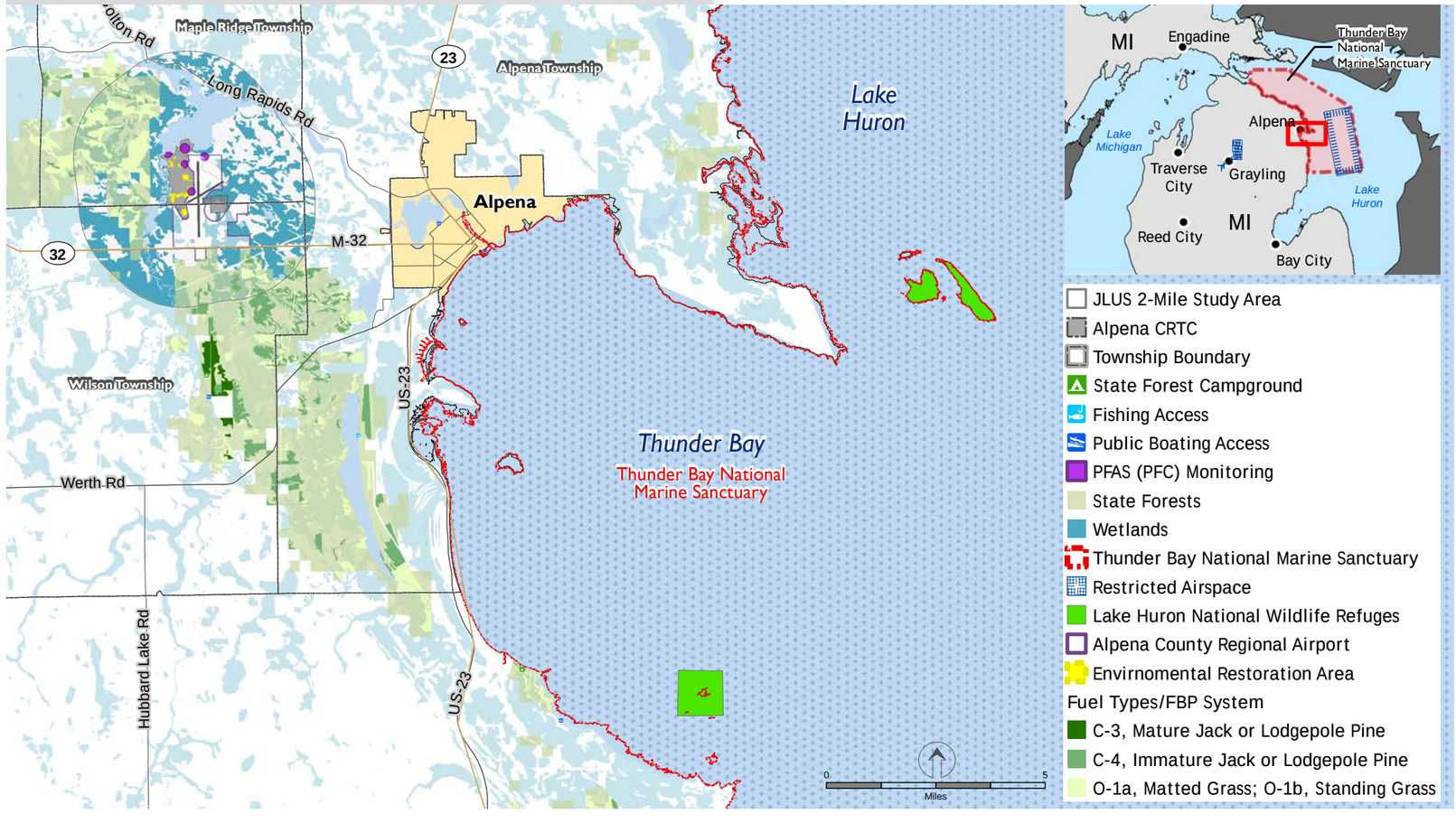
about alpena CRTC

Alpena CRTC manages the operational aspects of the joint-use airspace used by units training at Alpena CRTC and Camp Grayling JMTC. It is colocated with the Alpena County Regional Airport, sharing functional assets including two runways. The majority of air traffic is military related. While the installation does not have any flying units of its own, it supports organizations from all branches of the military throughout the US and coalition partners.

about the surrounding area

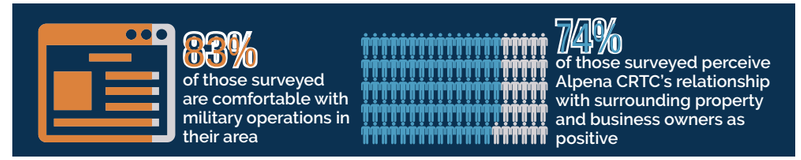
Alpena CRTC is located west of the City of Alpena, which is situated on Lake Huron's Thunder Bay in the northeastern part of Michigan's Lower Peninsula. This study focuses on the installation itself and a two-mile buffer around the boundary. Compatible land use analysis was limited to the study area. The area directly surrounding the installation is largely rural.



- JLUS 2-Mile Study Area
- Alpena CRTC
- Township Boundary
- State Forest Campground
- Fishing Access
- Public Boating Access
- PFAS (PFC) Monitoring
- State Forests
- Wetlands
- Thunder Bay National Marine Sanctuary
- Restricted Airspace
- Lake Huron National Wildlife Refuges
- Alpena County Regional Airport
- Envirnomental Restoration Area

Fuel Types/FBP System

- C-3, Mature Jack or Lodgepole Pine
- C-4, Immature Jack or Lodgepole Pine
- O-1a, Matted Grass; O-1b, Standing Grass



top issues

Public meetings, an online survey, and one-on-one interviews were some of the methods used to collect public input and determine the largest positive and negative aspects of military operations in the area. The issues that repeatedly came up in the Alpena CRTC area were:

- **IMPACTS AND EFFECTS ON SURFACE WATER SYSTEMS, GROUNDWATER, AND DRINKING WATER:** PFOS/PFOA substances have been detected at low levels in the areas surrounding Alpena CRTC.
- **TRAINING ACTIVITIES:** Being one of the largest training areas in the US, the Alpena CRTC/Grayling JMTC complex is a national asset that easily attracts training events like that of the well know Northern Strike exercise. This can impact the community, to suddenly be inundated with thousands of visitors that need services, supplies, entertainment, vehicles, housing and the like. However, these events also bring a boost to the local economy

JLUS implementation team action plan

Many of the JLUS strategies have actions that overlap. To capture the best use of plan implementation, overarching actions have been defined that will ultimately serve more than one strategy. The JLUS Implementation Team would be charged with tracking these items. See Section 4 of the JLUS for more information.

ACTION	STRATEGIES
Create a Military Overlay Zone	1a.4, 1a.5, 1a.6, 2c.2, 4a.2, 5a.6
Conduct an AICUZ Study	1a.4, 1a.5, 1a.6, 2c.2
Alpena CRTC Community Outreach and Alpena CRTC Community Council	2b.1, 2c.3, 3a.1, 3c.1, 4b.1, 4c.1, 5a.1, 5a.2, 5a.3, 5a.4, 5a.5, 5b.2
Commission a Thunder Bay Environmental Impact Study	2a.1, 2c.3, 3a.1, 3b.a, 3b.2, 3c.1, 4e.1
Economic Impact, Tracking and Incentives: Conduct an Economic Impact Study	5a.3, 5a.4, 5b.1, 5b.2, 6a.1, 6c.1, 6d.1, 6d.2
Commission a Joint NOAA/Alpena CRTC Bathymetric Survey	2a.1, 2c.1
Formalize Thunder Bay Interagency Cooperation	2a.1, 2c.1, 2c.3, 3b.1, 3b.2, 4b.1, 5a.5, 5b.1, 6b.1
Update the Alpena Area-wide Comprehensive Transportation Plan	4c.1, 4d.1, 4e.1

1

introduction

chapter overview

A joint land use study (JLUS) is a collaborative effort between the military and surrounding local communities to protect both the long-term viability of the military mission and public health and safety, while also enhancing local economies and industries. This JLUS studies the areas around Camp Grayling Joint Maneuver Training Center (JMTC) and Alpena Combat Readiness Training Center (CRTC) in Northeast Michigan. The Northeast Michigan Council of Governments (NEMCOG) is the sponsoring agency of the study.

1.1 What is a Joint Land Use Study?

A JLUS is a collaborative planning effort between military installations and their surrounding communities. They are designed to address compatibility issues and foster a strong working relationship among the military, local governments, and members of the community.

This JLUS examines northeastern Michigan and the communities surrounding Camp Grayling Joint Maneuver Training Center (JMTC), administered by the Michigan Army National Guard (MIARNG), and Alpena Combat Readiness Training Center (CRTC), administered by the Michigan Air National Guard (MIANG).

The JLUS effort is community driven and relies on strong master planning and zoning to ensure the affected entities can coexist in a mutually beneficial manner. Public input is critical to ensure not only the success of the JLUS, but also the success of the relationship between the military and residents of the surrounding communities.

The Camp Grayling JMTC and Alpena CRTC JLUS is funded by a grant from the Office of Economic Adjustment (OEA), Department of Defense (DOD). The local sponsor and grant administrator is the Northeast Michigan Council of Governments (NEMCOG), which oversees nine counties in the northeastern portion of Michigan's Lower Peninsula. A consultant team from Tetra Tech was contracted to complete the study.

1.1.1 JLUS Goals

Several goals were identified for this JLUS at the outset of the project:

1. Promote land use compatibility between the installations and surrounding communities.
2. Seek ways to manage development that is compatible with military training, testing, and operational missions.
3. Encourage cooperative action among military personnel, local community officials, and citizens.
4. Maintain and strengthen regional economic engines.

The City of Alpena's municipal marina, which lies on Lake Huron's Thunder Bay, is owned and maintained by the city.

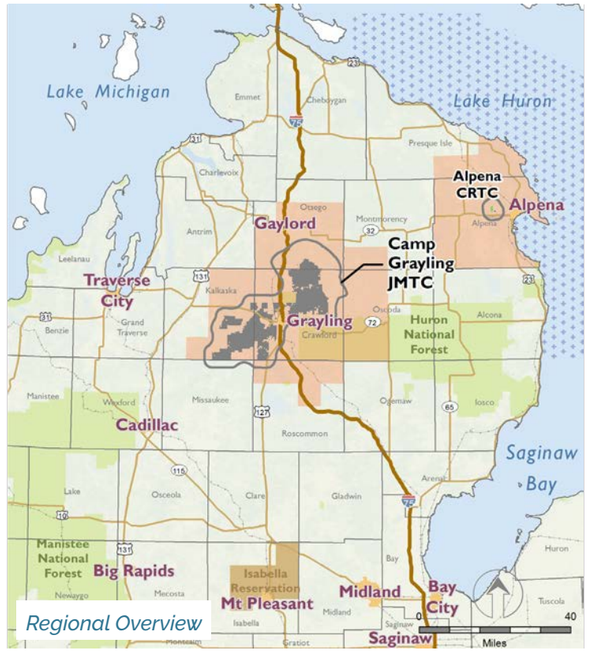
1.2 How to Use this Study

The strategies presented in Chapter 4 should be implemented when possible to prevent encroachment or incompatible uses from developing, as well as to mediate any existing land use issues. Consider them to be part of a "toolbox" of planning options to ensure the relationship between the military and the surrounding communities remains strong and mutually beneficial. Each strategy is listed with key participants and suggested timelines to aid the strategy lead in plan implementation. ***It is important to understand that the JLUS is a recommended set of strategies and tools, not an adopted plan.*** It is recommended that NEMCOG form a JLUS implementation team to monitor progress and maintain momentum after the plan is published.

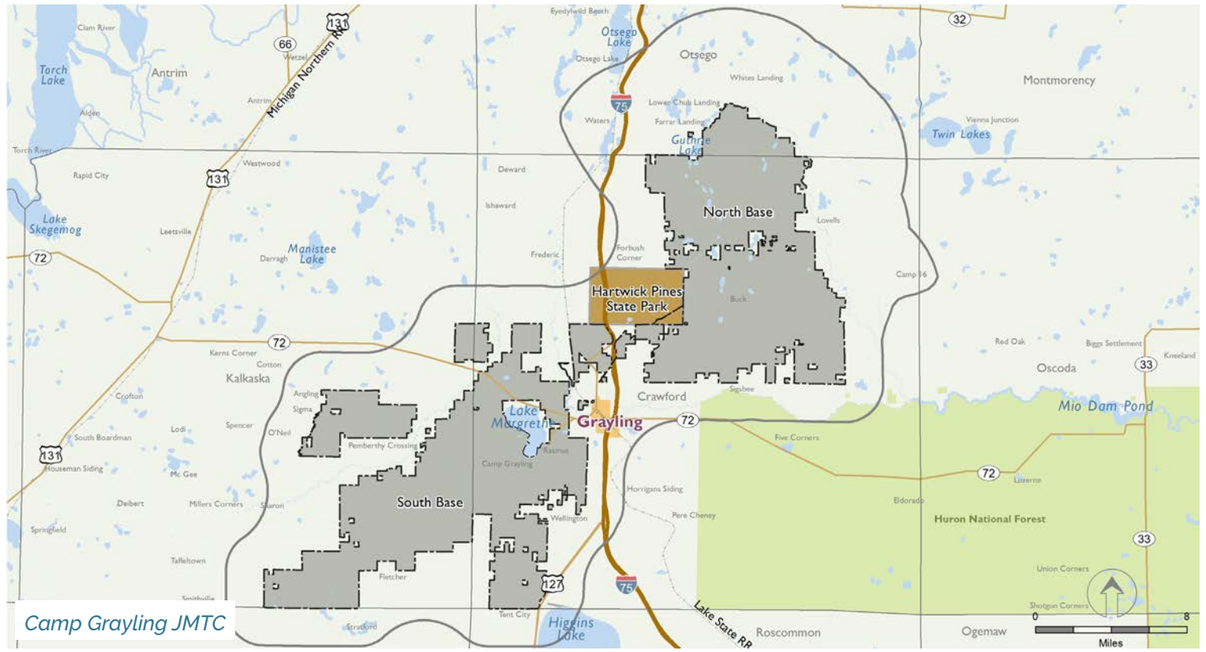
purpose

This JLUS is a collaborative planning effort among the military, the surrounding communities, and stakeholders to create a plan to guide the future development of the lands around Camp Grayling JMTC and Alpena CRTC. It aims to enhance understanding of area issues, promote collaboration, and provide a set of tools for future planning.

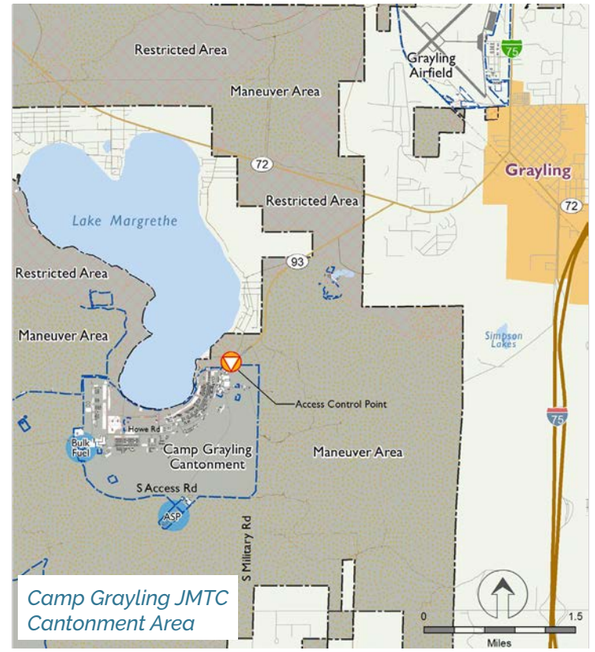
Figure 1.1 | Study Area



Regional Overview



Camp Grayling JMTC



Camp Grayling JMTC Cantonment Area

1.3 Study Area Overview

NEMCOG, established in 1968, is a multicounty organization formed to help municipalities in the northeastern part of the state with grant writing, planning, digital mapping, and other tasks that rural governments typically don't have personnel or funding to manage. It is based in Gaylord and covers Alcona, Alpena, Cheboygan, Crawford, Emmet, Montmorency, Oscoda, Otsego, and Presque Isle counties. NEMCOG's board of elected officials, business leaders, and residents is drawn from throughout the nine-county region.

The JLUS study area includes Camp Grayling JMTC, Alpena CRTC, and surrounding local jurisdictions within a 2-mile radius of each installation.

- The Camp Grayling JMTC area of influence includes Crawford County and portions of Oscoda County, Roscommon County, Kalkaska County, Otsego County, Antrim County, and Montmorency County, for a total of seven counties and 33 municipalities.
- The Alpena CRTC area of influence includes Alpena County and a small portion of Presque Isle County, as well as 13 municipalities.

Camp Grayling JMTC, the largest National Guard training center in the country, is a 147,000-acre training site, spanning portions of Kalkaska, Crawford, and Otsego counties. The central cantonment area is located in Crawford County, southwest of Grayling Township, and the rest of the property is largely used as maneuver area and range land. Part of Camp Grayling JMTC is bounded by Lake Margrethe, a popular recreation spot for fishing.

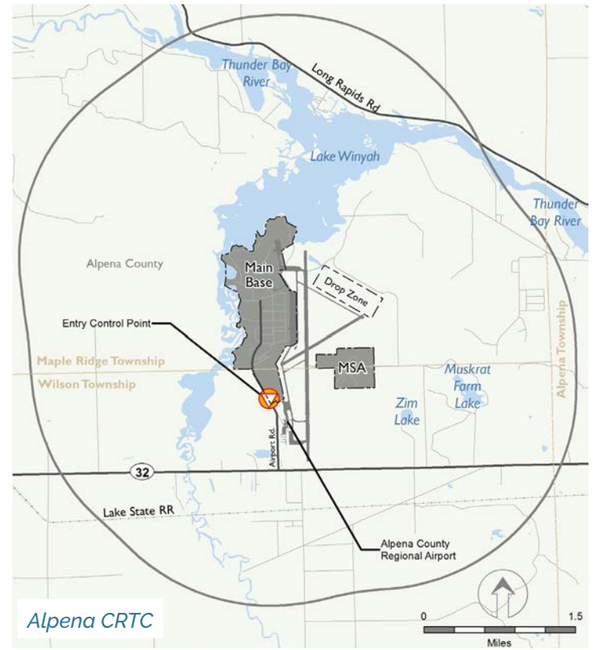
Alpena CRTC is located adjacent to the Alpena County Regional Airport in Alpena, Michigan. The city of Alpena is located in the northeast part of the Lower Peninsula on the edge of Lake Huron on Thunder Bay. Alpena CRTC is bounded by Lake Winyah to the north, the Lower South Branch of the Thunder Bay River to the west, and the Alpena County Regional Airport terminal and Michigan State Route 32 (M-32) to the south.

Camp Grayling JMTC and Alpena CRTC are situated in the largest airspace complex for military training east of the Mississippi River. The annual joint Northern Strike training exercise involves more than 5,000 Army, Navy, Marine, and Special Forces personnel from across the nation and six coalition countries.

The wooded, rural surrounding region is sparsely populated. Alpena is the biggest city and transportation hub. The area grew quickly in the mid-1800s due to extensive logging activities. Logs would be transported down the Thunder Bay River to sawmills in the city of Alpena and its port on Lake Huron.

The region surrounding Camp Grayling JMTC and Alpena CRTC is rich in natural resources, and recreational lands and waters are plentiful. The climate features mild summers and cold winters with a large amount of snowfall. In spring, the freeze-thaw cycle is hard on roadways and other infrastructure. Despite that, military personnel are able to participate in year-round training at the installations.

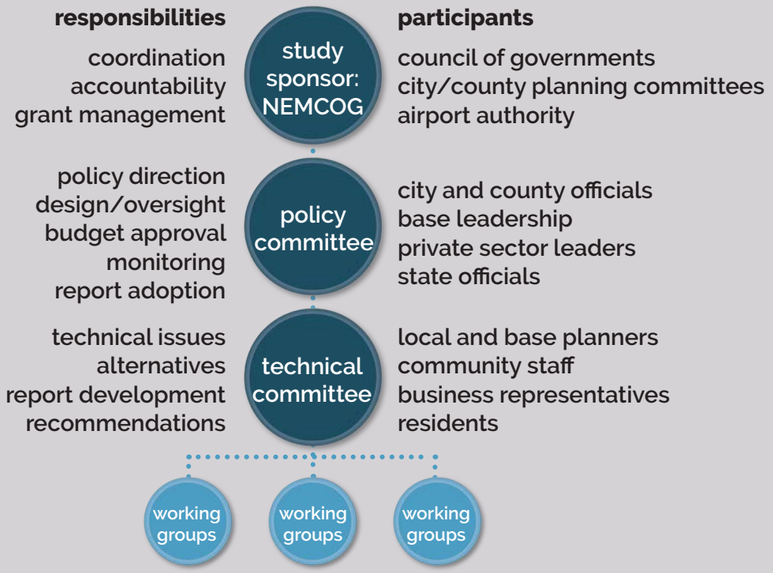
More detailed information on the military missions and background on each site can be found in chapters 2 and 3, which are specific to Camp Grayling JMTC and Alpena CRTC, respectively.



Alpena CRTC

City Limits
Study Area 2-Mile Buffer
Installation Boundary

Figure 1.2 | JLUS Project Organization



policy committee

The policy committee (PC) comprises city, township, and county officials; installation leadership; state officials; and private sector leaders. The PC meets on a quarterly basis and is charged with:

- providing overall project leadership to include policy direction and oversight, budget approval, project monitoring, and report adoption
- participating in public outreach events

technical committee

The technical committee (TC) comprises local and Installation community planners, community staff, business representatives, and residents. The TC meets on a monthly or quarterly basis and is responsible for:

- data collection
- identifying and studying technical issues
- recommending working groups (if needed) for specific issues
- evaluating alternatives
- developing recommendations for the PC

1.4 JLUS Organization and Public Process

Development and subsequent implementation of this JLUS relies on a community-driven, collaborative, strategic planning process among the local governments, jurisdictions, and communities surrounding Camp Grayling JMTC and Alpena CRTC. The organization of the JLUS project reflects this approach, as shown in Figure 1.2. NEMCOG, as the sponsoring agency coordinating the development of this JLUS, oversees the overall process, schedule, and grant funding. To support the work of the JLUS, NEMCOG convened two stakeholder committees: a technical committee (TC) and a policy committee (PC). The TC focuses on a range of technical activities, including data collection, identifying issues and the need for issue-specific working groups, and developing recommendations for the PC. The PC focuses on providing overall project leadership, project monitoring, final report adoption, and participating in public outreach activities and events. Committee membership is provided on the following page.

Achieving the JLUS project goals requires strong public participation throughout the process. The JLUS project team developed and implemented a public participation plan to effectively engage stakeholders. The following text presents a summary of the comprehensive JLUS public participation plan, which is available in Appendix B.

The public participation plan includes five components:

1. **IDENTIFYING AND CHARACTERIZING KEY STAKEHOLDERS:** Understanding stakeholders' awareness, perceptions, concerns, values, and priorities related to Camp Grayling JMTC and Alpena CRTC helps the JLUS project team develop targeted involvement opportunities and educational resources, as well as to understand stakeholders' communication channel preferences. Based on discussions with NEMCOG and the Camp Grayling JMTC community relations specialist, as well as other members of the PC and TC, the community residents rely on traditional sources of information, such as newspaper, radio, and word of mouth, to obtain information.
2. **CREATING EFFECTIVE MESSAGES:** Messaging to stakeholders evolves throughout the process. Initial messages for the discovery phase focused on raising awareness and promoting engagement. Highlighting stakeholder input on issues and concerns is important to identifying solutions that will benefit local communities. Messages for the strategy and planning phase focus on reporting interim findings of the identified issues/conflicts and emphasizing the need for stakeholders to determine if the JLUS project team accurately captured stakeholders' issues and concerns. Messages for the implementation phase focus on presenting the final report findings and recommendations in both the Grayling and Alpena areas, stating the need to collaboratively implement final recommendations based on stakeholder input to benefit local communities and address priority issues.
3. **IDENTIFYING AND CREATING EFFECTIVE STAKEHOLDER INVOLVEMENT OPPORTUNITIES AND EDUCATIONAL RESOURCES:** The JLUS project team selected a suite of stakeholder involvement opportunities, including TC and PC meetings, Camp Grayling JMTC and Alpena CRTC PC and TC member tours and issue identification sessions, community meetings and input sessions, project fact sheets, the JLUS project website, and project presentations. Community surveys and stakeholder interviews are essential involvement opportunities, providing the JLUS project team with insights on priority issues related to Camp Grayling JMTC and Alpena CRTC activities that would require effective strategies. The community meetings and input sessions were also critical to identifying issues, both positive and negative, that drive the overall JLUS process.
4. **IDENTIFYING EFFECTIVE DISTRIBUTION CHANNELS AND MECHANISMS:** Distribution of outreach relies on both a targeted approach to TC and PC members and a ripple approach that asks PC and TC members to use existing distribution mechanisms — such as newsletters, websites, email distribution lists, social media, meetings, and community bulletin boards — to reach their organizational members and constituents with information on involvement opportunities and educational materials. The JLUS project team also relies on local newspapers and radio to help reach stakeholders about the process, the survey, and other means of participation.
5. **ASSESSING EFFECTIVENESS:** Feedback from stakeholders on involvement activities help the JLUS project team determine if changes are necessary to improve effectiveness. The ultimate metric of public involvement effectiveness is support for the final JLUS and implementation of its recommendations over time.

Subsequent chapters of this report provide the outcomes of the public participation process including specific issues and strategies for Camp Grayling JMTC and Alpena CRTC.

22 local cities and townships involved
60 stakeholder interviews conducted
65 technical and policy committee members
195 total online survey responses

1.4.1 Committee Membership

Table 1.1, JLUS Policy and Technical Committee Members and Organizations, contains a list of JLUS TC and PC members. These individuals played a key role in developing the JLUS, and their continued involvement is critical to implementing it by serving as the core group of stakeholders.

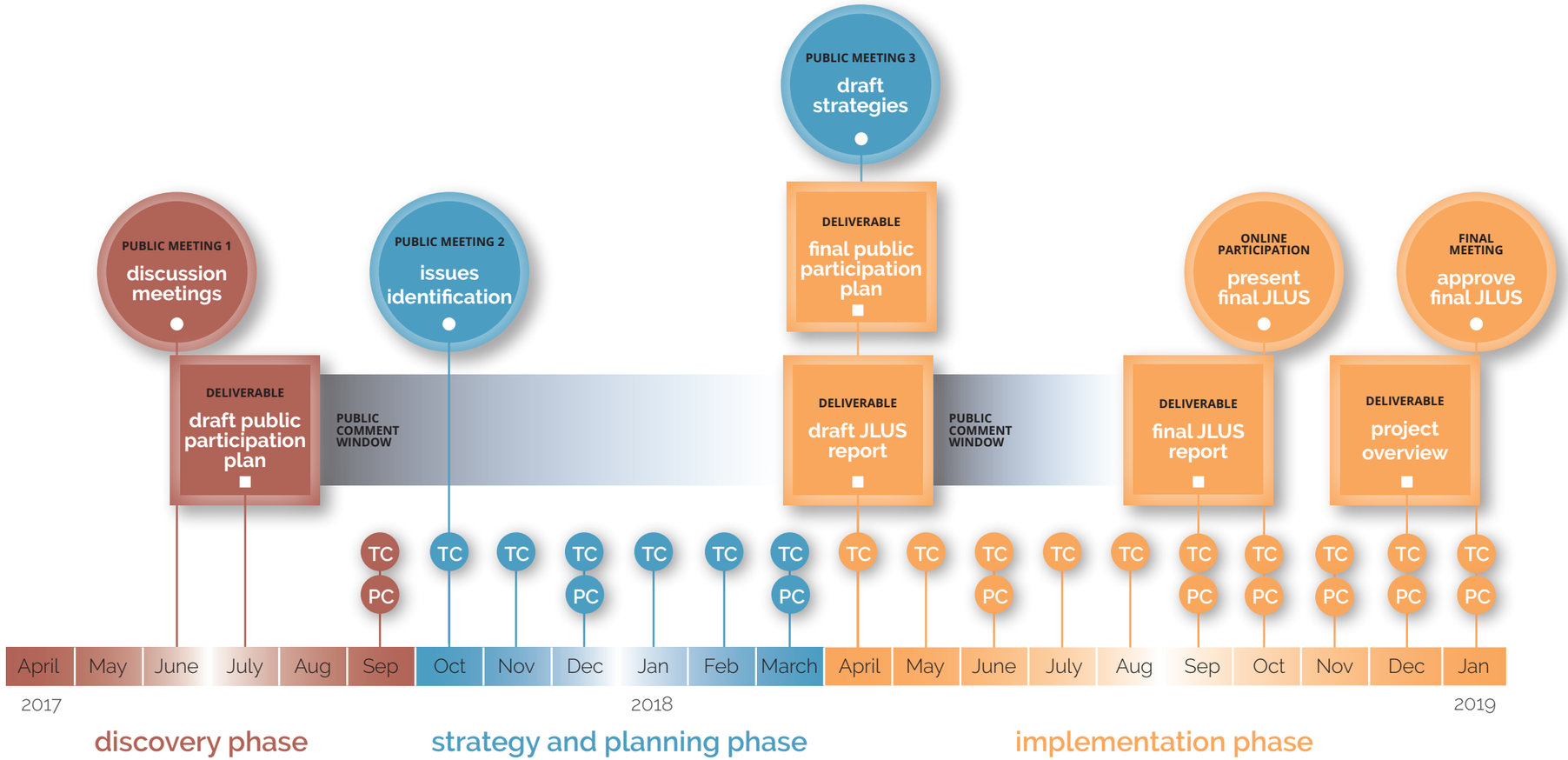
Table 1.1 | JLUS Policy and Technical Committee Members and Organizations

JLUS POLICY COMMITTEE	
Name	*Representing/Title*
Ken Glasser (JLUS Chairman)	Otsego County Board
Greg Sundin (JLUS Vice Chairman)	City of Alpena
Matt Waligora (JLUS Vice Chairman Alternate)	City of Alpena Mayor
Marc Dedenbach (JLUS Secretary)	Grayling Township
SGM Kent Smith	Camp Grayling JMTC
SFC Jeremie Mead	Camp Grayling JMTC
LTC Brian Burrell	Camp Grayling JMTC
Lt Col Matthew Trumble	Alpena CRTC
Lt Col Michael Leski	Alpena CRTC
Capt Brian Blumline	Alpena CRTC
Jonathan Edgerly	Michigan Army National Guard – Environmental
Kim VanNuck	Beaver Creek Township Supervisor
Brandon Schroeder	Michigan State University Extension/Michigan Sea Grant
Susan Thiel	MDNR
Jeff Gray	Thunder Bay National Marine Sanctuary, NOAA
Rob Pallarito	Otsego County Board
Mark Ignash	MEDC
Jim Klarich	Target Alpena
Scott Thayer	MDOT
Dave Stephenson	Crawford County Board Chair
Doug Baum	Grayling City Manager
Steve Smigelski	Alpena Airport Manager
David Persons	Garfield Township Supervisor
Cody Werth	Wilson Township Board/Planning Commission
Julie Lowe	MDEQ
Lisa McComb	Otsego County Economic Alliance
Bill Johnson	Frederic Township Supervisor
Shelly Pinkelman, alternate	Frederic Township Zoning
Ken Lobert	Ossineke Township Supervisor
Nathan Skibbe	Alpena Township Supervisor
Dave Post	Village of Hillman
Myron McIntire, alternate	Hillman Village President
Cam Habermehl	Alpena County
Brian Goebel	Bagley Township
Ken Arndt, alternate	Bagley Township
Jodi Valentino	Roscommon County Controller
Bruno Wojick	Briley Township
Howard Lumsden	Long Rapids Township Supervisor
Sharcy Ray	USDA Natural Resource Conservation Service

JLUS POLICY COMMITTEE, CONTINUED	
Name	*Representing/Title*
George F. Banker	Bear Lake Township Supervisor
Chris Peterson	US Forest Service
Scott R. Koproski	US Fish & Wildlife Service
Edward A. Nellist	Lyon Township Supervisor
James Zakshesky	Posen Township Supervisor
Michael Grohowski	Krakow Township Supervisor
Nyle Wickersham	Metz Township Supervisor
William E. Curnalia	Higgins Township Supervisor
Gary Neumann	Lovells Township Supervisor
Denise Matteini	Otsego Lake Township
Margaret Black, alternate	Otsego Lake Township Clerk
Bonny Miller	Chester Township Supervisor
Scott Kruger	Antrim County Commissioner
Brenda Fournier	Alpena County Commissioner

JLUS TECHNICAL COMMITTEE	
Name	*Representing/Title*
Adam Poll	City of Alpena Planning & Development Director
Erich Podjaske	City of Grayling Zoning/Economic Development
Lisa Kruse	Alpena CRTC Environmental Specialist
Susan Thiel	MDNR
Julie Lowe	MDEQ
Alayne Hansen	Michigan Works!
Patty O'Donnell	MDOT
Doug Baum	City of Grayling
Denise Matteini	Otsego Lake Township
John Bailey	Huron Pines
SMSgt Jerome Torres	Alpena CRTC
SMSgt Damian Pappas, alternate	Alpena CRTC

Figure 1.3 | Project Timeline



TC technical committee meeting

PC policy committee meeting

1.5 Project Timeline

Stakeholders were engaged in this JLUS from an early phase through a variety of methods. Tours provided an opportunity for TC and PC members to become more familiar with the missions and operations of Camp Grayling JMTC and Alpena CRTC. Public meetings gave local residents, not just TC and PC members, a chance to express their concerns and learn more about the JLUS process. Online surveys collected data from an even wider pool of stakeholders across the study area. This project is divided into three phases:

- **DISCOVERY PHASE (APRIL-SEPTEMBER 2017):** During this phase, data collection began and the public participation plan was initiated (see Appendix B) and published in draft form. Initial public meetings were held in June 2017 to raise awareness of the JLUS process and to solicit input. A strengths, weaknesses, opportunities, and threats (SWOT) analysis was performed to begin the issues collection process. The JLUS project team began analyzing the results.
- **STRATEGY AND PLANNING PHASE (SEPTEMBER 2017-MARCH 2018):** During this phase, the interim findings on the identified issues and conflicts were reported to the stakeholders and work began on the JLUS report. The public participation plan was finalized and published.
- **IMPLEMENTATION PHASE (APRIL-DECEMBER 2018):** During the final phase of the project, the final report findings are presented to the TC and PC as well as the public. The draft JLUS is published, and the public is given a chance to weigh in on the strategies and recommendations presented in the plan. The JLUS project team then refines the plan before the final version is published and the results presented at the final public meetings. The team will help guide local governments on how to best implement the strategies presented in the JLUS.

1.6 Next Steps: JLUS Implementation Team

The JLUS Implementation Team should include representation from each participating agency, the TC, and the PC. The strategies developed in the JLUS should allow local government leaders and the military to roll JLUS recommendations into their existing programs. A communication plan, proper zoning tools, and long-range planning are some of the most cost-effective ways to ensure compatible development in the long term. This JLUS is meant to be a living document, so certain strategies may need to be revisited as the local situation and applicable laws evolve. For more information on the Implementation Team Action Plan, see Section 4.

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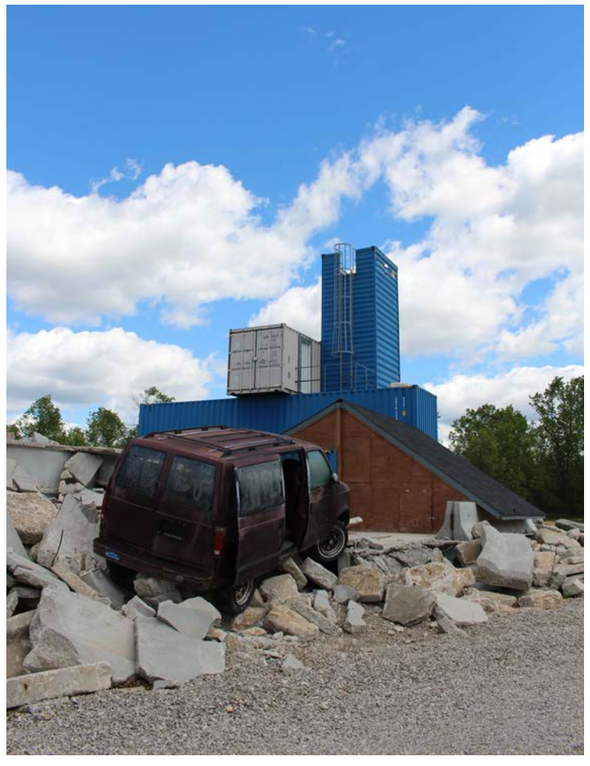
2

camp grayling JMTC and community study area

chapter overview

An impact range at Camp Grayling JMTC.



The Combined Arms Collective Training Facility (CACTF) at Camp Grayling JMTC consists of numerous structures to train soldiers in Urban Operations capabilities.

2.1 Camp Grayling JMTC Study Area Overview

2.1.1 How to Read this Chapter

The following sections describe Camp Grayling JMTC and the areas surrounding it. The first section contains a study area overview, which includes existing conditions information about the Camp Grayling JMTC area. A two-mile study area buffer was created around the Camp Grayling JMTC boundary to establish a focus area for this land use study. The next section has a description of the public participation aspect of this JLUS for Camp Grayling JMTC, and finally, the third section features a discussion of the JLUS issues brought up by local stakeholders and refined by the JLUS project team.

2.1.2 How Camp Grayling JMTC and its Surrounding Area Is Unique

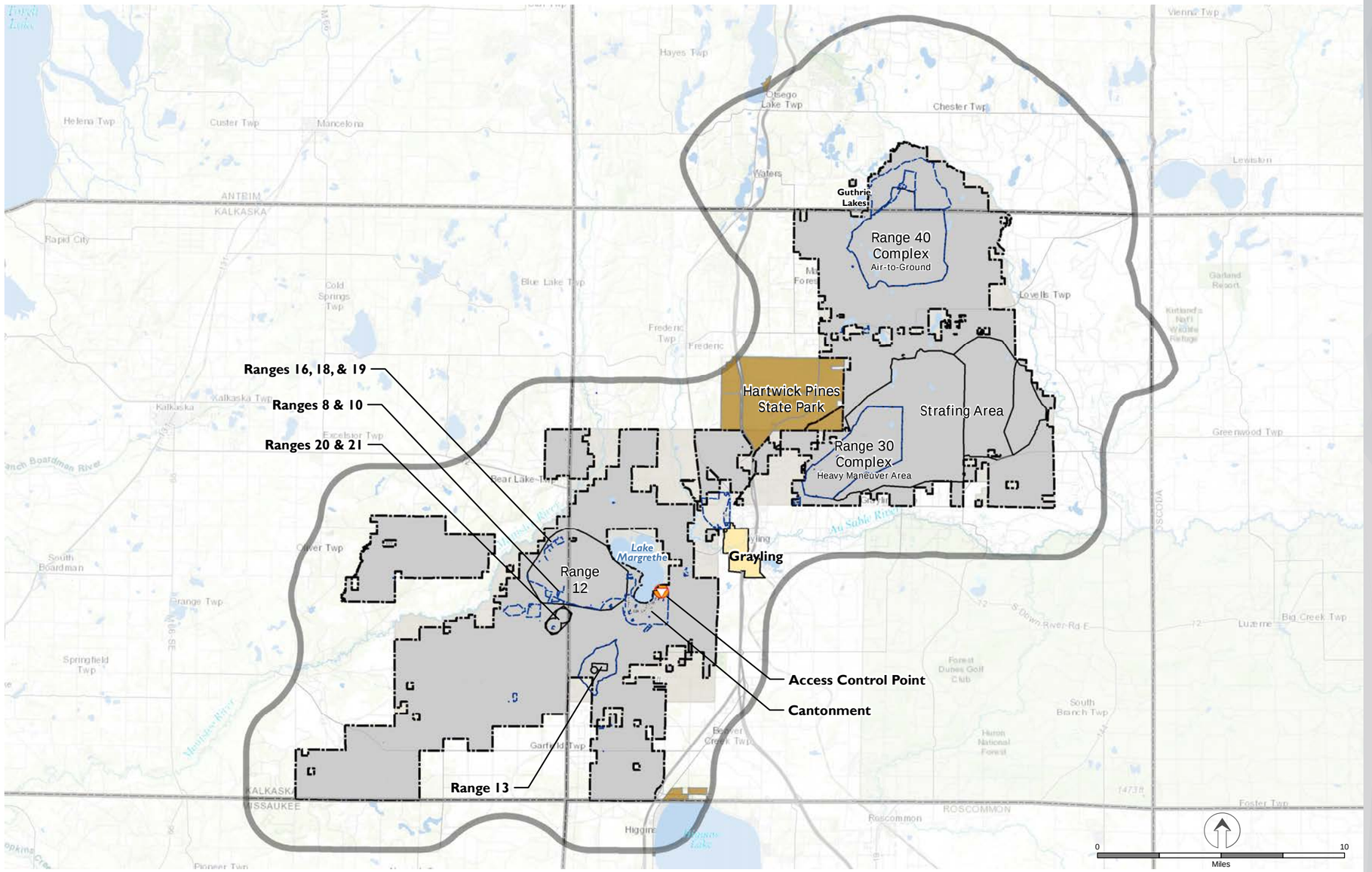
The region surrounding Camp Grayling JMTC is unique in that it provides a large training area, an air-to-ground range, and a large airspace for aerial training all in one complex. Military activity has been going on in the region for over 100 years. Camp Grayling JMTC is used by a cross-section of the U.S. military, including active-duty and National Guard forces, and as a result, the equipment used to train at the camp is also varied. Nonmilitary groups and agencies also use the ranges and other facilities, including Michigan state police, county sheriff departments, local clubs, and scout troops.

The training area is also used by international partners such as Canada, Great Britain, Australia, and Latvia and Liberia (part of the National Guard's State Partnership Program that matches states with international security partners).

The surrounding communities and townships are small, and the area is mostly rural and wooded, with abundant recreational uses. Much of the land on and around Camp Grayling is managed by the Michigan Department of Natural Resources (MDNR) and leased to the Michigan Department of Military and Veterans Affairs (MDMVA). The original 13,000-acre installation footprint was granted to the state of Michigan by lumber baron Rasmus Hanson to use as forest game preserve and military training. No hunting is allowed in the Hanson land grant area, and the public is allowed to access much of the large Camp Grayling JMTC footprint except during active military training.

Camp Grayling JMTC has a state-of-the-art Urban Operations training site, used to train soldiers to handle combat in urban environments. It features a mock village, including subterranean tunnels, to simulate wartime settings. The Michigan Army National Guard (MIARNG) mixes live training at the installation with virtual capabilities using state-of-the-art simulation software.

Figure 2.1 | Camp Grayling JMTC



-- Fence
Camp Grayling JMTC
JLUS 2-Mile Study Area
County Boundary

Camp Grayling JMTC is a key piece of the Michigan Army National Guard arsenal, providing top-of-the-line training land, airspace, and facilities. Surrounding communities value the installation for bringing new people and economic activity to the region, and most residents feel that the installation has a positive impact on quality of life. Some have concerns about noise levels, roads, and the impact of growth on infrastructure capacity.

An image of Camp Grayling in 1917. (Source: Library of Congress Prints and Photographs Division Online)

2.1.3 Setting

The Camp Grayling JMTC study area is located in the rural north-central portion of Michigan's Lower Peninsula. The installation cantonment, adjacent to the City of Grayling, is approximately 50 miles east of Traverse City and 200 miles northwest of Detroit. Access to the area is generally via Interstate 75 (I-75) and Michigan Highway 72 (M-72).

The abundance of public forest land and the locations of the Au Sable and Manistee rivers make the area popular with outdoor enthusiasts; activities include hiking, fishing, golfing, canoeing, kayaking, skiing, snowmobiling, and biking.

Camp Grayling JMTC, the largest National Guard training center in the country, spans 147,000 acres in Crawford, Kalkaska, and Otsego counties and is split into North Camp and South Camp. The study area for this JLUS extends into Roscommon, Oscoda, and Montmorency counties.

The Camp Grayling JMTC main cantonment area, located in South Camp, is about 4 miles from the City of Grayling, the immediate area's largest population center. Gaylord, a city of about 3,600, is a 35-minute drive to the north.

The Camp Grayling JMTC study area has a very short and highly variable growing season. Temperatures at Camp Grayling JMTC range from an average low of 16.7 degrees Fahrenheit in January to an average high of 79.6 degrees in July, according to the Midwestern Regional Climate Center. The area averages 33.61 inches of precipitation annually. The average snowfall is 93.1 inches.

2.1.4 History

The forested environment surrounding Camp Grayling JMTC played a major role in its history, as many of the first settlements in the area were associated with the trapping and lumber industries, and railroad construction in the area began in the late 1800s. The first schoolhouse in Grayling opened in the 1870s, and a railroad depot was built there in 1882. In 1911, First Mercy Hospital opened in Grayling. Two years later Rasmus Hanson, a local lumberman, donated 13,000 acres of land to the state for military training, which later became Camp Grayling JMTC. The camp's historic Officer's Club building was constructed in 1917.

In 1914, Hanson founded the Grayling Fish Hatchery, partly in an unsuccessful attempt to save the Michigan Grayling from extinction. The hatchery is now owned and operated by the Grayling Recreation Authority, and its preservation is part of a public-private partnership (P3) with Harrietta Hills Trout Farm. The area also had a DuPont Chemical Plant, as well as the Hanson and Salling Mill; both closed in 1925.

However, the area's military contingent was growing. Between 1918 and 1921, the acquisition of 35,000 acres allowed for the first artillery range. The Grayling airport was developed for the National Guard Air Squadron of Detroit. Featuring sand runways, it opened in 1929, and the runways were paved in 1936. An exchange, control tower, fire department, and barracks were added to the camp in 1942.

In 1948, the land area of Camp Grayling grew dramatically when more than 53,000 acres were leased in perpetuity from the Michigan Conservation Department (now the MDNR). This allowed for tank training at the camp.

An additional 47,000 acres were leased from the MDNR in 1984. Among the numerous range and facility projects at Camp Grayling in that part since the 1960s, including the development of a logistical support facility, motor pools, and the Maneuver Area Training Equipment Site (MATES) facility, which was built in 1986. More recently, the wastewater treatment facility was added in 1991 and a multipurpose range complex in Range 30 was built in 1997.

2.1.5 Mission/Operations

The Alpena CRTC and Camp Grayling JMTC are vital and irreplaceable components of the U.S. military. They are physically separated but operationally inseparable. Camp Grayling acts as the local garrison component of the range complex while Alpena CRTC oversees and controls training

Downtown Grayling in 2018.

operations and management of the entire complex stretching from the eastern border with Canada to the western edge of the camp including the supporting special use airspace (SUA) complex. While Alpena CRTC is a Michigan Air National Guard installation, Camp Grayling JMTC is owned and operated by the MIARNG.

Camp Grayling JMTC is directly accessible from interstate highways and has its own railhead for equipment delivery. This training complex provides units from all branches of service under the DOD opportunities to train and qualify at nearly every activity necessary for national defense. It provides for joint, intra-service operational training, which is imperative in today's asymmetrical battlefield. Its massive footprint is among only a small few in the nation that can support mission command across extended distances and the ability to synchronize joint attack maneuvers to maximize the most effective use of the battle space while retaining freedom and flexibility of action, protecting against fratricide, and integrating joint and multinational forces in a dynamic, decisive operating environment. It provides realistic and simulated environments and four-season capability to train for military operations in all conditions.

This includes simultaneous integration of ground forces (both on foot and vehicular), ground-to-air (including artillery, mortar, and small arms fire), air (including rotary wing, fixed wing, fighters, bombers, reconnaissance, communications, and unmanned aerial systems [UAS]), air-to-ground (strafing, door gunnery, aerial bombing, missiles, close air support [CAS], medical evacuation [MEDEVAC], electronic detection and prevention, and laser targeting), and space assets (including intelligence, surveillance, and reconnaissance [ISR], and communications satellites and receivers).

Camp Grayling JMTC comprises a few component features:

- **RANGE 30 COMPLEX:** Includes 65,000-acre heavy and light maneuver areas, small arms firing ranges for training and qualification, sniper ranges, convoy training, improvised explosive device (IED) awareness training, military operations on urban terrain (MOUT) mock villages, a heavy multipurpose range complex, rocket launching systems training, UAS launch and recovery and flight zone within restricted airspace (RA), and equipment storage and maintenance support facilities.
- **RANGE 40 COMPLEX:** Includes over 17,000-acres of maneuver area, 10,000 acres of live-fire area with a dudded impact zone, small-arms fire capability, artillery and mortar direct fire, mechanized live fire, combined arms live fire, rotary-wing and fixed-wing aerial gunnery, rotary-wing door gunnery, and aerial bombing from as high as 23,000 feet above mean sea level (MSL) within RA.
- **SOUTH CAMP GRAYLING:** Includes small-arms ranges for training and qualification on all current firearms, infantry squadron battle course, mortar and grenade ranges, light demolition range, fire movement range, and known distance ranges.
- **OPERATIONAL READINESS TRAINING COMPLEX AT CAMP GRAYLING:** Includes 8,000 transient bed spaces, 53 officers' quarters, 45 mess halls, seven maintenance buildings, seven classrooms, and two distance-learning centers. It has over 220,000 SF of warehouse storage space, bulk fuel storage for aircraft and ground equipment, munitions storage facilities, and a wide variety of recreational support facilities.
- **GRAYLING ARMY AIRFIELD (AAF):** Includes an area large enough to support up to a combat aviation brigade including 60 helicopter tie-downs, housing to support 300 troops plus an additional 300 person bivouac area, dining facilities, training and administrative facilities, educational and operations facilities, two paved runways (both 5,000 feet long by 150 feet wide) capable of landing a fully loaded C-17, a control tower overseeing Class-D controlled airspace, aircraft maintenance hangars, a launch and recovery runway for RQ-7B Shadow UAS, and Shadow UAS simulators. The airfield is owned and operated by the Army but is open to the public. Grayling AAF supports slightly more overall activity than Alpena County Regional Airport but fewer military flights.
- **SPECIAL USE AND PROTECTED AIRSPACE:** One of the largest airspace complexes in North America, including approximately 18,000 square nautical miles of low-altitude (below 18,000 feet MSL) and high-altitude (above 18,000 MSL) SUA, some extending as high as 45,000 feet MSL and as low as 300 feet over Lake Huron. It includes approximately 935 square nautical miles of protected airspace for dangerous activities like tactical flight maneuvering, air interdiction, aerial denial, chaff and flare release, aerial gunnery, and bombing designed to protect nonparticipating aircraft.

The training activities at Camp Grayling JMTC bring as many as 250,000 personnel through the area per year. The installation supports 44 Army National Guard personnel, 54 state employees, and 20 contract employees with an additional 56 temporary employees during training events.

2.1.6 Demographics

The Camp Grayling JMTC study area for this JLUS is set in a largely rural area in Michigan. As of 2017, data shows 1,820 people reside in the City of Grayling, with 5,705 residing in Grayling Township. In general, northern Michigan is much less urban than the rest of the state, and the study area is primarily rural.

Although there are only about 174 personnel housed at Camp Grayling JMTC annually, approximately 10,000 troops train there throughout the year. Camp Grayling JMTC is a continued source of economic activity for the local community. The federal funds that pay camp employee salaries are subsequently used to pay local taxes and to support schools, hospitals, churches, and local businesses.

Outside of the military, property tax is the primary generator of revenue. The City of Grayling has a workforce population of 803 people. In 2017, the leading industries in Grayling were health care, social services, retail, accommodation and food services, and public administration.

Population Projections

Population in the area has slowly been declining since 2000. This could be due to the aging population of Grayling and high poverty rates. However, unemployment rates have decreased significantly, dropping from 15.3 percent in 2010 to 5.6 percent in 2016. Also, the cost of living is very low compared to other rural areas in the region. The forecasted population looks to increase by the year 2022 due to key growth potential factors. See Figure 2.2, City of Grayling Population Trend, 1910-2020.

Growth Potential

There are several key growth potential factors and strategies that the Camp Grayling JMTC study area has planned to implement. These plans are in place to help boost the economic and population growth potential in the area.

In an effort to attract skilled talent to the area and curb a decreasing population, a 10-year talent plan was commissioned for the 11-county Northeast Michigan region. The plan focuses on long-term growth, bringing to the region full-time, higher-wage positions in the highest growth industries. The Northeast Michigan 10-year talent plan provides a timeline, best practices, and recommendations for assessing and bringing in skilled employees to the region. Northeast Michigan is looking to adequately plan for long-term growth by anticipating industry trends and educational needs. The vision for the future of Northeast Michigan is to fill 10,000 jobs in 10 years. For details, see Table 2.1, Northeast Michigan Industry Forecast.

Grayling will soon experience a resurgence in the forestry industry. A Chilean forestry company, Arauco, is opening a particle board factory in 2018. This is poised to bring in hundreds of local jobs and boost the economy significantly. Once the factory opens, it will become the second-largest county employer after Grayling's hospital, dropping Camp Grayling JMTC to third largest.

The City of Grayling has recently prepared a thorough economic development strategy. The strategy specifies detailed steps, responsible parties, and timelines for implementation to boost Grayling's economic growth. The steps focus on the key issues in the area, some of which include:

- Child care options
- Better communication with Camp Grayling JMTC
- Transportation
- Housing options
- Cell service and internet access
- Diversity in dining options
- Appearance improvement to the downtown area

Figure 2.2 | City of Grayling Population Trend, 1910-2020

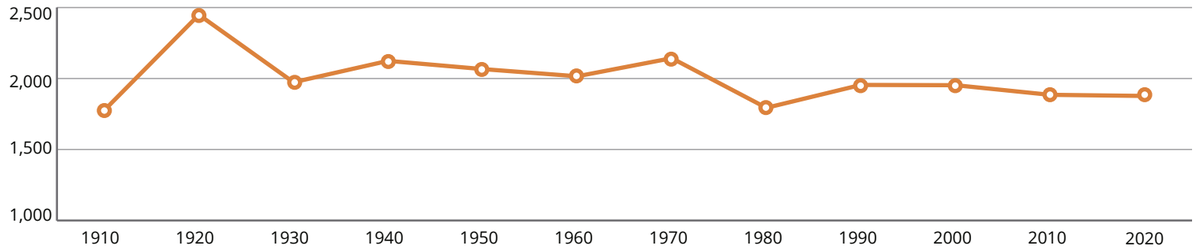


Figure 2.3 | Camp Grayling JMTC Study Area

Table 2.1 | Northeastern Michigan Industry Forecast

INDUSTRY	EMPLOYMENT 2012	EMPLOYMENT 2022	PERCENT CHANGE (%)
Retail Trade	10,960	10,860	-0.9
Healthcare and Social Assistance	9,560	10,212	6.8
Transportation and Warehousing	1,460	1,630	11.6
Manufacturing	5,170	5,420	4.8
Construction	2,380	2,780	16.8
Agriculture, Forestry, Fishing, and Hunting	1,790	1,850	3.4
Professional and Business Services	2,320	2,620	12.9
Accommodation and Food Services	6,410	6,860	7.0
Leisure and Hospitality	7,530	8,040	6.8
Government	6,270	6,090	-2.9
Financial Activities	2,320	2,360	1.7

Source: http://www.discovernortheastmichigan.org/downloads/rpi_10_year_talent_plan.pdf

Figure 2.4 | Camp Grayling JMTC Study Area Demographics

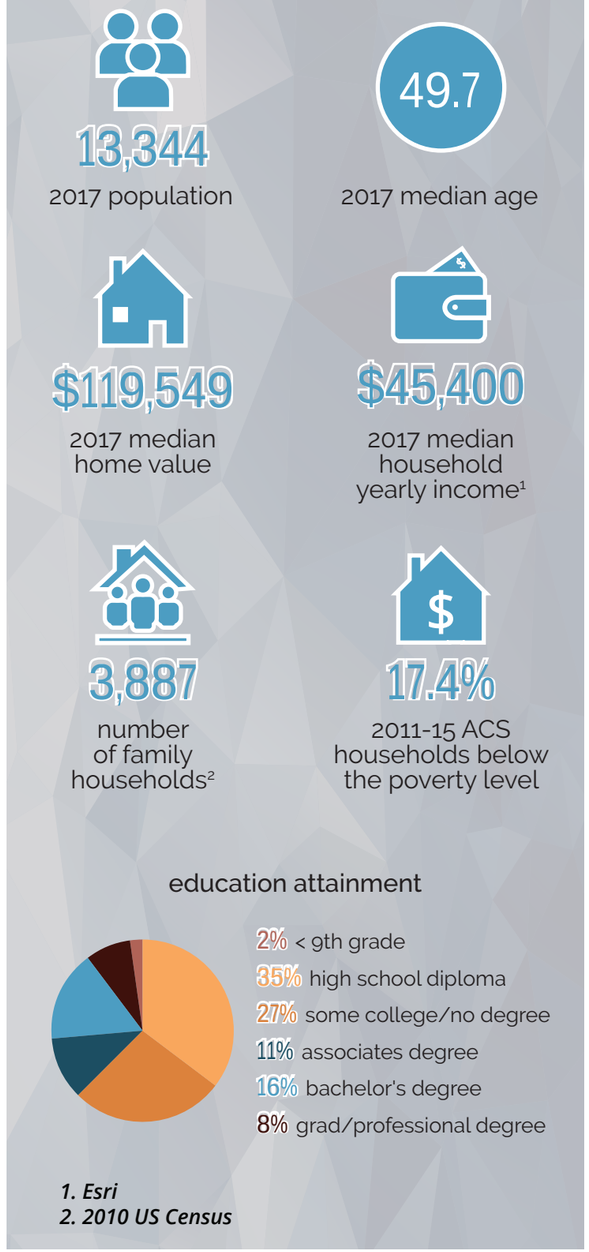
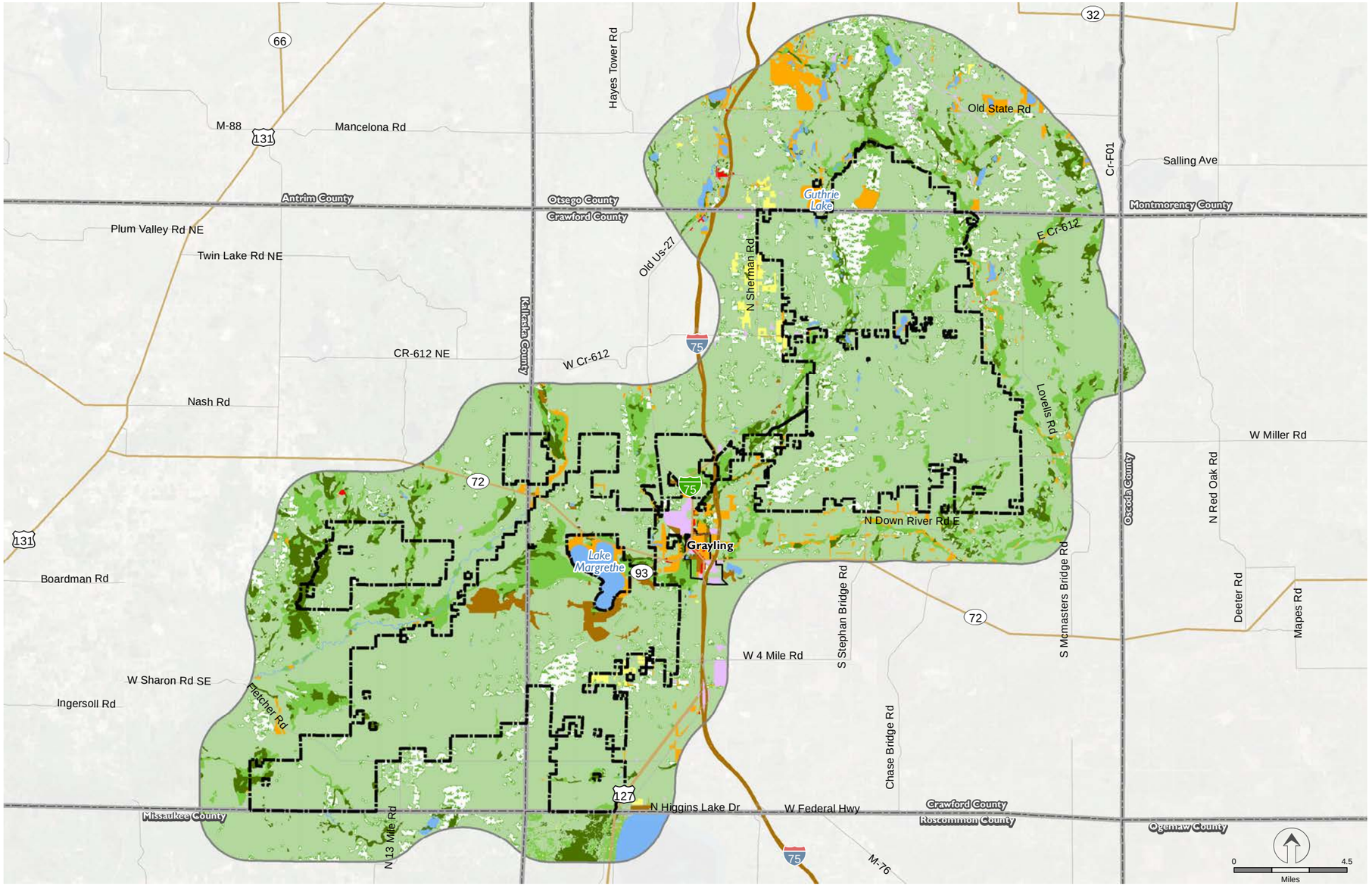


Figure 2.5 | Camp Grayling JMTC Land Use



2.1.7 Land Use

The divisions of land use are categorized into natural areas and those created by human activity. They were organized in this manner to reconcile the differing land-use categories provided by the counties within the study area. Man-made uses are concentrated along the roadways throughout the study area but primarily located in the City of Grayling. Areas of man-made uses consist of commercial, industrial, recreational, and residential uses; the map only indicates the locations of the uses, not the density of these uses.

It should be noted that land use is a portrayal of the actual use of real property and, while it informs zoning, is not considered to be legally enforceable. It is generally used for reference and various data analytics. Many of these land uses may be in conflict with codified land-use regulations that are governed by the townships that fall within the study area boundaries. Often the land use map is used as the template for the creation of zoning laws that are compatible with the current land uses, or in some cases to alter a certain use for desired future development.

The study area for the Camp Grayling JMTC consists of over 300,000 acres of various land uses. Included in the land-use analysis are Crawford, Kalkaska, and Missaukee counties. A vast majority, approximately 96 percent, of the area are natural uses. These include lowland and upland forest, wetlands, water, and nonforested uplands. Among the land uses that are man-made, residential areas consist of 2 percent and are mainly located around Lake Margrethe and in the City of Grayling.

Figure 2.6 | Camp Grayling JMTC Study Area Land Use Distribution

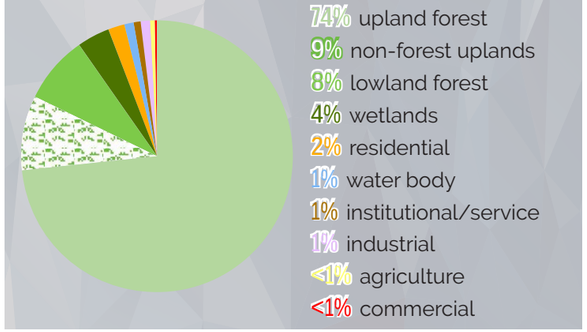
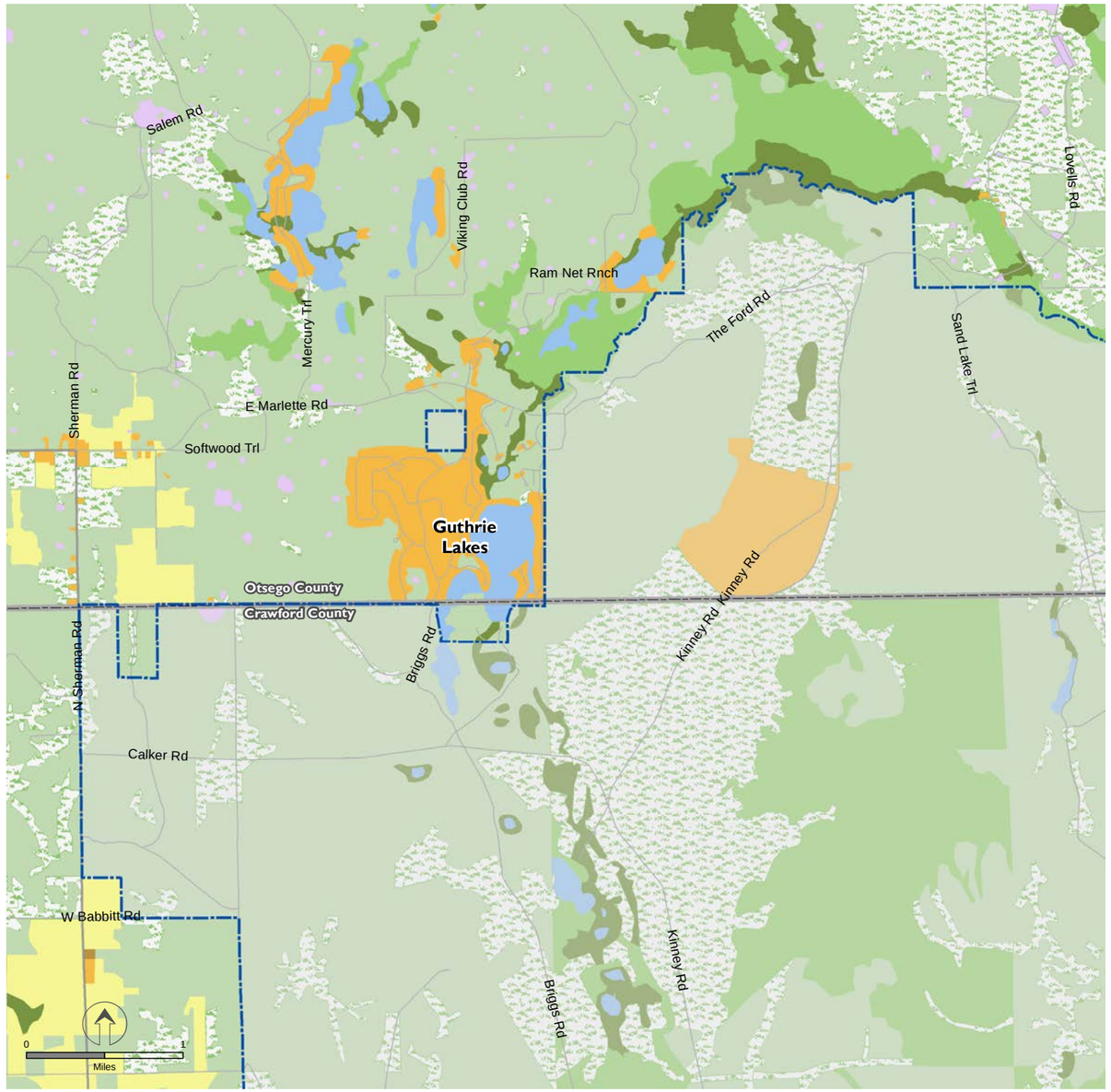
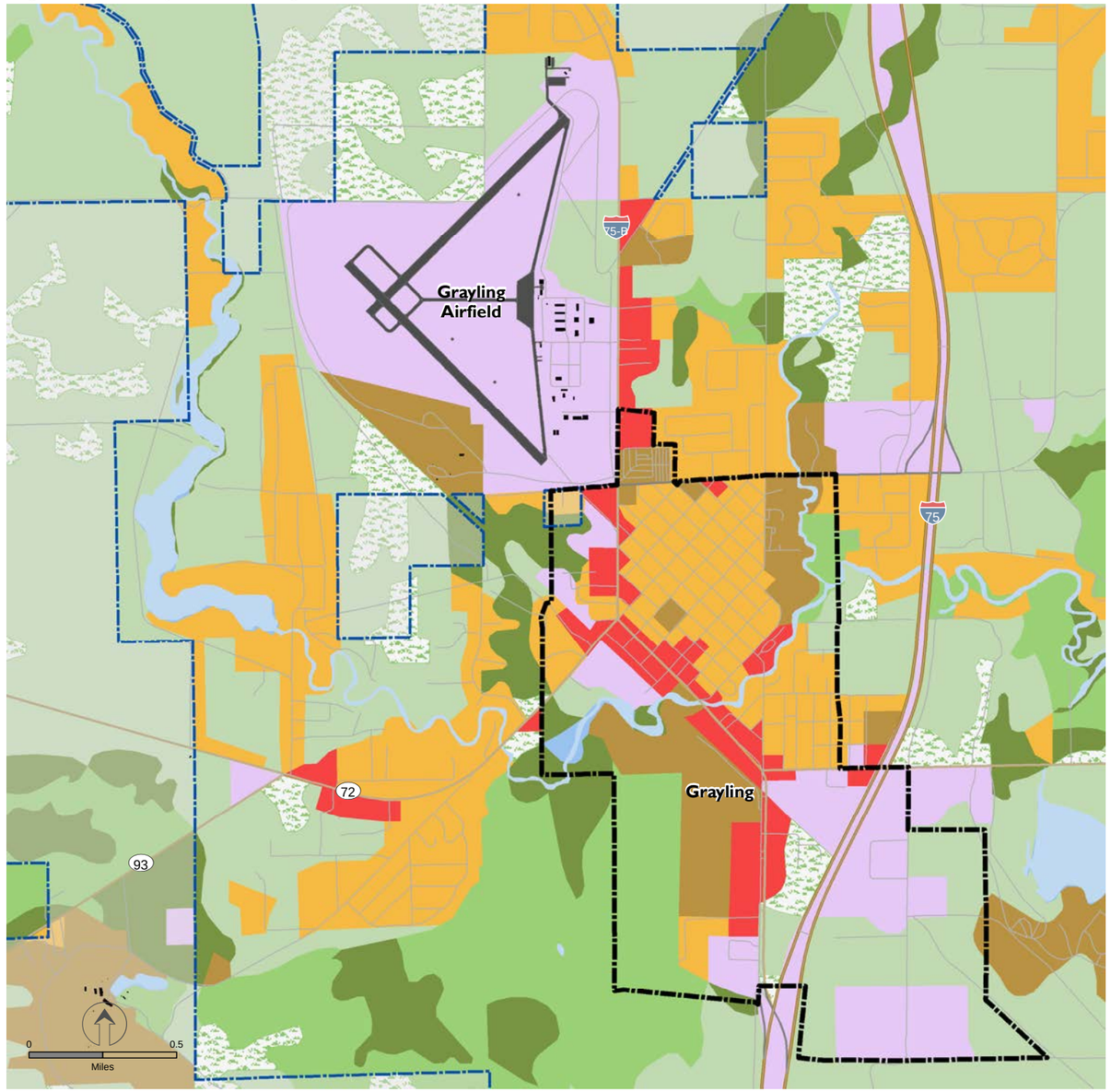


Figure 2.7 | Guthrie Lakes Land Use



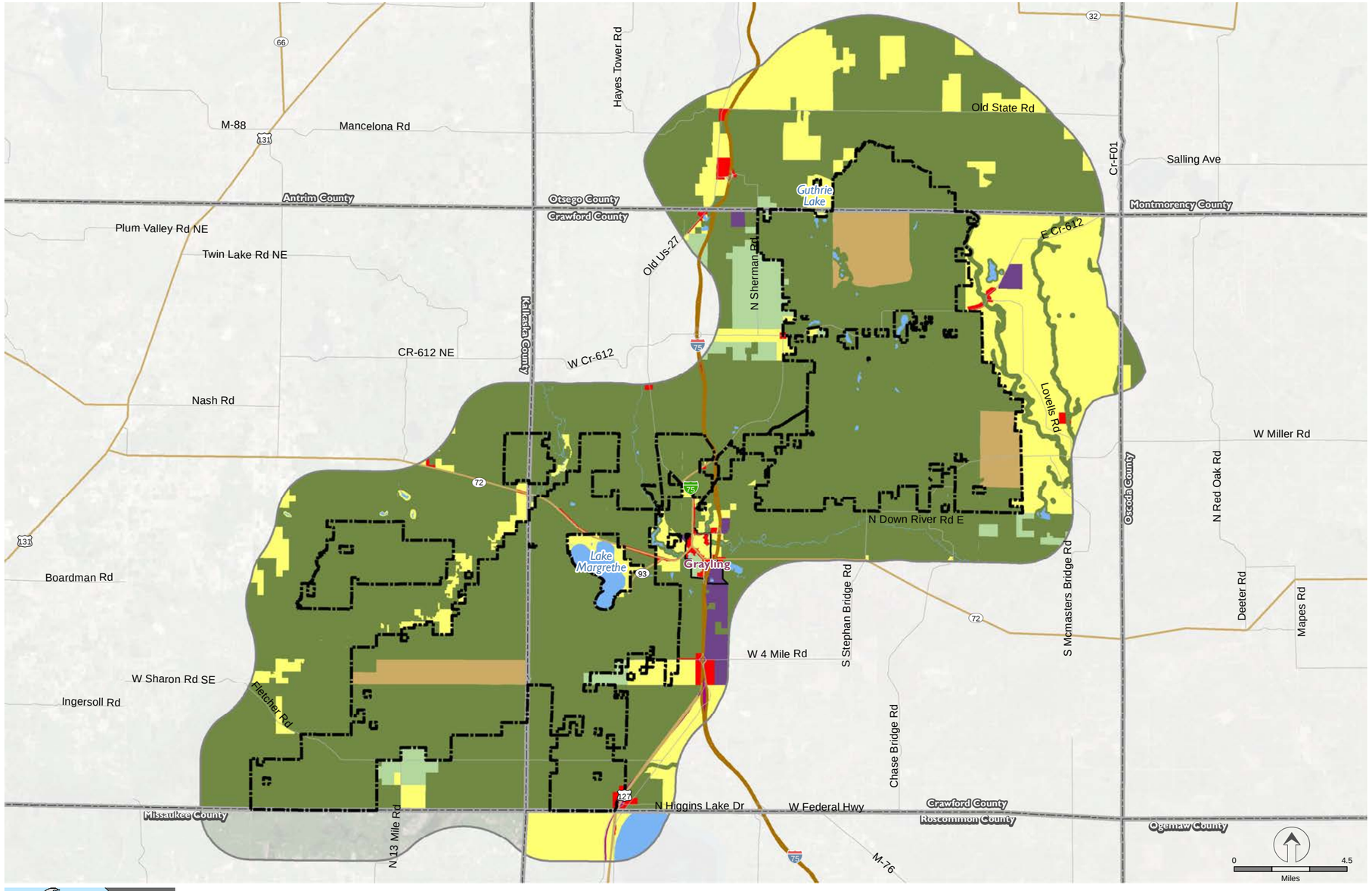
Camp Grayling JMTC
County Boundary
Existing Land Use
Residential
Institutional/Service
Agricultural
Non-Forest Uplands
Upland Forest
Lowland Forest
Wetlands
Water
Industrial

Figure 2.8 | City of Grayling Land Use



Camp Grayling JMTC
County Boundary
Existing Land Use
Residential
Commercial
Institutional/Service
Non-Forest Uplands
Upland Forest
Lowland Forest
Wetlands
Water
Industrial

Figure 2.9 | Camp Grayling JMTC Zoning



2.1.8 Zoning

The Camp Grayling JMTC study area includes portions of six counties, each with their own zoning regulations and/or zoning controlled by the townships within. Endowed by the state of Michigan to enforce zoning, the townships included in the study area have created zoning for each of their respective jurisdictions. The zoning data analyzed for this section was taken from the townships and the City of Grayling that are within Crawford County, Kalkaska County, Otsego County, Oscoda County, and Roscommon County. Missaukee County is not zoned.

The varying zones have been grouped into eight categories that best fit the overall description of the zone. While the categories do not take into account the intensity of the zone, they lay out the legal mechanisms available within the study areas that control the use of property.

Among the zoning categories, a natural resource (or open space type district) is the largest at 72 percent of the study area. This zone contains large portions of Camp Grayling JMTC that are inaccessible by nonmilitary personnel. Recreational areas accessible to the public at Camp Grayling JMTC area not included. The second-largest zoning category is residential, at varying levels of density. This category accounts for 16 percent of the study area. Although the zone category is located throughout the area, the highest densities are within the City of Grayling. Residentially zoned areas in the eastern portion of the study area are of very low density despite covering a large area. It should be noted that the military operations zone is a category assigned by only one of the townships within Crawford County and is not representative or inclusive of the entirety of Camp Grayling JMTC.

Figure 2.10 | Camp Grayling JMTC Zoning Distribution

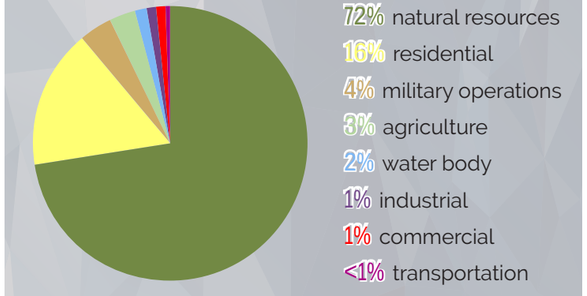


Figure 2.11 | Guthrie Lakes Zoning

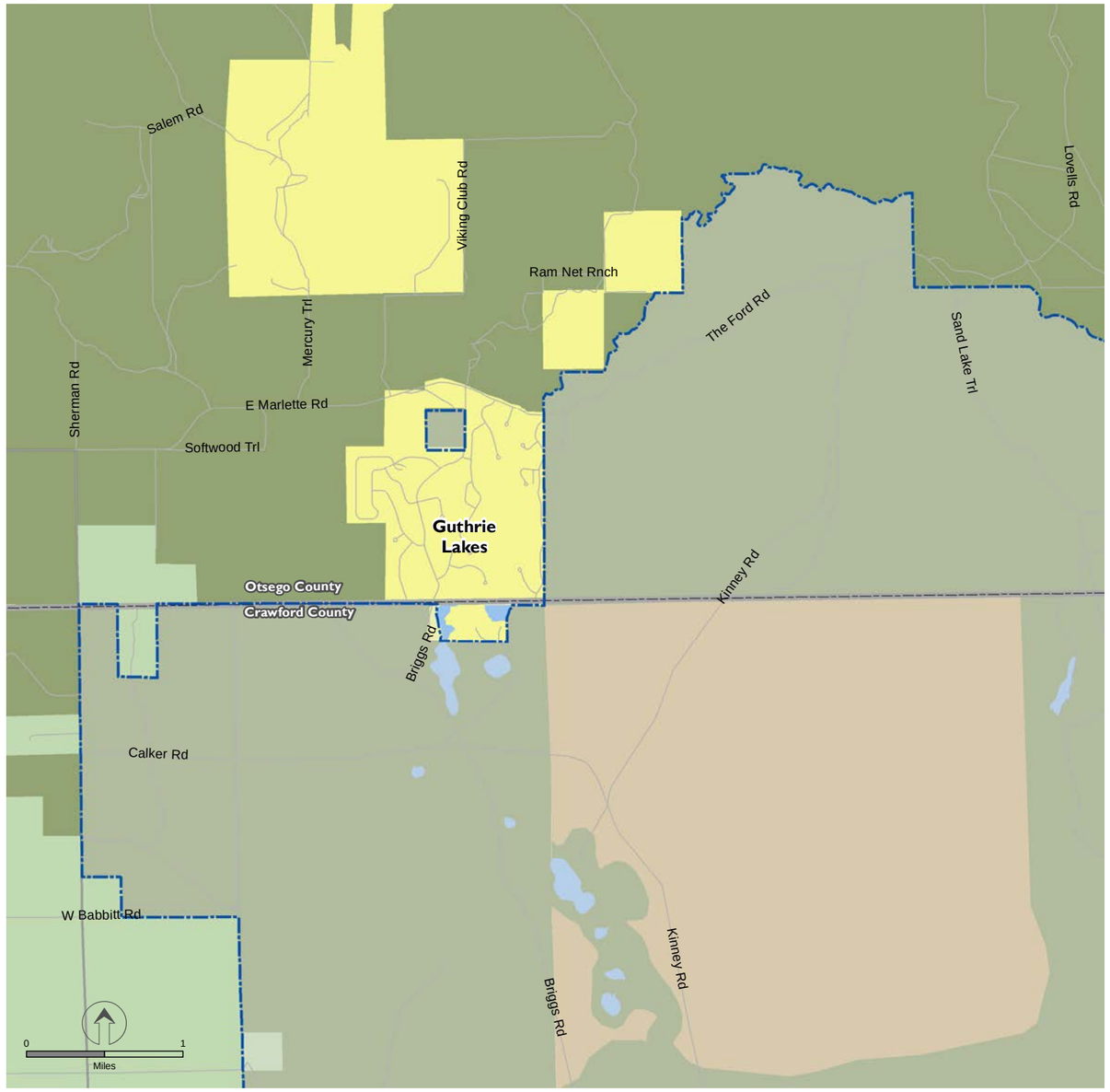


Figure 2.12 | City of Grayling Zoning

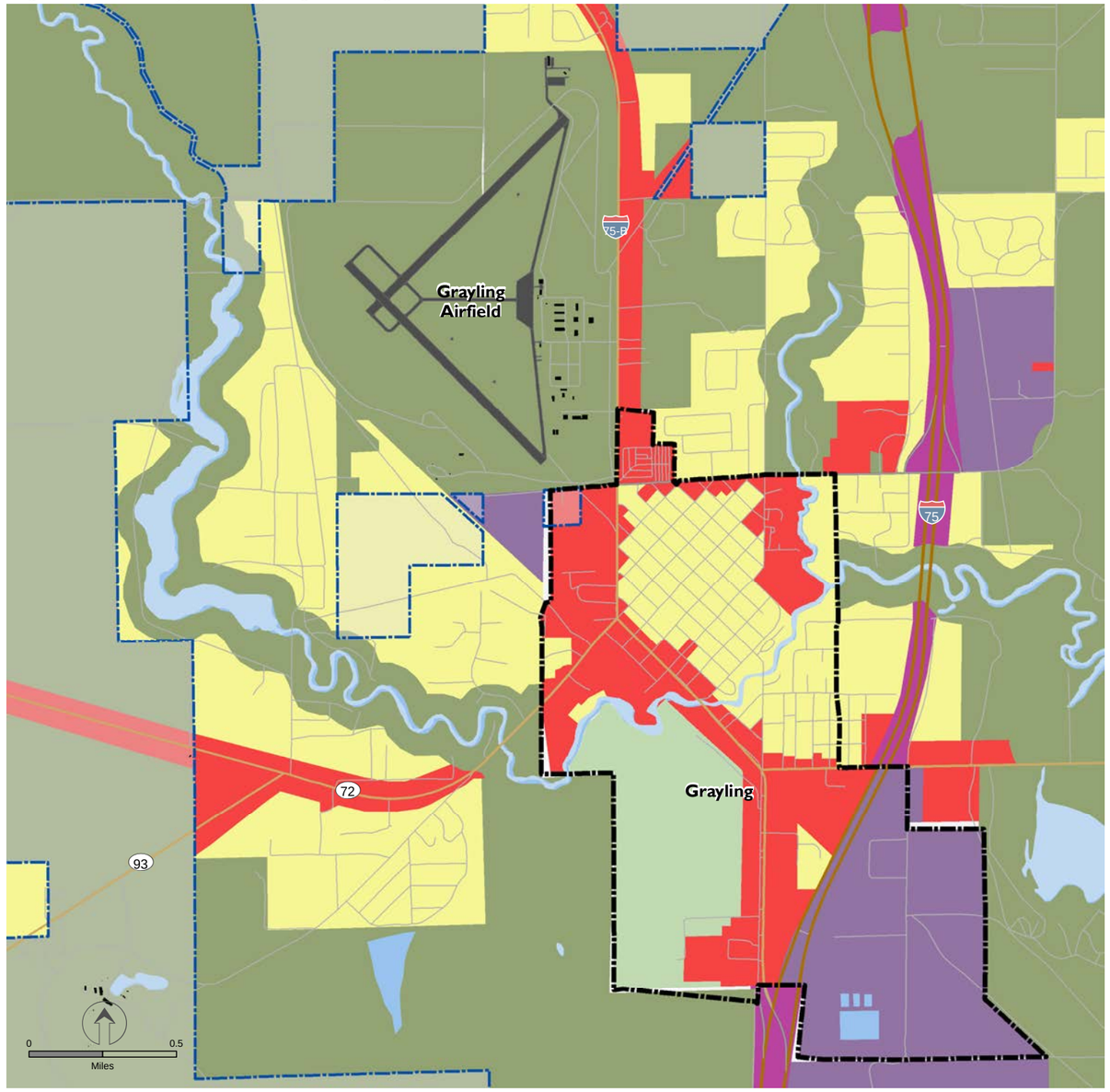
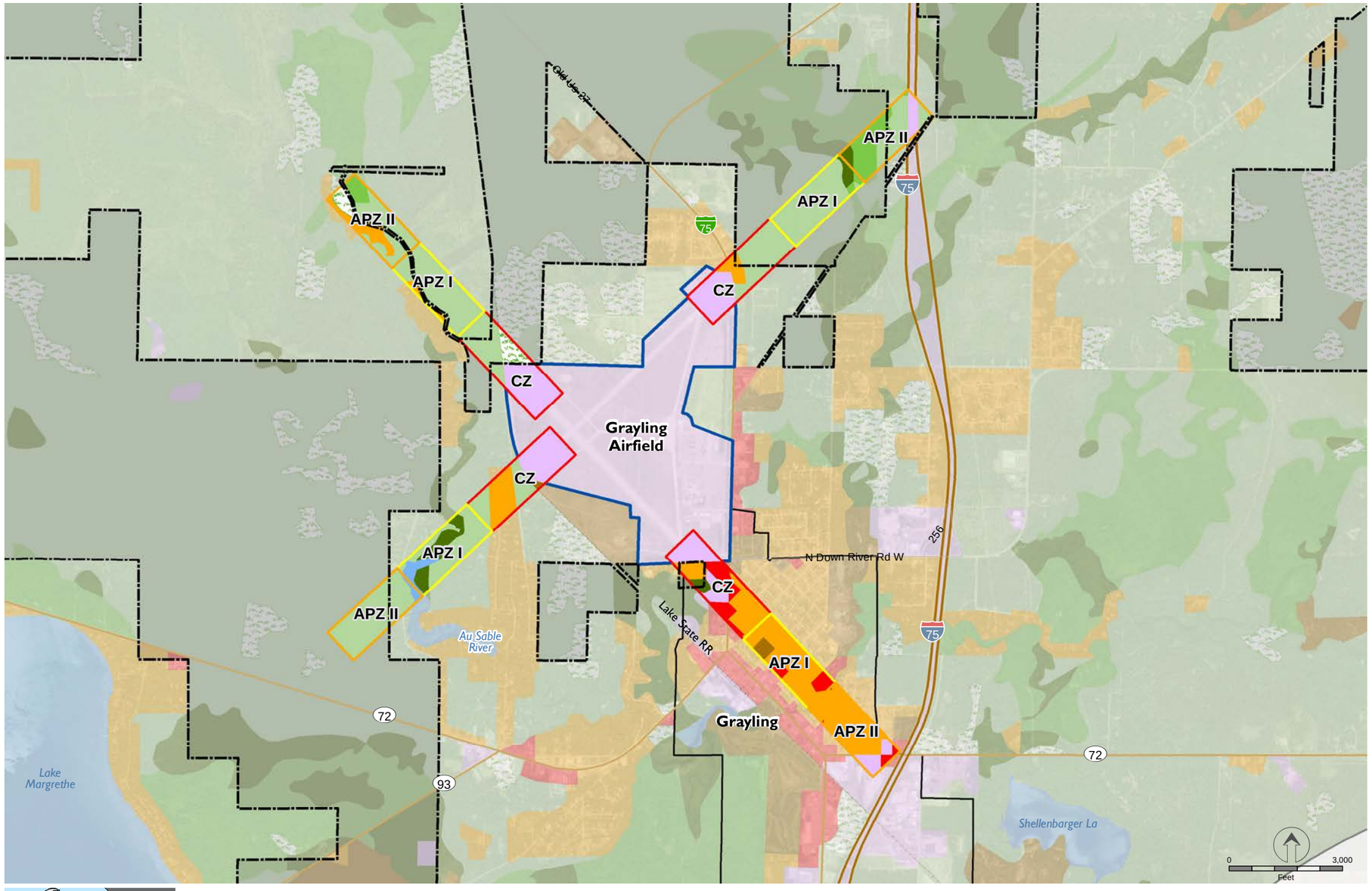


Figure 2.13 | Camp Grayling JMTC Incompatible Use – Land Use in APZs



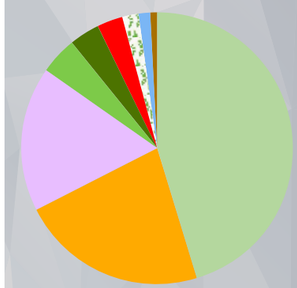
2.1.9 Incompatible Use

Land Use in APZs

Clear zones (CZ) and accident potential zones (APZs I and II) occur at the ends of runways and were established based on crash patterns. For an Army Class A runway – designed for small, light aircraft – the CZ starts at the end of the runway and extends outward 3,000 feet at 1,000 feet wide. It has the highest accident potential of the three zones and has few uses that are compatible. APZ I extends from the CZ an additional 2,500 feet in an area of lower but still considerable accident potential, and APZ II extends out from APZ I an additional 2,500 feet, possessing less accident potential than APZ I but still enough to warrant land use restriction recommendations.

The majority of the APZ for Grayling AAF falls within the jurisdiction of Gray ling Township and the City of Grayling. Within those areas that fall into the APZ, the majority is made up of natural uses at 56 percent. Residential use makes up 22 percent of the land within the APZs, followed by 17 percent industrial, 3 percent commercial, and less than 1 percent institutional.

Figure 2.14 | Camp Grayling JMTC Land Use Distribution in APZs



Land Use in Noise Contours

Varying uses of the land within the 75+ dB noise contours highlights the many opportunities for harmful human exposure to increased sound levels. A vast portion of the land uses within this area are classified as either a forest or wetland and thus the likelihood of human exposure is decreased. However, 2 percent of the use is residential, which would have higher chances of exposure to higher sound levels.

Figure 2.15 | Camp Grayling JMTC Incompatible Use – Land Use in Noise Contours

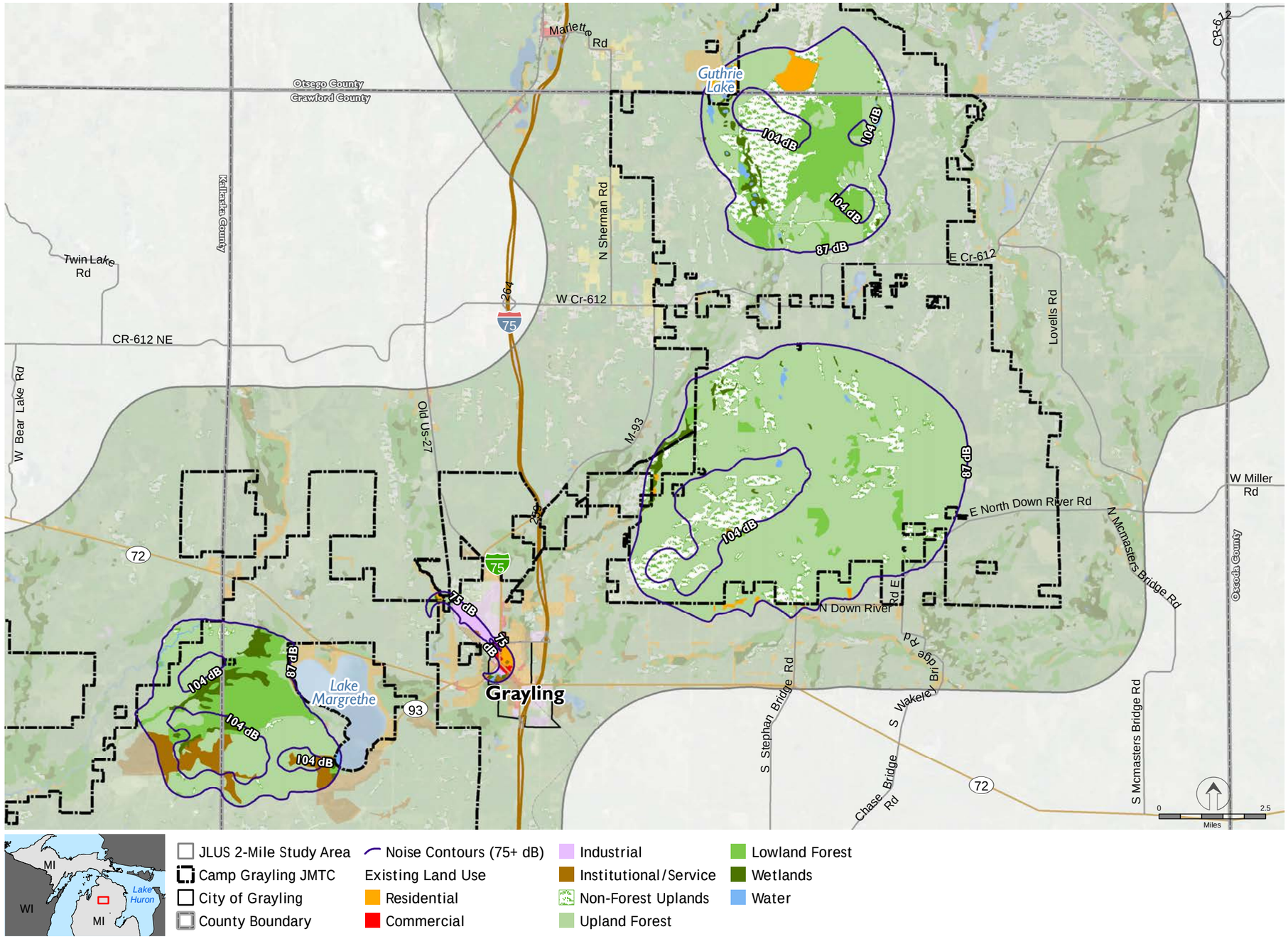
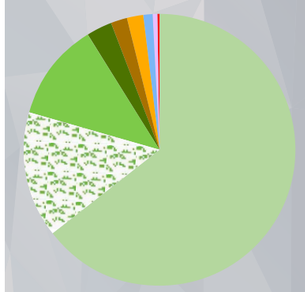


Figure 2.16 | Camp Grayling JMTC Land Use Distribution in Noise Contours



- 66% upland forest
- 15% non-forest uplands
- 12% lowland forest
- 3% wetlands
- 2% institutional/service
- 2% residential
- 1% water body
- <1% industrial
- <1% commercial

Figure 2.17 | Guthrie Lakes Land Use in Noise Contours

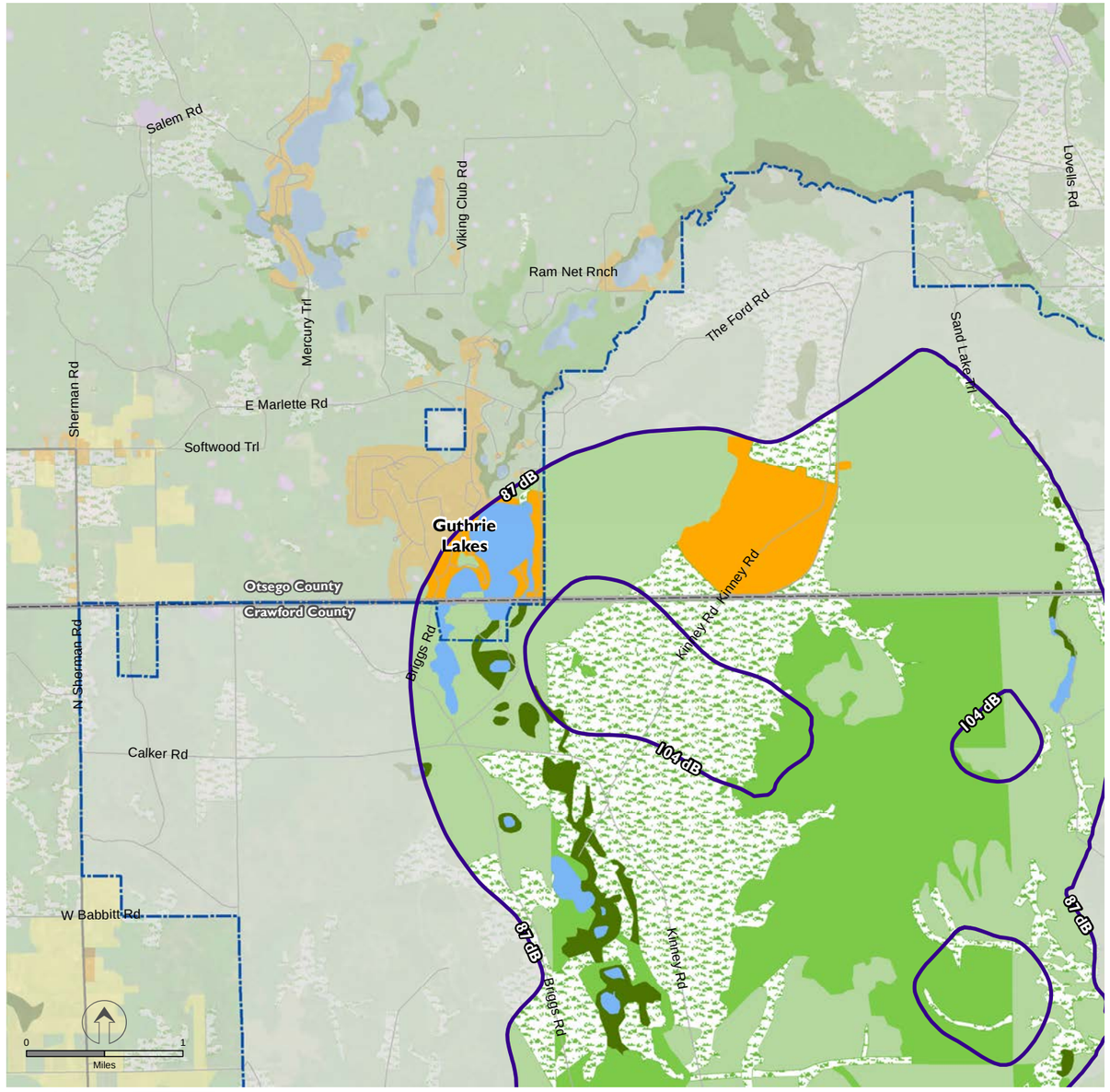
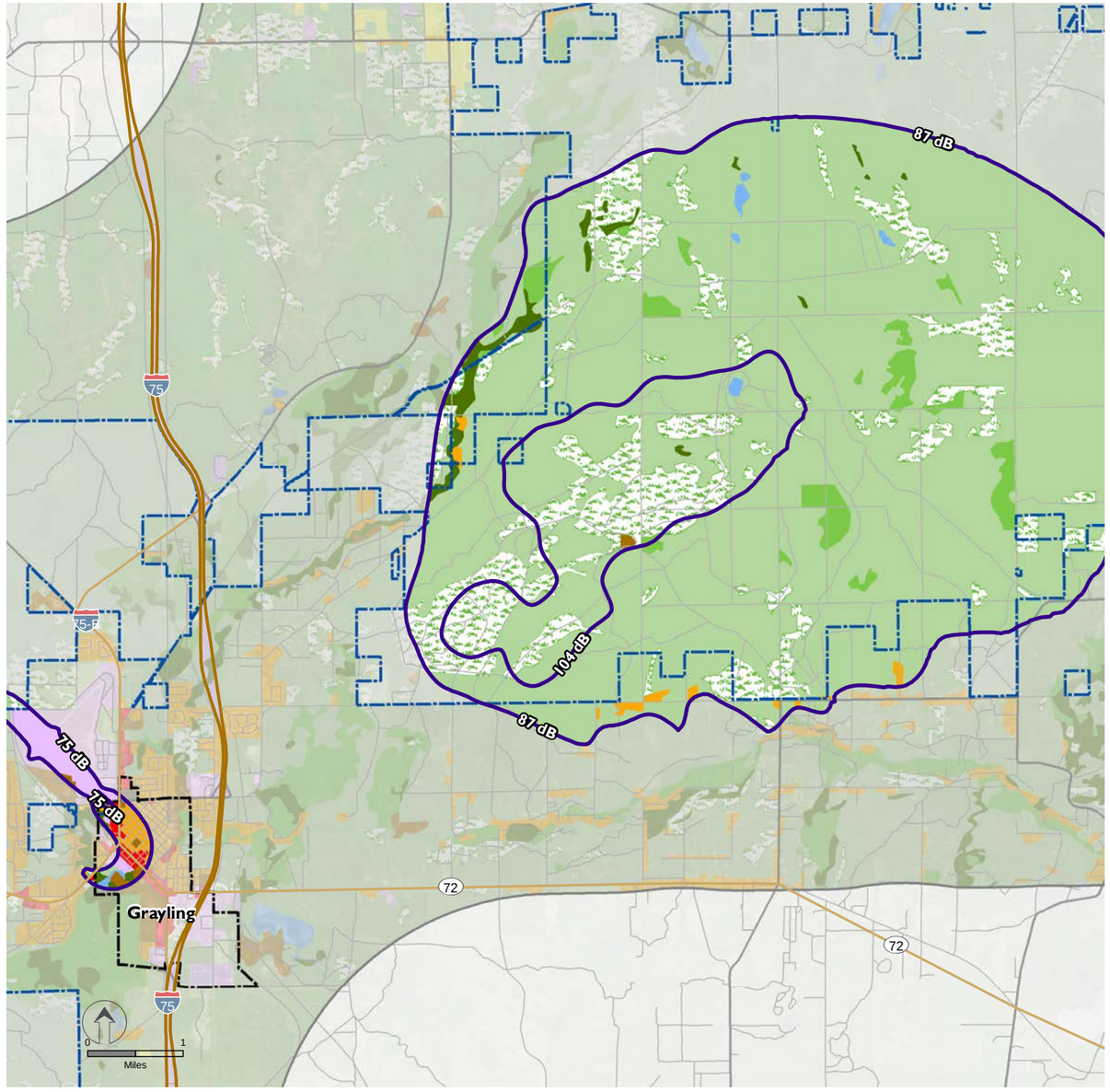


Figure 2.18 | Camp Grayling JMTC Cantonment/North Camp Land Use in Noise Contours



Zoning in APZs

The majority of the APZ for the Grayling AAF falls within the jurisdiction of the Grayling Township and the City of Grayling. Within those areas that fall into the APZs, 63 percent are categorized as natural resource/open space, and 31 percent are classified as some form of residential or commercial. Residential zones make up 24 percent, or approximately 175 acres. The commercial and residential zones that fall within the APZ and CZ areas cover the densest area of the City of Grayling, meaning a large number of residents could potentially be exposed to a potential accident scenario.

Figure 2.19 | Camp Grayling JMTC Incompatible Use – Zoning in APZs

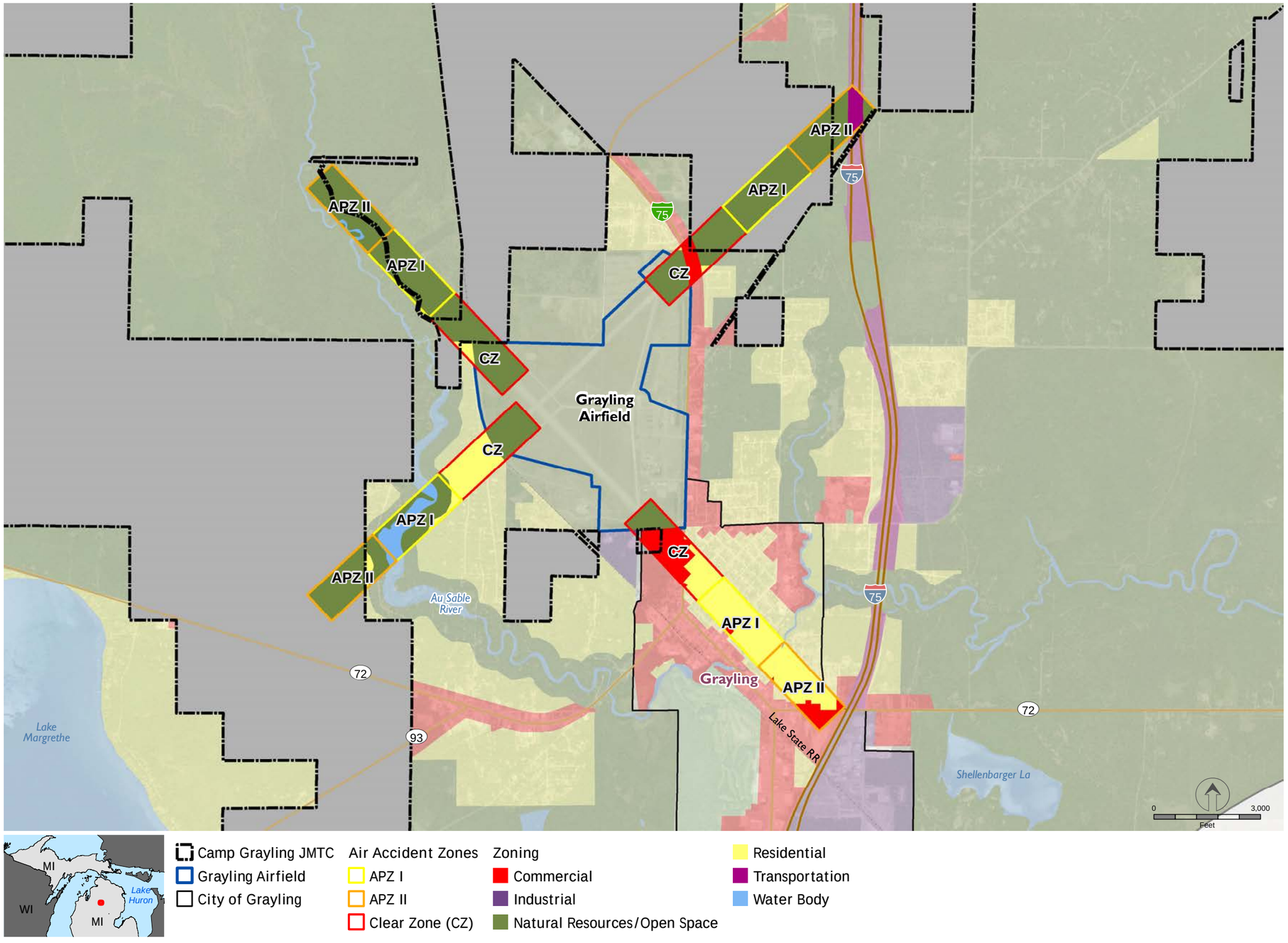


Figure 2.20 | Camp Grayling JMTC Zoning Distribution in APZs

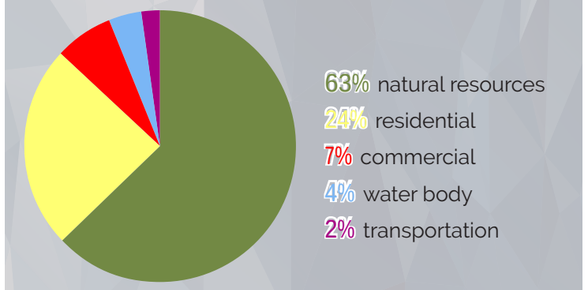
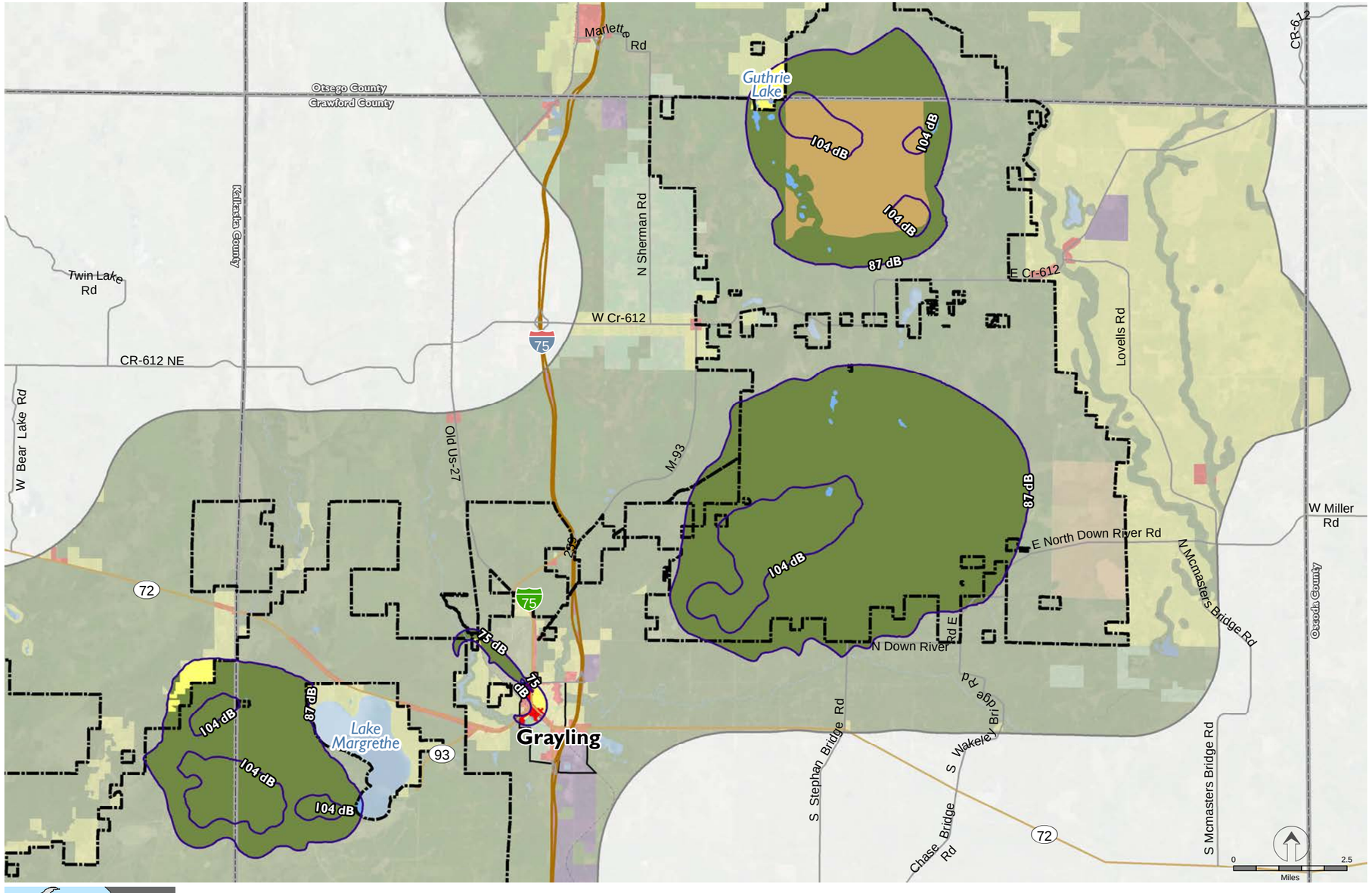


Figure 2.21 | Camp Grayling JMTC Incompatible Use – Zoning in Noise Contours



The Guthrie Lakes residential area lies inside the Range 40 noise contours.

Zoning in Noise Contours

A large majority, 86 percent, of the areas that fall within the 75+ dB contours are zoned as natural resources/open space. Because of the limited development in this zone, human exposure to unhealthy decibel levels is likewise limited. Exceptions include the residential areas surrounding the Guthrie Lakes, residential zones in eastern Kalkaska County, and portions of the City of Grayling. While these areas comprise only 2 percent of the 75+ dB areas, there is potential for the detrimental effects of the noise to be felt, and mitigation will need to occur in these areas.

In the worst case, residences are just 500 feet from the range boundary, 2,800 feet from established artillery firing points and approximately 1 mile from the impact area. That is too close for sound to dissipate to a reasonable level for a residential area.

Figure 2.22 | Camp Grayling JMTC Zoning Distribution in Noise Contours

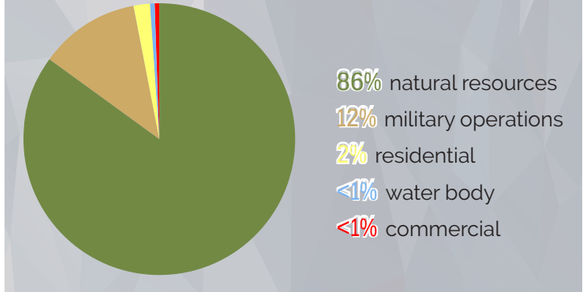
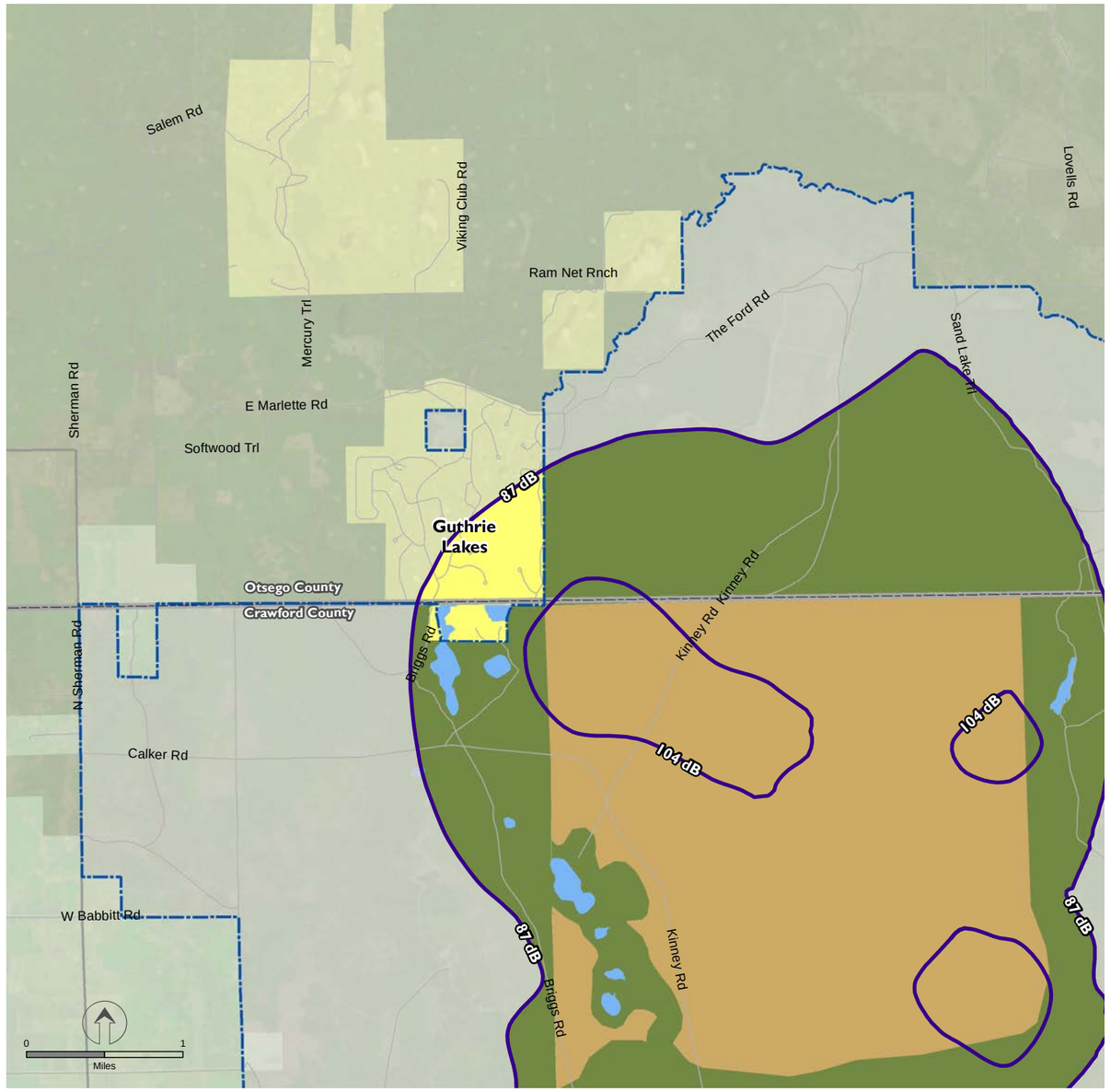


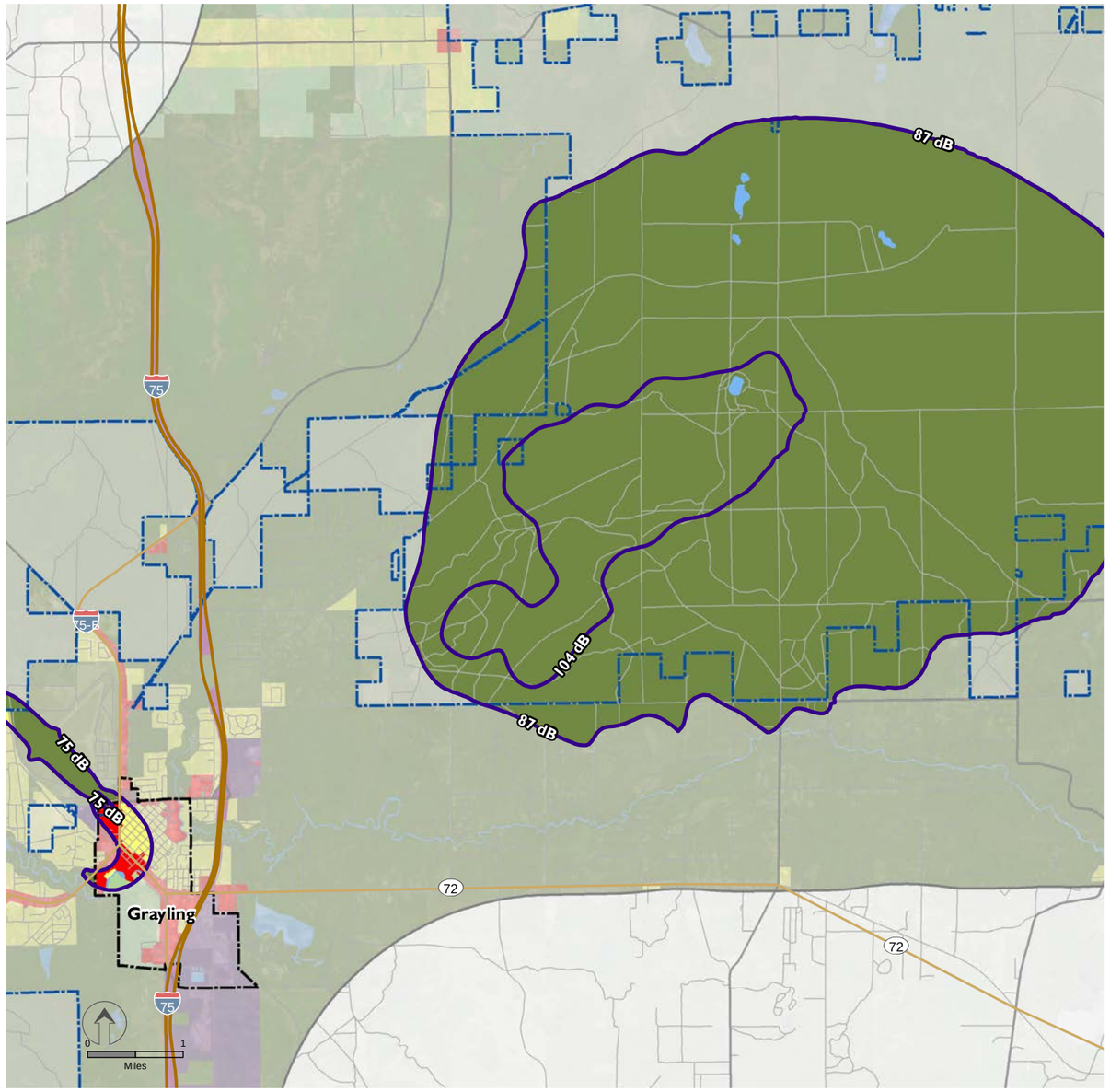
Figure 2.23 | Guthrie Lakes Zoning in Noise Contours



- Camp Grayling JMTC
- County Boundary
- Noise Contours (75+ dB)

Zoning
- Military Operations
- Natural Resources/Open Space
- Residential
- Water Body

Figure 2.24 | Camp Grayling JMTC Cantonment/North Camp Zoning in Noise Contours



- Camp Grayling JMTC
- County Boundary
- Noise Contours (75+ dB)

Zoning
- Agriculture
- Commercial
- Industrial
- Natural Resources/Open Space
- Residential
- Water Body

2.2 Camp Grayling JMTC Public Participation

The public participation process for Camp Grayling JMTC involved a suite of TC/PC meetings, stakeholder meetings, community survey, working group meetings, and one-on-one stakeholder interviews. The initial TC/PC meeting for Camp Grayling JMTC took place on April 24, 2017, at the University Center in Gaylord, Michigan. During this meeting, participants discussed expanding the TC list, approved the project work plan, and coordinated logistics for the tours.

The Camp Grayling JMTC installation tour for TC/PC members took place on June 5, 2017. The purpose of the tour was to provide TC and PC members with a more detailed understanding of the Camp Grayling JMTC operations, procedures, and facilities.

On June 6, 2017, TC and PC members met at Grayling Township Hall for a facilitated issues identification discussion. Through this meeting, TC and PC members identified an initial list of strengths, weaknesses, opportunities, and threats (SWOT) related to the Camp Grayling JMTC. Community stakeholders met the evening of June 6, 2017, at the Kirtland Health Sciences Center to engage in a similar issues identification discussion using the SWOT method. The JLUS project team advertised for this meeting in the Crawford County Avalanche and local radio stations. In addition, TC and PC members used their internal outreach mechanisms, such as email distribution lists and websites, to promote the meeting. During the meeting, the JLUS project team presented the JLUS process and facilitated an issues identification discussion. Section 2.3 provides more detail on this process and the results.

After the initial stakeholder meetings, the JLUS project team conducted a series of one-on-one interviews with key stakeholders. Sixty stakeholders participated in the interview process. In addition to interviews, the JLUS project team sought broader stakeholder input through a survey made available on the NEMCOG website for 3 months. A copy of the survey questions is available in Appendix B, as part of the Public Participation Plan. Members of the TC and PC used their existing outreach mechanisms, such as websites and newsletters, to help the JLUS project team promote participation in the survey. NEMCOG also provided information to the Crawford County Avalanche and local radio stations. Subsequent news articles and radio coverage promoted participation in the survey. Stakeholders submitted nearly 200 survey responses.

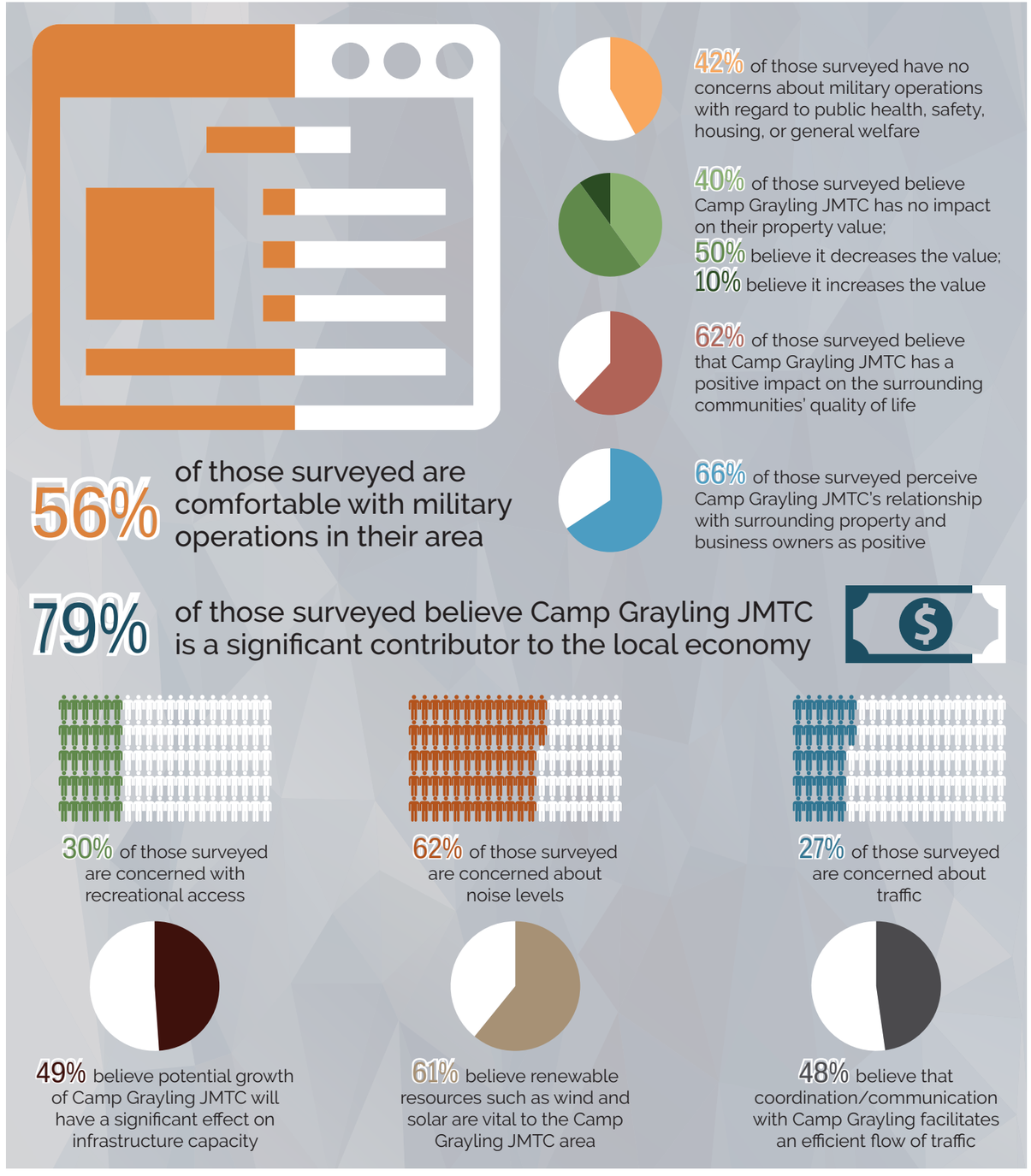
The survey results for Camp Grayling JMTC are presented in Figure 2.25. Overall, the survey responses indicate that a majority of stakeholders sharing their perspective are comfortable with the operations at Camp Grayling JMTC and believe it is a significant contributor to the local economy and has a positive impact on the quality of life of surrounding communities. Stakeholders responding to the survey have a greater concern about noise from Camp Grayling JMTC (62 percent) than recreational access (30 percent) or traffic (27 percent).

Stakeholder input from the SWOT analysis, the one-on-one interviews, and the survey helped the JLUS Project Team understand the comprehensive universe of issues and prioritize those issues for further strategy development. The second JLUS project stakeholder meeting for Camp Grayling JMTC took place October 10, 2017, at Camp Grayling JMTC. This community update and input meeting focused on reviewing the JLUS process steps, status, SWOT results, and identification of possible strategies to deal with priority issues identified by stakeholders. Additional news articles and radio coverage discussed this meeting and continued to promote participation in the online community survey.

Additional TC and PC meetings took place in November and December 2017 and continued through the spring of 2018. During these meetings, TC and PC members discussed JLUS project status and action items, data needs, and next steps.

Additional stakeholder meetings and working group sessions, both in-person and via conference calls, took place during 2018 to address details of the recommended strategies for each of the priority issues. During these meetings, stakeholders provided feedback on the strategies, identifying key information that will assist with successful implementation over time. The strategies and associated recommendations and challenges identified by the JLUS project team with input from stakeholders are described in more detail in Section 4.

Figure 2.25 | Survey Highlights



JLUS stakeholders participate in a SWOT analysis during the June discussion meetings.

Figure 2.26 | Camp Grayling JMTC SWOT Results

(Items in the smallest font size got less than 5 votes.)

2.3 Camp Grayling JMTC Issues Overview

2.3.1 Issue Definition Process

The first opportunity for the public and project stakeholders to share thoughts on their proximity to Camp Grayling JMTC was at a series of discussion meetings on June 6, 2017. There, the consultant team led TC and PC members through an issues collection exercise to gather input. These issues could be positive or negative.

The issues were sorted into four categories: strengths, weaknesses, opportunities, and threats, and then meeting participants voted on which issues mattered the most to them. Later that same day, the consultant team led area residents through the same exercise at a public meeting. The results of that analysis can be seen in Figure 2.26, Camp Grayling JMTC SWOT Results. Larger font size indicates issues that received the most votes. Detailed results are provided in Appendix C. Additional notes and input were gathered during the meetings, as well as during individual interviews with stakeholders.

All of the input from stakeholders, the TC and PC, and the online survey was considered when drafting the final list of issues. The survey was closed on November 30, 2017, with over 200 responses.

Along with stakeholder feedback, a large trove of data from NEMCOG and other local sources was considered, including demographic data, existing studies, and geographic information systems (GIS) data on land use and other facets of the region.

Six overarching categories emerged:

- Military Operations
- Noise
- Environmental
- Transportation and Infrastructure
- Community Partnerships
- Economic Development

All of the issues raised fell into one of those categories, which are described in more detail on the following pages.

Figure 2.27 | Camp Grayling JMTC Issues Analysis Process

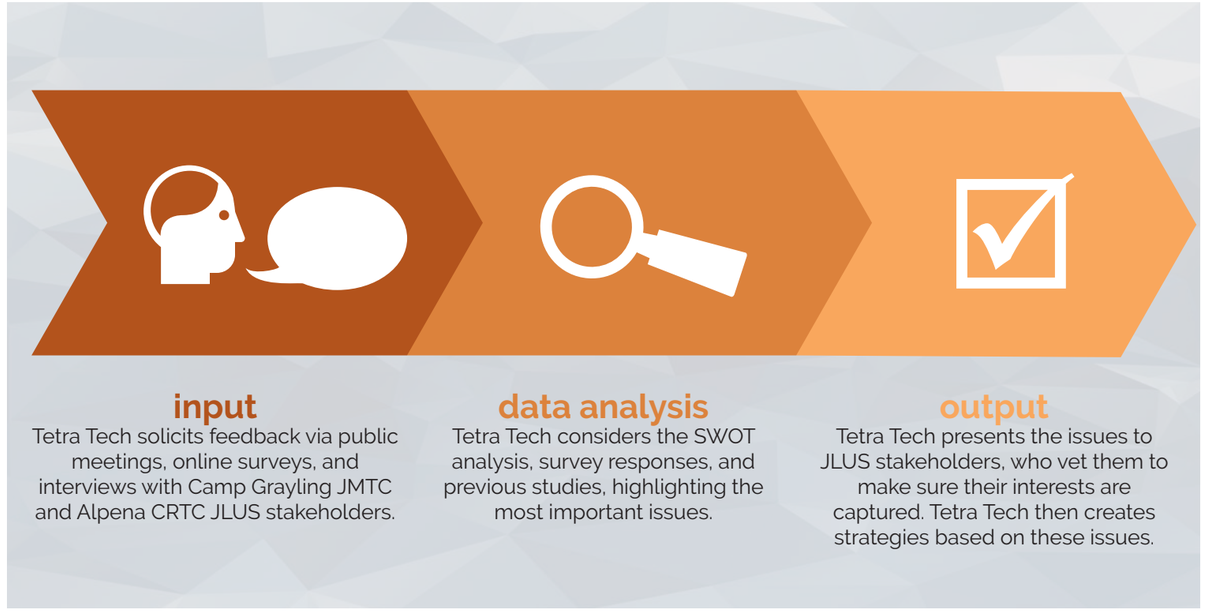


Table 2.2 | Camp Grayling JMTC Issues

ISSUE ID	DESCRIPTION	SOURCE
Noise		
1a	Impact of Aircraft Noise on Communities	SWOT
1b	Tree Cutting Reduces Noise Buffer	Survey
Military Operations		
2a	Flight Path over Homes	SWOT
2b	Noise and Vehicular Disruption from MATES	SWOT
2c	Noise and Vibration from Night Training	Survey
2d	Population Growth may Encroach on the Mission	Survey
Environment		
3a	PFOS and PFOA Contamination of Groundwater	SWOT
3b	Impacts/Effects on Groundwater and Drinking Water	SWOT
3c	Impacts/Effects on Surface Water Systems	SWOT
3d	Base Effects on Health of Wildlife Populations	SWOT
3e	Wildfire Management	SWOT
3f	Resource Use and Sustainability	SWOT
Transportation/Infrastructure		
4a	Effects of Growth on Utilities	Survey
4b	Improve Internet Access	SWOT
4c	Poor Cellular Reception	SWOT
4d	Traffic	Survey
4e	Recreational Access	Survey
4f	Poor Road Condition	SWOT
Community Partnerships		
5a	Communications/Education	SWOT
5b	Public Relations/Community Involvement	SWOT
Economic Development		
6a	Effect on Property Value Mostly Perceived as Neutral or Positive	Survey
6b	Significant Contributor to Local Economy	SWOT
6c	Economic Incentivizing and Monitoring	SWOT

For a complete list of issues, see Appendix C, SWOT Results.

Military personnel train on many different types of aircraft, vehicles, and weapons systems at Camp Grayling JMTC.

2.3.2 Camp Grayling JMTC Noise and Military Operations Issues

Noise issues are generated by military operations including ground activities at the Camp Grayling JMTC ranges and air activities throughout the region stretching from the Canadian border to the north, the middle of Lake Huron to the east, and to Camp Grayling JMTC to the west. This vast area supports all manner of military activities necessary for training military personnel in preparation for combat. There are primarily three types of military airspace:

- **MILITARY OPERATIONS AREAS (MOAS):** These lie in what is considered low-altitude airspace below 18,000 feet MSL. This type of airspace does not restrict commercial or private air traffic but pilots are warned that the area (when activated) can contain high-speed military aircraft conducting potentially dangerous tactical maneuvers that may endanger non-participating aircraft.
- **AIR TRAFFIC CONTROLLED ASSIGNED AIRSPACE (ATCAA):** This is above 18,000 feet MSL. Air traffic in Class-A airspace is controlled by regional Air Route Traffic Control Centers, preventing interaction between military aircraft performing potentially dangerous activities and non-participating aircraft.
- **RESTRICTED AIRSPACE:** This extends from the surface up through low-altitude airspace and often well into high-altitude airspace. Air traffic is restricted in these areas to military aircraft under the control of a military organization conducting separation services of the various ground-borne and air activities.

In fiscal year (FY) 2017, the MOAs were activated and used in relatively small amounts of time. When not activated, they are considered open airspace for use by any and all commercial and private pilots. The annual hours recorded for those SUA are listed in Table 2.3, Airspace Use.

Table 2.3 | Airspace Use

AIRSPACE	HOURS ACTIVE	HOURS USED
Pike East MOA	129	104
Pike West MOA	242	189
Steelhead MOA	493	313
Lumberjack ATCAA	156	140
Garland ATCAA	211	181
Firebird ATCAA	156	140
Molson ATCAA	0	0
Steelhead ATCAA	228	193

These hours are out of the total available hours in the year (24 hours per day, 365 days per year) of 8,760. Although military training operations must be conducted at all hours and in all conditions in order to properly train, these are considered low usage totals.

Issue 1a: Impact of Aircraft Noise on Communities

Low-level aircraft operations — ones that would create the greatest noise issues for residents — occur throughout the area, near launch and recovery sites like airports and airfields and along specially designated aircraft routes called military training routes (MTRs). Proximity to these locations increases the level of noise and subsequent disruption including shockwave vibrations.

These activities are inherent in military training and are a vital component to the U.S. defense, which is why these activities are typically established in locations far separated from residential neighborhoods. City and county zoning regulations often establish buffer zones surrounding ranges and airfields not only to provide a sound barrier but also for safety reasons.

Military ranges that have high concentrations of air activity and those that fire live munitions have a protected airspace above them referred to as an RA. These are established by the Federal Aviation Administration (FAA) to protect these activities from non-participating aircraft and to protect ground activities from falling debris, wayward munitions, or accidental aircraft failure. The RA over Camp Grayling JMTC contains two sections, referred to as R-4201A and R-4201B.

It is a condition of the establishment of these areas that they be over property owned by the military or the U.S. Government. Alternatively, small portions may be privately owned if a conditional use lease agreement has been established between the land owner and the government. The R-4201B, which overlies the impact area of the range, is over a large swath of land (approximately 24,000 acres) that is not owned by the government, including the housing community in Guthrie Lakes.

This has allowed for private residences to be built very close to the range and noise-causing military training activities; too close for any reasonable degree of noise dissipation from those activities with little terrain or vegetation in between to dampen or reduce shockwave vibration.

Being within RA allows pilots to begin operations that are considered potentially hazardous to the public including arming weapons for strafing or bombing runs, flying at altitudes very low to the ground, conducting tactical aerial ma-

Logging activity in the area.

neuvering such as aerial interdiction, dropping chaff and flares, laser targeting, etc. Conducting these activities over public or private land is inconsistent with FAA criteria and military protocol.

Guthrie Lakes resides within the noise contour 70 dB day/night average sound level (ADNL). Housing is typically restricted to areas registering below 65 ADNL. The range and the impact areas are well-established, and necessary functions of the range and military training activities and are impractical to relocate. It is unclear how these incompatible functions came to be located in such close proximity. Yet, both exist and both are likely to remain. The only solution to reduce the impact is sound mitigation. Residents can improve insulation values in their homes, and more vegetative cover can be added around homes to reduce the shockwave effect.

Issue 1b: Tree Cutting Reduces Noise Buffer

Trees and thick vegetation are good tools to help reduce noise and shockwave vibrations emanating from the range. Mixed broadleaf plantings at least 25 feet thick can reduce noise levels by up to 10 dB. Conifers would be needed for the same effect in the winter months.

These assets are most effective when located around the home rather than nearer the noise source, as the noise from a bomb blast or artillery fire does not hug the ground; rather, it radiates up into and through the atmosphere. Cloud cover can even cause a perceived increase in noise level. To be effective, trees would need to hug the structure being protected from above as much as from the sides, which is not advised, as it leads to increased danger from fires and for roof damage.

Figure 2.28 | Camp Grayling JMTC Noise

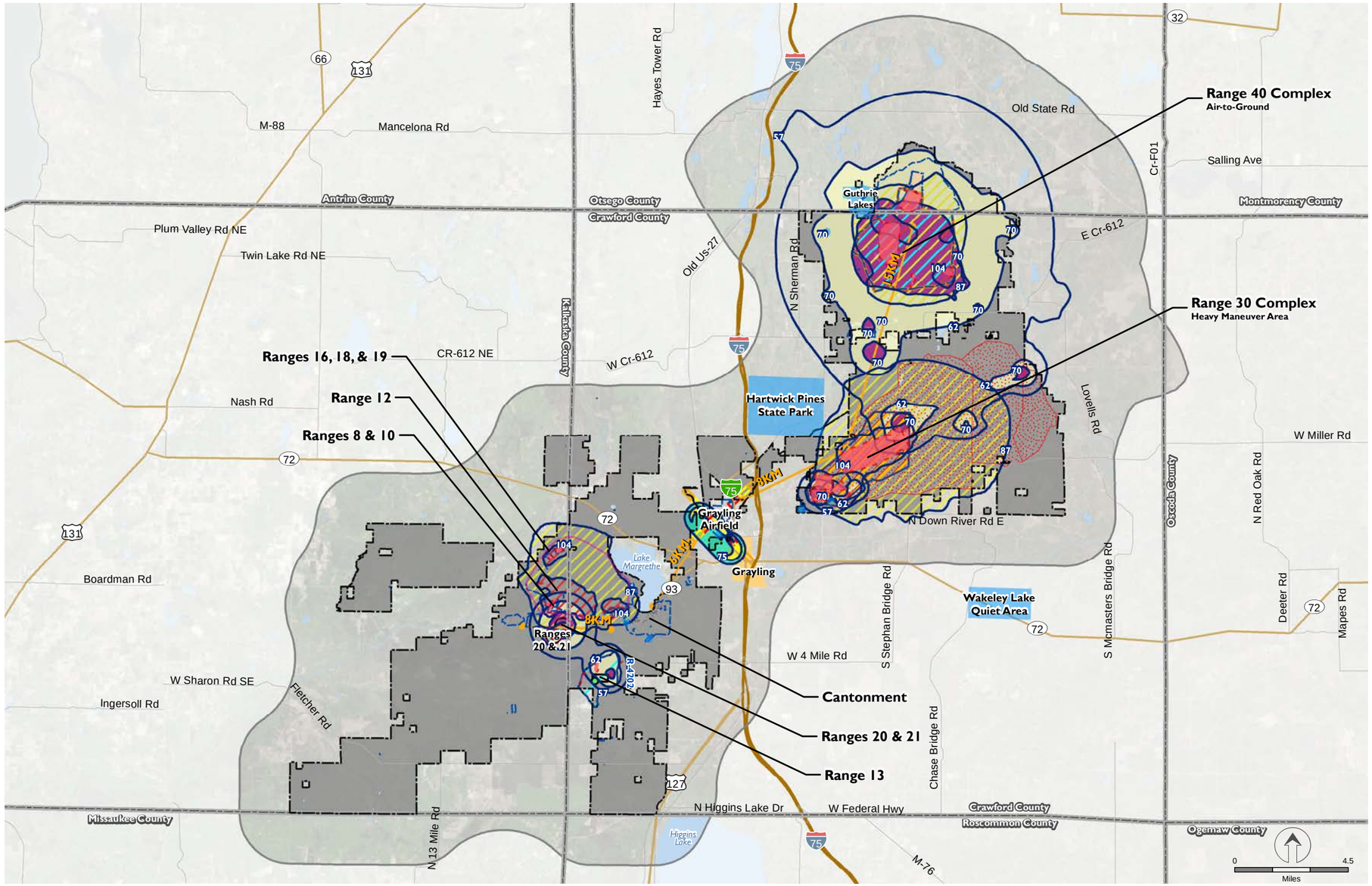
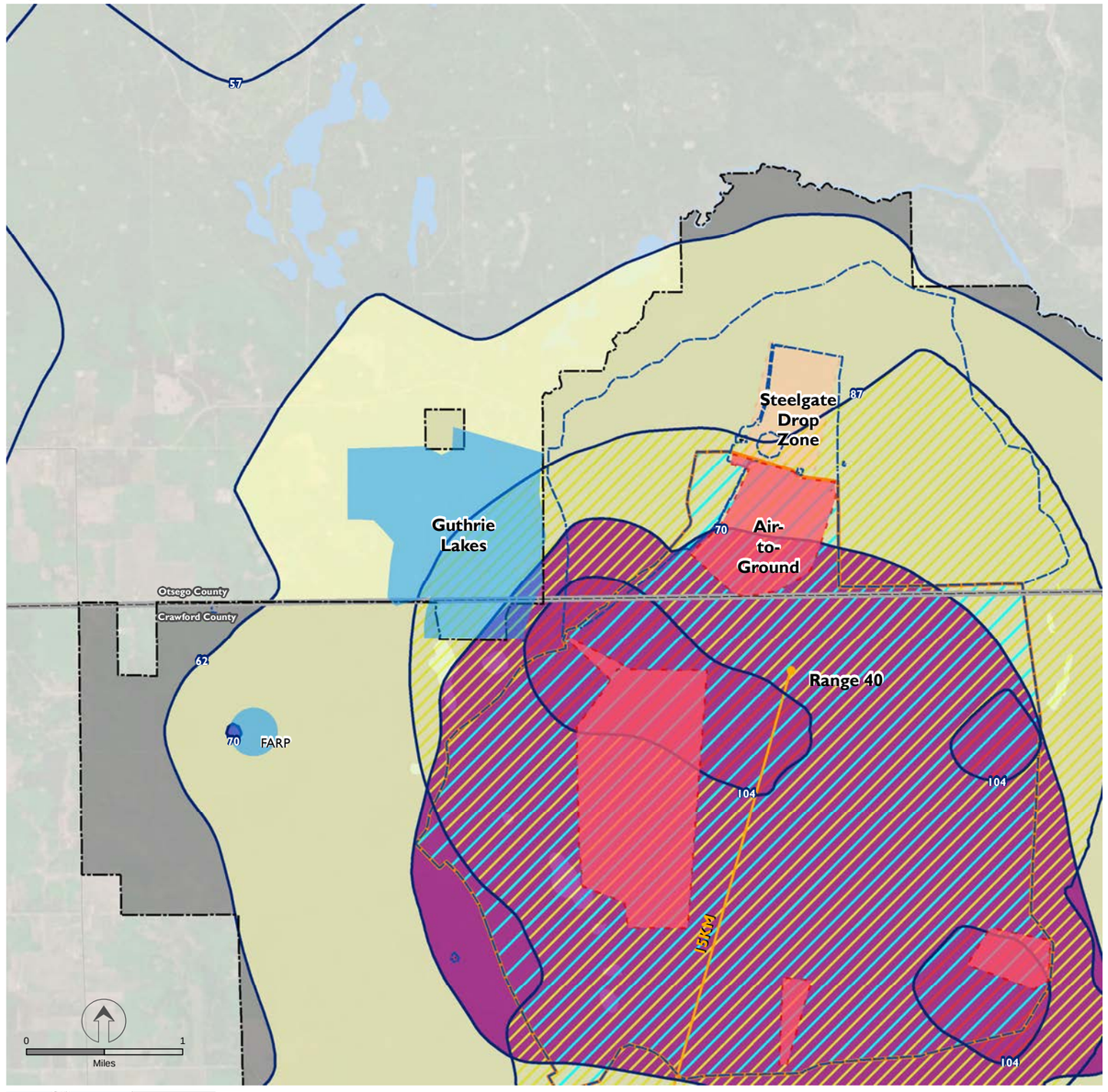
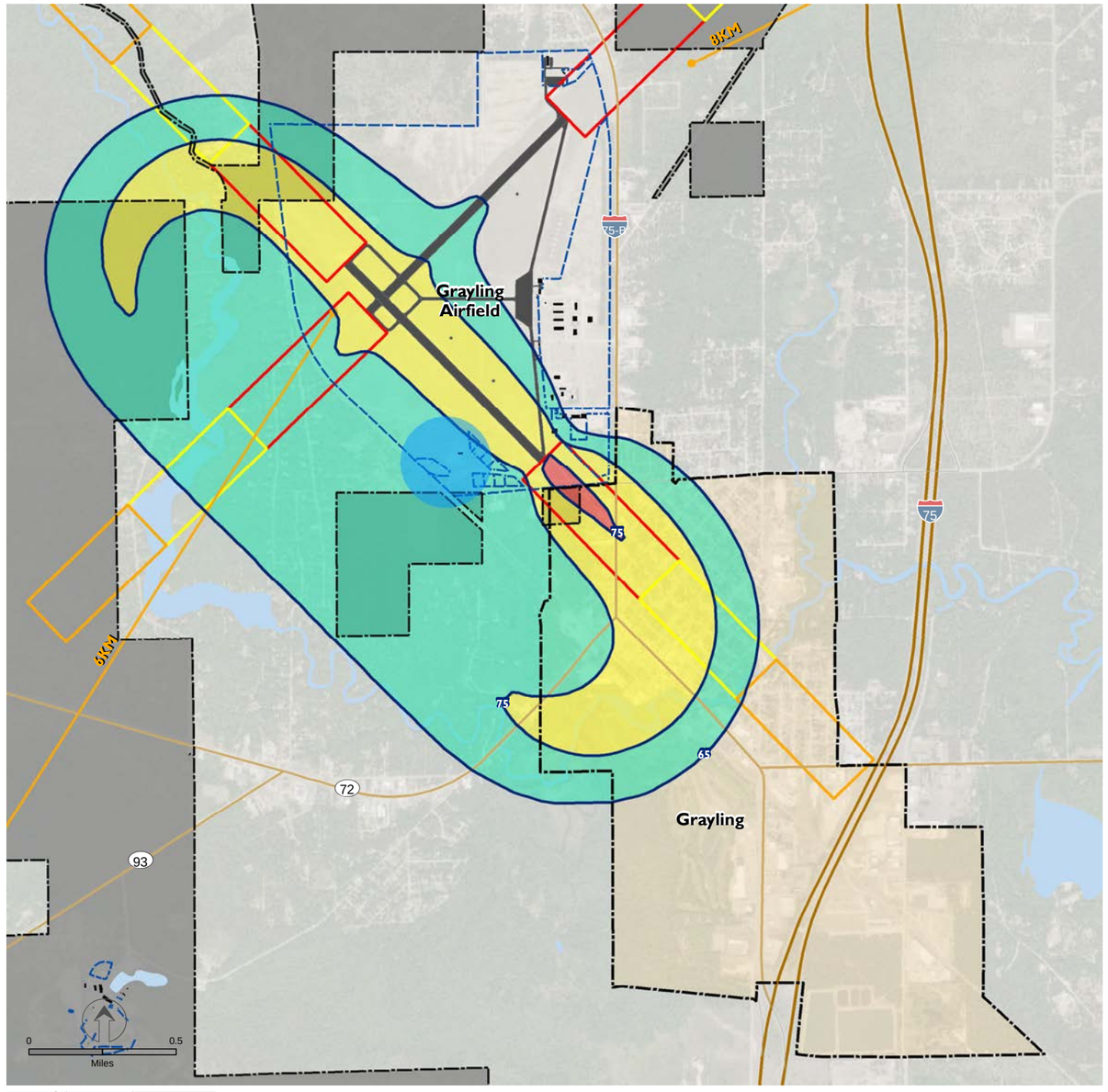


Figure 2.29 | Guthrie Lakes Noise



Camp Grayling JMTC
County Boundary
Military Range Area
No Overflight Areas
Noise Contours (dB)
Fence
Home Station Training Lane
Range 40
Building
Grayling Range Noise Zones
Measurement Method (dBP)
Zone II (87 dB)
Zone III (104 dB)
Measurement Method (CDNL)
Zone II (62 dB)
Zone III (70 dB)

Figure 2.30 | City of Grayling Noise



Fence
Camp Grayling JMTC
County Boundary
City of Grayling
Home Station Training Lane
No Overflight Areas
Noise Contours (dB)
Air Accident Zones
APZ I
APZ II
Clear Zone
Grayling Airfield Noise Zones
Measurement Method (ADNL)
Zone I (60 - 65 dB)
Zone II (65 - 75 dB)
Zone III (> 70 dB)

Placing vegetation near the impact area is inconsistent with safe range management because of the high potential for wildfires ignited from munition blast. It also degrades the usefulness of the range in visual targeting and scoring. Vegetation near firing points could slightly reduce sound vibration at lower levels.

Issue 2a: Flight Paths Over Homes

Most rotary-wing air traffic in the area is conducted out of Grayling AAF. This is a necessary component of training in that equipment, and personnel arrive at Camp Grayling JMTC and are transported to and from the range for training activities.

An unfortunate past development mishap was allowing private neighborhood housing to be built directly under the primary runway end of Grayling AAF (Runway 32), which is the primary egress point toward the range.

This neighborhood sits within the APZ. See Figure 2.33 for a more detailed view. APZs are delineated areas near civilian and military airports that define the highest level of potential for aircraft-related accidents. Typically, these areas are zoned by cities to restrict use to agriculture, parking, or other non-densely populated uses. Subsequently, these areas also typically have the highest noise levels, here above 65 dB ADNL. Housing is typically restricted to areas registering below 65 dB ADNL. Although the majority of traffic is transient general aviation, the airport is military owned and operated. As such, CZs, APZs, and other restrictions for this airport are established by Unified Facilities Criteria (UFC) 3-260-01, Airfield and Heliport Planning and Design.

Even more alarming, first responders and law enforcement are located within the CZ. The CZ area is restricted from all objects fixed or mobile. If an accident occurred, it could potentially take out both the police department and the fire department.

It is possible that flights could be redirected to the other runway (5-23), which does not have a similar land use condition at its runway ends. However, that runway is in poor condition and would need to be repaved at considerable expense. It also lies perpendicular to the prevailing winds,- making it more dangerous to use and potentially reducing its availability during certain climatic conditions.

Alternatively, operations requiring load transfers to the range could be conducted from the primary runway (14-32) heading northwest (from Runway 14) then circling around toward the range. Again, this is subject to prevailing winds and climatic conditions and also takes a longer route, which requires additional time and fuel.

Figure 2.31 | Camp Grayling JMTC Military Operations

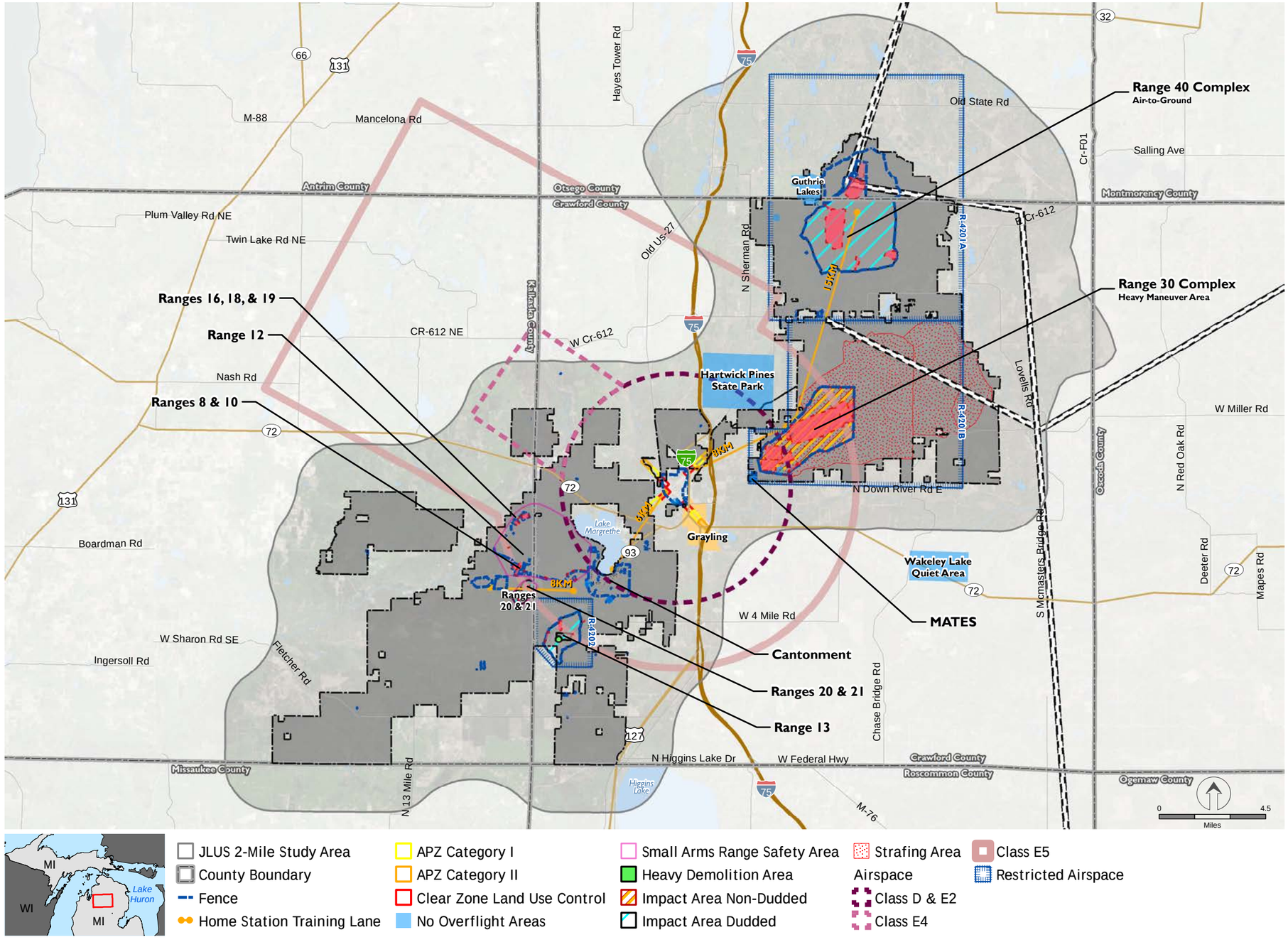
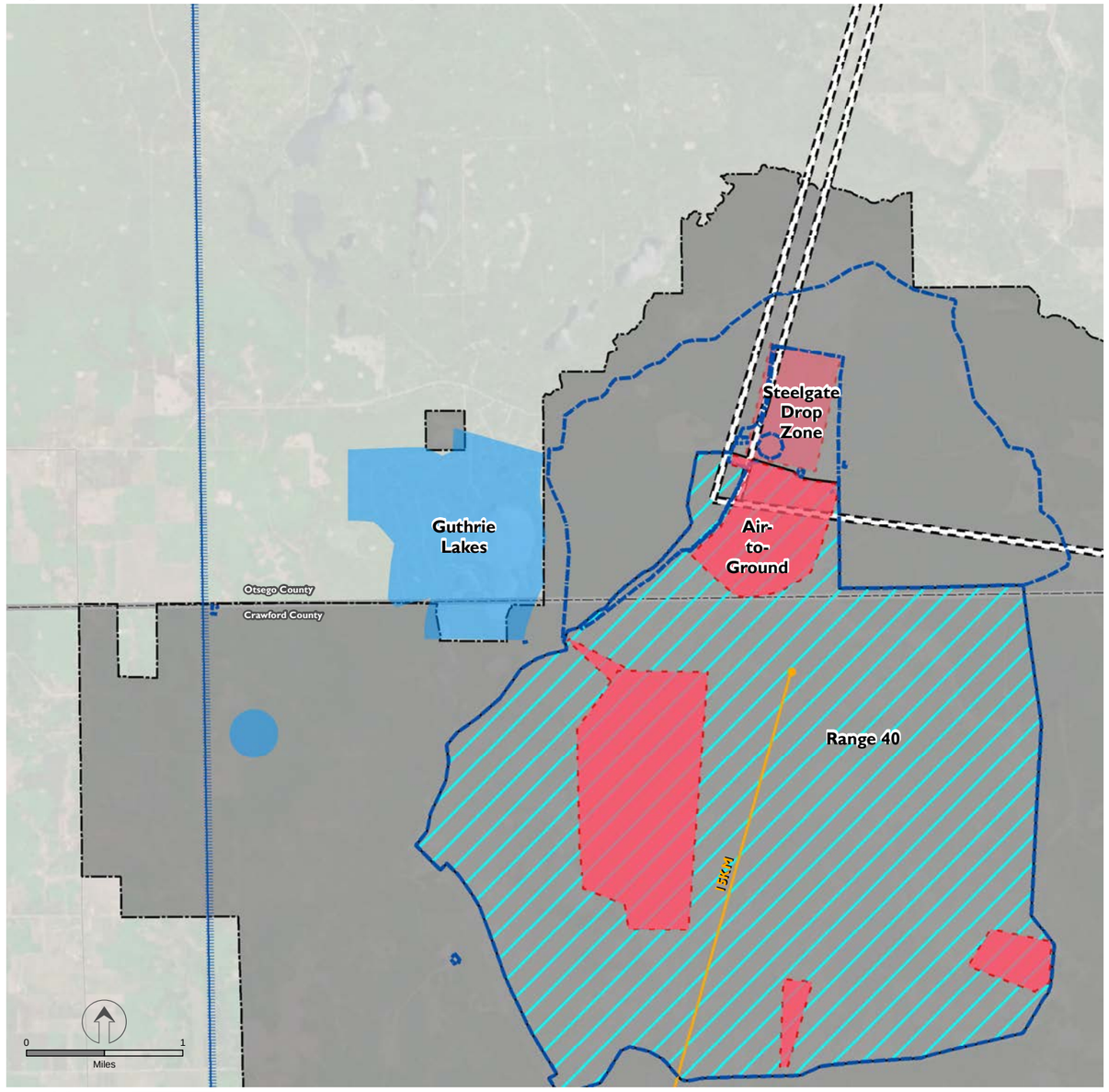
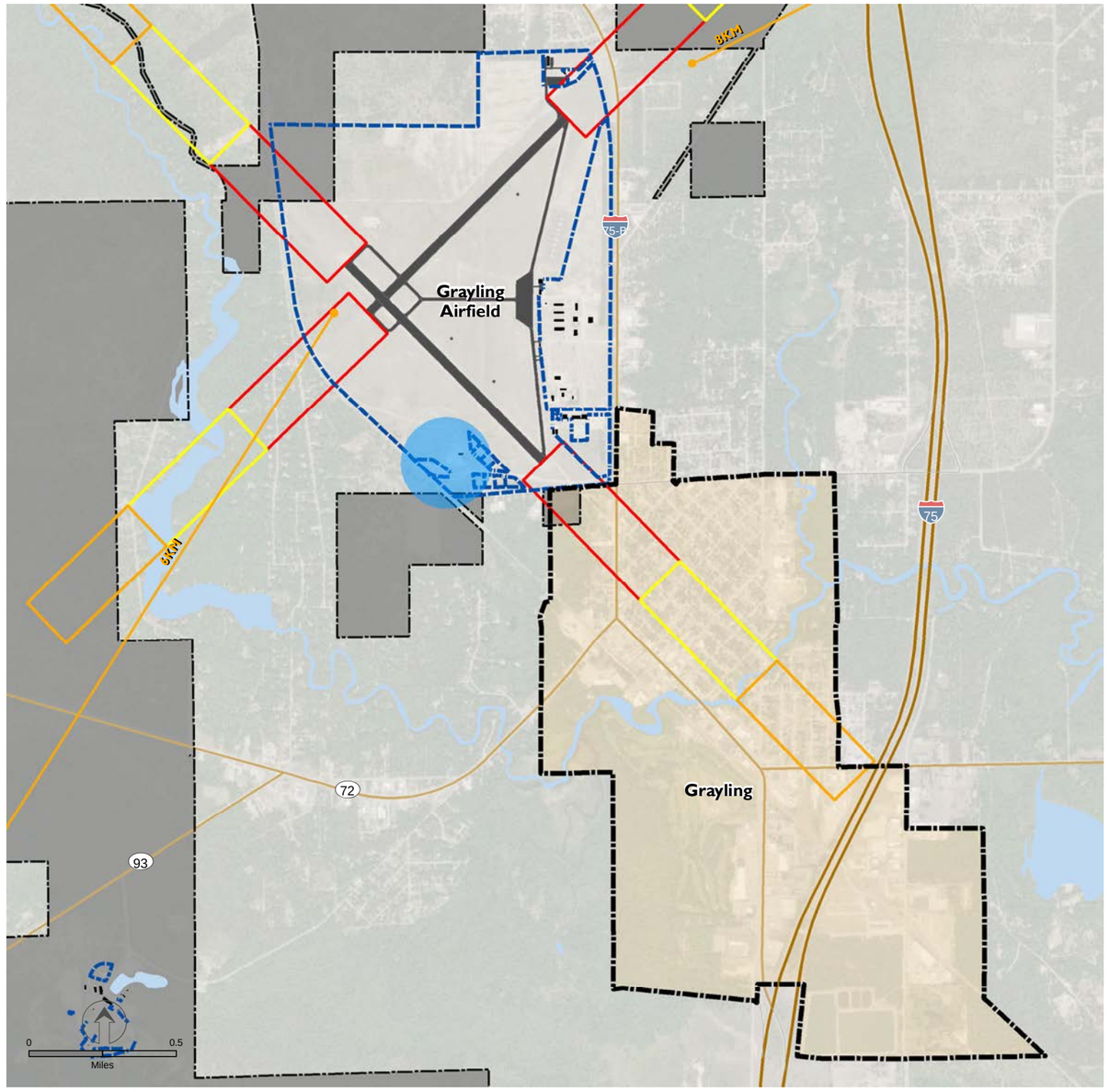


Figure 2.32 | Guthrie Lakes Military Operations



Camp Grayling JMTC
County Boundary
Military Range Area
No Overflight Areas
Restricted Airspace
Range 40
Fence
Military Training Routes (MTR)
Home Station Training Lane

Figure 2.33 | City of Grayling Military Operations



Camp Grayling JMTC
County Boundary
City of Grayling
No Overflight Areas
Fence
Air Accident Zone
APZ Category I
APZ Category II
Clear Zone Land Use Control

U.S. Marines from Echo Company, 4th Reconnaissance Battalion, 4th Marine Division, Marines Forces Reserve, check their gear after conducting an exercise into Lake Margrethe at Camp Grayling JMTC. Source: Alpena CRTC Public Affairs

Issue 2b: Noise and Vehicular Disruption from MATES

The MATES is an activity that naturally generates noise, although significantly less than munitions firing or aircraft activity noise generators. Current noise contour maps do not have any contours associated with the area surrounding the MATES, with a minimal noise level registration of 60 ADNL. The Range 30 complex immediately adjacent is recorded at 87 ADNL, likely associated with firing activities.

The MATES is located in the southwestern corner of the northeastern portion of Camp Grayling, about 3 miles northeast of the City of Grayling. The public and private property surrounding the MATES is sparsely populated, being primarily forested land. The closest residence is one-third of a mile to the west along W. North Down River Road. There are additional houses in increasing density as one moves farther to the west toward the city of Grayling. The highest concentration of homes is at the intersection of W. North Down River Road and N. Wilcox Bridge Road. There are also a few homes approximately 0.75 mile away to the east at the corner of W. North Down River Road and S. Headquarters Road.

Vehicular activity is unavoidable in this area, as the purpose of the MATES is vehicle and equipment repair and storage. The road it resides on (W. North Down River Road) is the connector accessway between the facility and Camp Grayling JMTC to the southwest, where the majority of transient equipment comes into the area for training, either via the airfield or the railhead. It unfortunately runs through the city of Grayling. No other alternative routes of travel are feasible.

Issue 2c: Noise and Vibration from Night Training

Night time operations are crucial to successfully executing asymmetrical warfare, consistent with that being conducted in the Middle East. Training for those operations is, therefore, highly important. Disruption to residents is related to the proximity of the residences to those activities.

Mitigation tactics for the noise caused by those activities is the same as described for daytime noise issues. Vegetative cover located close to the structure and increased insulation for sound attenuation are the most effective deterrents. It could also be possible for military training schedules to be posted, which would give residents the opportunity to plan for the event, although that would not reduce the disruption.

Issue 2d: Population Growth May Encroach on the Mission

Encroachment is a constant and pervasive issue with military training ranges and airfields. Safety and noise buffers should be established through property acquisition surrounding these assets. In lieu of that and because fiscal constraints make it unlikely to occur, cities, counties, and townships should establish zoning regulations that prevent the further development (allowance) of residential properties installations.

A safe buffer zone distance from ranges, installation, and airfield property boundaries is one consideration addressed in this plan. This area could be used for agriculture or other non-populated functions. Industrial activities are a better choice than residential, community, institutional, or educational activities. As military training requirements to provide for large force and multi-force exercises increase, it should be an accepted fact that all the land area within the boundary could be utilized for training activities.

2.3.3 Camp Grayling JMTC Environmental Issues

Issue 3a: PFOS/PFOA Contamination of Groundwater

Contamination of groundwater and drinking water from wells from perfluoroalkyl and polyfluoroalkyl substances (PFAs, also known as PFCs), is the top environmental concern for both Camp Grayling JMTC and Alpena CRTC. The principal contamination source in the Camp Grayling JMTC area is considered to be perflourooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) contamination from use of now discontinued aqueous film forming foam (AFFF) fire suppressants. On the national level, PFA/PFC compounds are emerging unregulated contaminants of concern with suspected but largely unknown negative human health effects. As of November 27, 2017, eight of 386 area wells tested for PFOS-PFOA by the Michigan Department of Environmental Quality (MDEQ) exceeded the Environmental Protection Agency (EPA) concentration limit of 70 parts per trillion (ppt). In addition, filters were provided to approximately 90 nearby homes.

MIARNG, funded through the National Guard Bureau (NGB), is managing a monitoring and analysis program in collaboration with concurrent monitoring, control (including filters), groundwater modeling, and remediation efforts by a number of state agencies. The MDEQ is conducting residential, business, school, and community water-supply well sampling. The MDEQ is also in the process of investigating the quality of groundwater beyond the perimeter of the Camp Grayling JMTC airfield by collecting groundwater samples from borings conducted at several locations from a monitoring well network planned for the near future. Information about the contaminants, forms to request well testing, and options for homeowners whose wells have been found to contain the substances, may be found on the state web site: https://www.michigan.gov/pfasresponse.

Public meeting feedback indicates some residents are finding it difficult to get clear and timely responses from the MDEQ for well testing and for other services like filter distribution. The MDEQ plans to develop and publish a plume map once the investigation is further along to provide a more complete and accurate description of the situation.

Many residents do not use or have regular internet access, so nondigital forms of communication (mailers, hotline phone number) should continue to be emphasized to ensure all residents are fully informed. During public comment, several residents requested more frequent use of local radio, television, and newspapers to not only advertise public meetings but also to convey basic information about the base and issues affecting the public. The latest content from monitoring and control programs should be updated for informational fliers. Concern over how wells are selected for testing was frequently raised at the public meetings.

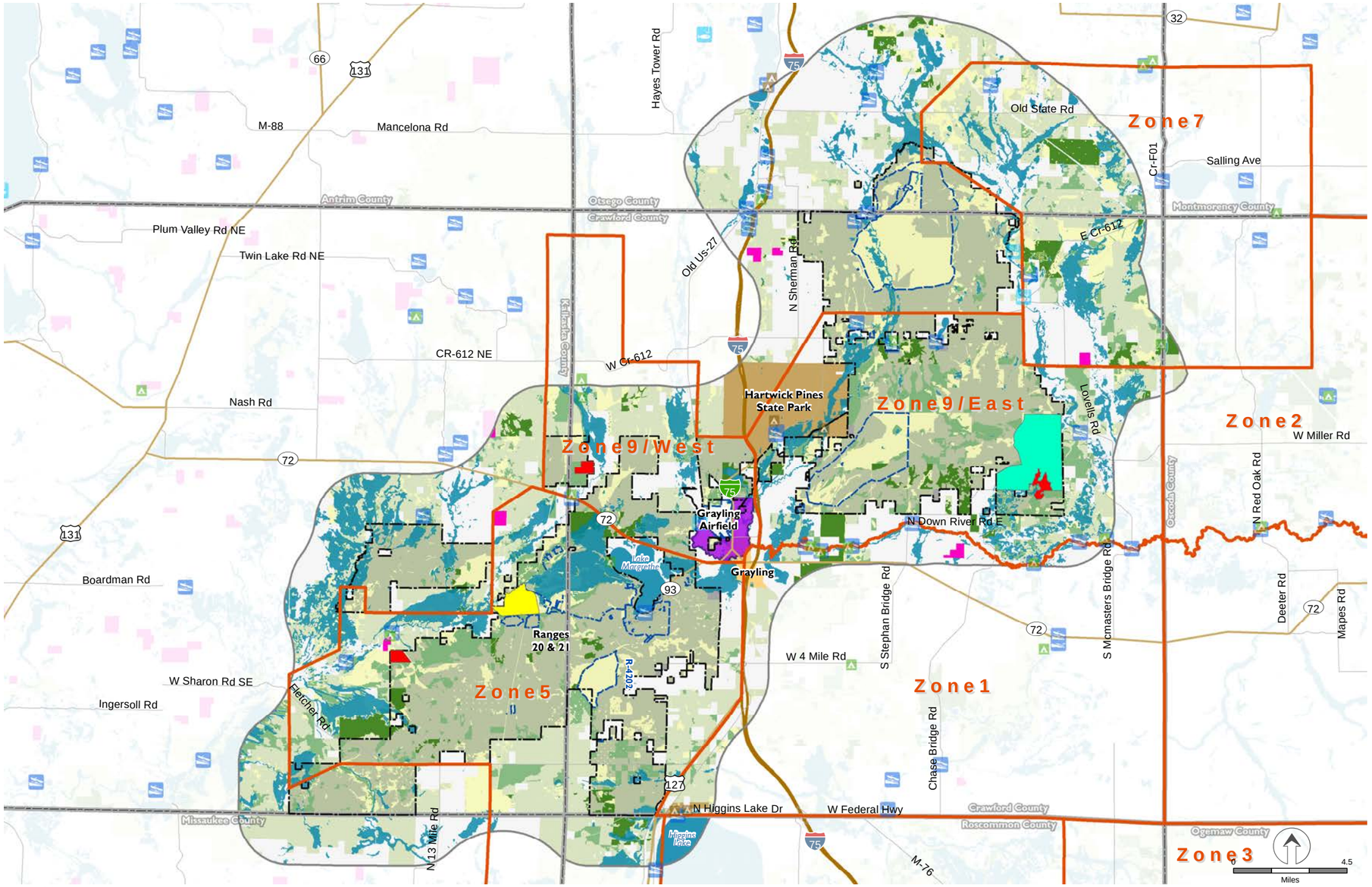
Governor Rick Snyder issued Executive Directive No 2017-4 for a PFAS Action Team. In November 2017, the governor directed the leaders of the MDEQ, the Michigan Department of Health and Human Services (MDHHS), MDMVA, and the Michigan Department of Agriculture and Rural Development (MDARD) to immediately establish a Michigan PFAS Action Response Team. The team has been assigned to direct the implementation for the state's action strategy to research, identify, and establish PFAS response actions related to the discovery, communication, and migration of PFAS to the extent practicable.

PFOS/PFOA Information

More information is available at https://www.michigan.gov/pfasresponse

If any resident has additional questions regarding this issue, the MDEQ Environmental Assistance Center can be contacted at 1-800-662-9278 or email deq-assist@michigan.gov. Representatives may be reached to assist with your questions Monday through Friday, 8:00 AM to 4:30 PM.

Figure 2.34 | Camp Grayling JMTC Environmental



Issue 3b: Impacts and Effects on Groundwater and Drinking Water

The aquifers that provide potable water for residents near Camp Grayling JMTC are vulnerable to contamination. The depth to groundwater in some areas is as little as 9 feet. Remediation efforts have been required to treat fuel spills and other areas where groundwater was compromised, and a system to protect potable water in the cantonment area was put in place in 2001. In addition to fuels, oils, solvents, and hydraulic fluids are among the hazardous materials generated at Camp Grayling JMTC, which are disposed by the Defense Reauthorization and Marketing Office (DRMO). Environmental managers could consider providing educational materials on the newer Michigan Part 201 rules govern criteria for the groundwater-surface water interface (GSI) in addition to standing rules on groundwater criteria. Spills and environmental emergencies are reported to the MDEQ using the 24-hour Pollution Emergency Alerting System (PEAS) Hotline (800) 292-4706 or by contacting the MDEQ District Office (Alpena and Grayling area) at 989-731-4920. The public can view spills on Michigan's waterways using the Water Resources Division MiWaters Database: https://miwaters.deq.state.mi.us/nsite/.

Issue 3c: Impacts and Effects On Surface Water Systems

The negative effects of sediment and runoff on surface water quality within Camp Grayling JMTC watersheds are a high priority for the installation and surrounding communities. Traffic from military operations and industries can contribute to erosion and runoff at road/stream crossings. Regulation 200-1 prohibits military activity within 400 feet of streams and water bodies, with the exception of activities on established roads and trails, unless there is prior authorization. An industrial stormwater permit for runoff is held by Camp Grayling JMTC.

Public comment reveals potential for misperceptions that installation operations such as tank maneuvers are degrading seasonal or secondary roads when in actuality roads are being degraded by commercial logging vehicles. Camp Grayling JMTC has funded several road/stream crossing improvement projects led by Huron Pines and the Crawford County Road Commission to prevent excess sediment from entering the AuSable River watershed. Effects of erosion and runoff can be measured through bioassessment sampling around the installation. Formal bioassessments of Michigan rivers and streams are conducted by the MDEQ through the Surface Water Assessment Section Procedure 51 monitoring program that evaluates macroinvertebrate community, fish community, and habitat quality, and reports on trends in watershed health. MDEQ Procedure 51

Figure 2.35 | Guthrie Lakes Environmental

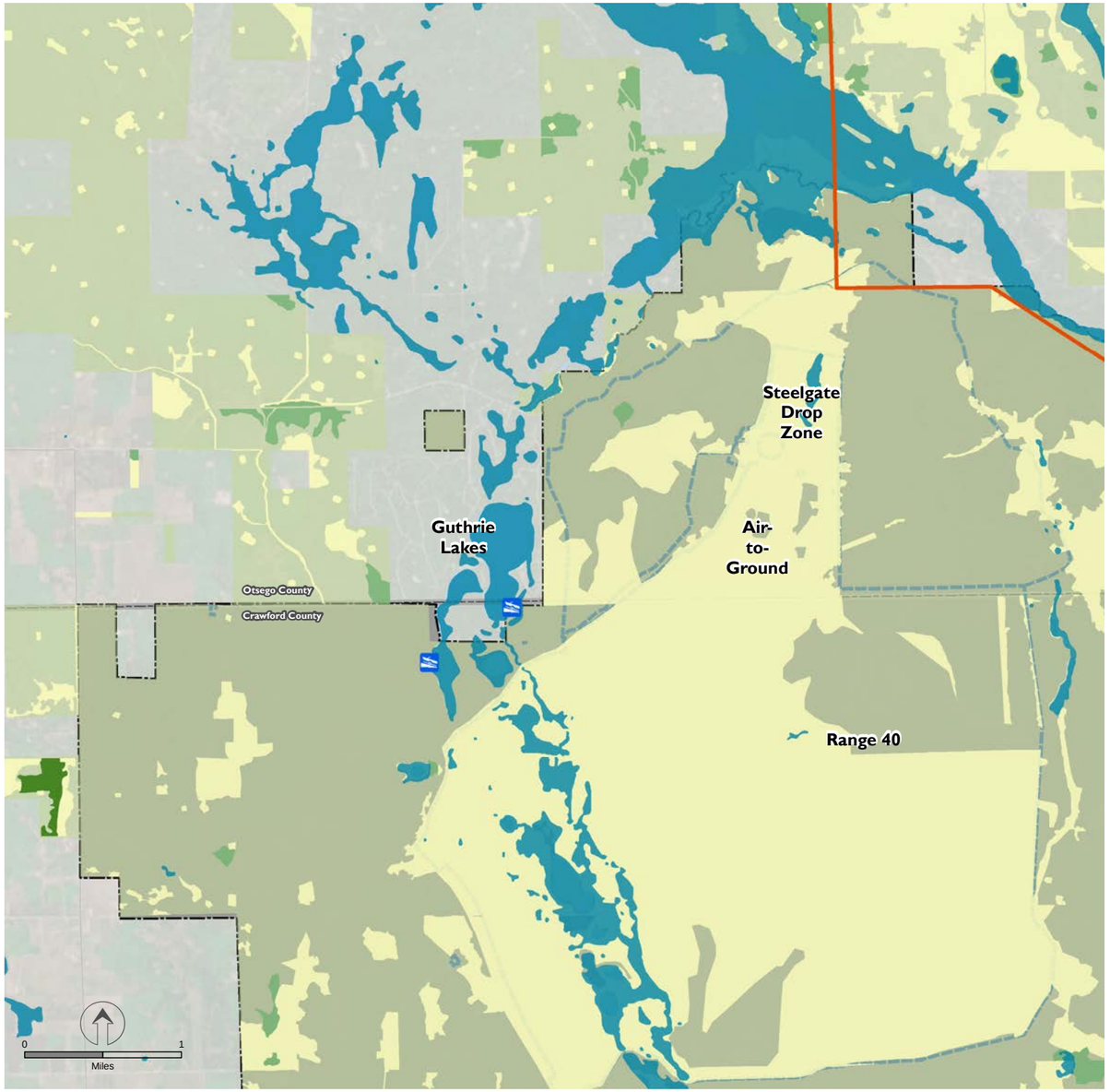
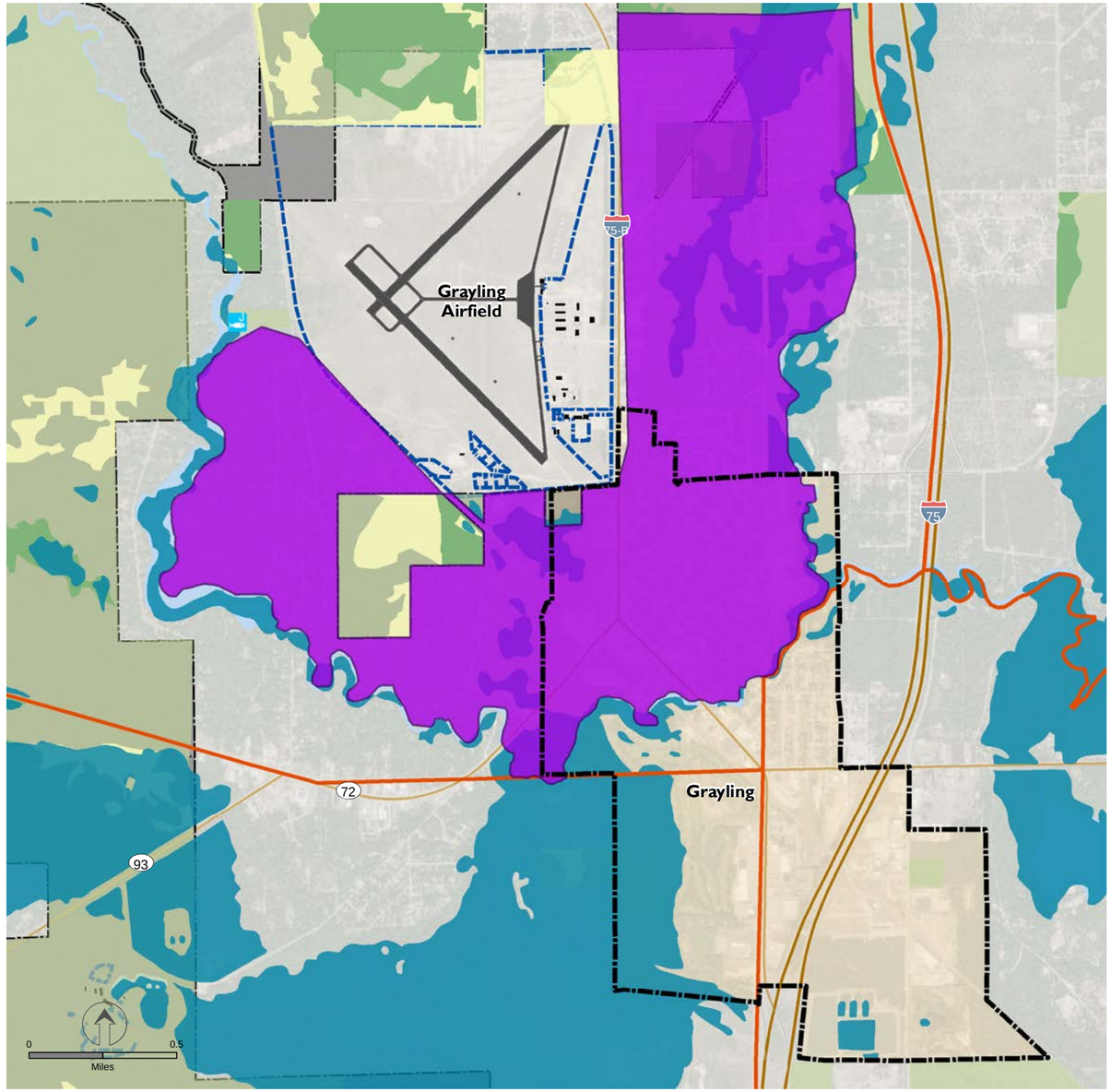


Figure 2.36 | City of Grayling Environmental



data can supplement local and concentrated data generated through citizen volunteer monitoring and conservation organization research.

The Michigan Clean Water Corps (MiCorps) is a network of volunteer water quality monitoring programs that supplement MDEQ efforts in collecting and sharing water quality data for use in water resources management and protection programs. MiCorps is administered by the Great Lakes Commission under the direction of the MDEQ and in partnership with the Huron River Watershed Council, Michigan Lake and Stream Associations, and Michigan State University. MiCorps comprises the Volunteer Stream Monitoring Program and the Cooperative Lakes Monitoring Program, which provide training and support for quality assurance, reporting, and communications among member organizations. The MiCorps website has an online searchable database with monitoring data for selected waterbodies. Aquatic macroinvertebrate survey data, an indicator of stream ecology health, are available for select streams in study area watersheds such as the AuSable River. Monitoring data for lakes includes basic water chemistry and indicators of nutrient pollution that cause eutrophication and algal blooms. The database also contains invasive species survey data and several technical studies and reports available for download on the MiCorps website.

Organizations such as the AuSable River Restoration Committee, the Upper Manistee River Restoration Committee, and various Trout Unlimited Chapters, and Section 319 funded watershed management plans conducted by Huron Pines have contributed to restoration of many erosion sites along area waterways. Camp Grayling JMTC maintains strong relationships with these and many other local groups to help watchdog and maintain water quality in the area.

Data on water quality and aquatic ecology in the area exist from many governmental and non-governmental organizations. Questions about specific topics like fish population health, site contamination, or trends in ecological health can often be addressed from multiple sources. Sources of existing and ongoing water quality and aquatic ecology survey, assessment, and monitoring data in the area include MDEQ Procedure 51 biological and ecological trend monitoring; Part 201 contamination sites; MDEQ probabilistic water quality monitoring sites; Environmental Protection Agency (EPA) National Rivers and Streams and National Lakes Assessments survey sites; 303(d) Impaired Waters and Total Maximum Daily Loads (TMDL); National Pollutant Discharge Elimination System (NDPES) discharge permit locations; and various data from conservation organizations, citizen-based monitoring studies and lake associations. Stakeholders, developers, planners, and citizens could benefit from a clearinghouse that summarizes conditions and provides links and references to various agencies and organizations that conduct aquatic research. A webpage hosted on the installation or collaborative organization website could consolidate multiple resources into a coherent story while providing links to further information.

Hiking trail in the Red Pines Natural Area on Camp Grayling. (Source: MDNR)

Issue 3d: Effects on the Health of Wildlife Populations

Maintaining habitat for wildlife is important for retaining the environmental quality of the area. Surveys for wildlife have been conducted several times at Camp Grayling JMTC, including 1993-1995 and 2004. Among the flora and fauna identified, one plant and two animal species are protected by the Endangered Species Act of the State of Michigan (Public Act 203 of 1974 as amended) and/or the Federal Endangered Species Act of 1973. In addition, the bald eagle is protected by the Bald and Golden Eagle Protection Act.

Camp Grayling serves as the breeding habitat for the Kirtland's warbler, an endangered bird, which nests in the jack pine forests in the area. Camp Grayling has a permanent Kirtland's warbler management area, where suitable nesting habitat is maintained through planned rotation cuttings. Threatened species on the installation include Houghton's goldenrod and the rarely seen Eastern Massasauga Rattlesnake, the only venomous snake in Michigan. Camp Grayling researchers have led detailed surveys of Massasauga populations for over 10 years.

There is also the Red Pines Natural Area on Camp Grayling where military activity is prohibited. The Grayling Forest Management Unit (FMU) currently has two areas designated for Pine Barrens management, a rare ecosystem typically inhabited by many threatened and endangered species, such as the Kirtland's Warbler.

Maintaining unfragmented habitat is difficult because of the requirements of operation. Research such as the Lake Margrethe watershed management plan (funded by the NGB) and planned cooperative research with the Michigan Natural Features Inventory to expand on biological survey data and mapping can contribute to sustainable land use planning decisions that benefit the installation and the community. Sponsoring and pursuing future grant-funded biological surveys and watershed management planning in cooperation with conservation organizations like Huron Pines can augment biological data maintained by state and federal agencies and support Camp Grayling JMTC's environmental stewardship.

- **PAST WILDLIFE WORK:**
  - Radio-telemetry studies of federally listed Eastern Massasauga Rattlesnake movement (regular between 2002-current)
  - Monitoring of Kirtland's Warblers and their habitat at specific site at North Camp
  - Identification and monitoring of snake fungal disease in Eastern Massasauga Rattlesnakes
  - Flora/fauna surveys in 1990s and early 2000s for Land Condition Trend Analysis and Integrated Natural Resources Management Plan (INRMP) updates
  - Acoustic surveys for federally listed Northern Long-eared Bat
  - Swimmer's Itch risk in Lake Margrethe
- **CURRENT WILDLIFE WORK:**
  - Mitigating military and rattlesnake interactions using translocation (finishing 2018)
  - Snake fungal disease monitoring
  - Kirtland's Warbler surveys
  - Targeted flora/fauna survey for INRMP update (finishing 2018)
  - Openings enhancement: firing point plant management and food plots (multiyear)
- **UPCOMING WILDLIFE WORK:**
  - Weeklong spring surveys to estimate abundance/size of Eastern Massasauga Rattlesnake population (multiyear study)
  - Radio-telemetry study of Wood and Blanding's Turtle habitat use (both under review for federal listing); beginning 2018
- **COLLABORATIONS:**
  - National Wild Turkey Federation and MDNR: Collaborating with MDMVA to manage firing points; planting of plant species for game animals provides wildlife food source which, mostly importantly, reduces fire risk and improves vegetation growth management on military firing points
  - Kirtland's Warbler Conservation Team: monitoring populations and habitat of Kirtland's Warbler
  - Others: MDNR, Michigan Natural Features Inventory, U.S. Fish and Wildlife Service, Huron Pines, DLZ Associates, Purdue University, and many other groups and individuals

Issue 3e: Wildfire Management

Wildfires have occurred fairly frequently within Camp Grayling JMTC boundaries and surrounding areas. According to the Adaptation Planning for Climate Resilience document published by the MIARNG in 2016, Camp Grayling JMTC averages over 100 fires annually, caused in part by the training conducted there. Environmental managers at Camp Grayling anticipate that coming effects of climate changes such as higher temperatures will contribute to increased wildfire risk.

The devastation of forests by the emerald ash borer, oak wilt, and gypsy moths also adds to the risk of potentially catastrophic wildfires. The area has a large amount of jack pine forest, which is a high-risk volatile fuel type contributing to a history of frequent small fires and large catastrophic fires, such as the 1990 Stephan Bridge fire that burned almost 6,000 acres in 5 hours and caused $5.5 million in damage. A handful of wildfires have jumped the installation boundaries in the Range 40 area in the past 10 years.

The MDNR Grayling FMU is responsible for wildfire control and management, including on lands leased by the NGB. A key forestry management tool is prescribed burns, which may cause concern if they are perceived as wildfires.

Each year approximately 5,000 acres in Camp Grayling are subject to prescribed burns. The Grayling Unit has two areas designated for Pine Barrens management. Pine Barrens is a rare ecosystem that is typically inhabited by threatened and endangered species within volatile stands of jack pine. The North Camp Grayling Pine Barrens Management Plan designed to restore 5,120 acres of pine barrens within Camp Grayling is awaiting approval from the NGB and MDNR Divisions before prescribed harvesting and burning practices are instituted.

MDNR is working with Camp Grayling JMTC to develop an integrated wildfire management plan that should be finalized by 2020.

Facilitating public communications about management plans through open houses and outreach will help residents understand wildfire risk and MDNR and NGB forestry management plans.

Issue 3f: Resource Use and Sustainability

Concepts and goals from Camp Grayling waste reduction strategies can be communicated to study area residents to convey Camp Grayling's commitments to environmental stewardship and to demonstrate investments in protecting shared natural resources while maintaining energy and water security. Features of the U.S. Army Net Zero Initiative strategy narratives could be adapted to enhance the installation strategy message. A communications campaign facilitated through press releases posted to the installation website and directed to local media are facilitation options, along with potential broadcast news stories about the waste reduction program.

2.3.4 Camp Grayling JMTC Transportation and Infrastructure Issues

Issue 4a: Effects of Growth on Utilities

Camp Grayling JMTC has a 5-year plan to become a self-sufficient installation, and the camp has diligently worked toward net-zero status and sustainability goals. (See Issue 3f, Resource Use and Sustainability.) Future growth would be accommodated with adaptations, as necessary, to the existing infrastructure. Wind electricity generation machines, also known as wind funnels, were installed starting in 2015 and are expected to power about half the buildings on the installation. Water is provided through wells of the City of Grayling; wastewater is treated on site.

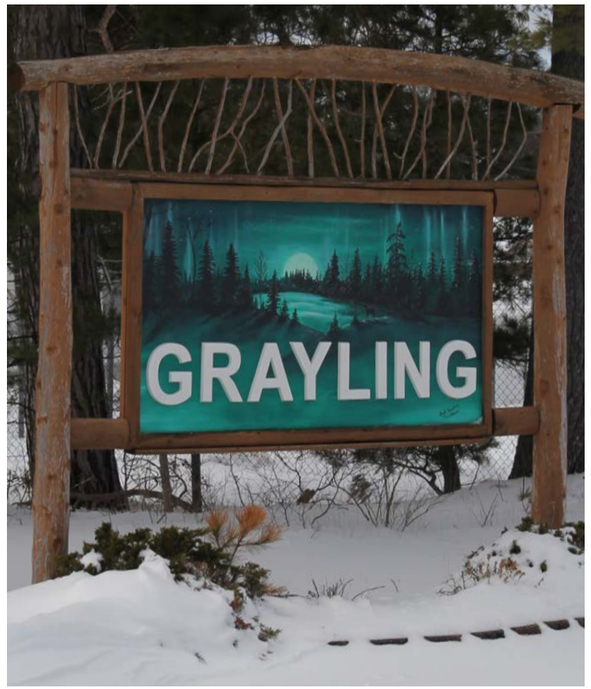
The surrounding area is serviced by Consumer Energy and Great Lakes Energy as well as DTE Energy (formerly MichCon), which provides three-phase electrical service. Many homes in the area are serviced by private wells. Water and sewer utilities in the City of Grayling are managed by the City. In Crawford County, there is a permitting system for private wells and septic systems, which is regulated by the District Health Department.

Construction of water and wastewater infrastructure near 4 Mile Road is ongoing to support the construction of an Arauco North America particleboard plant, which is expected to begin production in late 2018. The infrastructure development is funded through a $3.1 million grant and $4.1 million in loans. In December 2017, the Beaver Creek-Grayling Townships Utility Authority and C2EA, Inc., received approval from the Grayling Charter Township Board of Trustees to partner for the planning and development of infrastructure in this area.

A motion to allow for construction of a wastewater treatment facility was also passed by the board.

The City of Grayling also recently received a $1.5 million grant to replace a sewer main, which was installed in the 1970s. Work is anticipated to begin in 2018.

Efforts to fund and replace additional aging infrastructure are ongoing.



Sign welcoming visitors to the City of Grayling.

Issue 4b: Improve Internet Access

Internet service is limited in and around Camp Grayling because of its rural location. Cable, digital subscriber line (DSL), and wired internet options are available for residents and businesses with speeds ranging from 5 megabytes per second (mbps) to 100 Mbps. Otsego County has a fiber internet option through Winn Telecom, but the coverage area is small. Within the township of Grayling, the average download speed is only 16.53 mbps, according to data from broadbandnow.com. This is 66.5 percent slower than the average for Michigan and 156.8 percent slower than the national average.

As a state, the Michigan 21st Century Infrastructure Commission has set the following goals for internet access:

- All residents and businesses have access to a fixed broadband connection with a download speed of at least 25 mbps and an upload speed of 3 mbps by 2020 and a download speed of at least 100 mbps by 2024.
- All areas of the state (geographic) have access to a mobile broadband connection with a download speed of at least 10 mbps by 2020 and at least 25 mbps by 2024.
- Internet service has become vital as commercial, education, medical, and government activities occur more frequently online.
- All community anchor institutions (such as schools and libraries) have access to a fixed broadband connection with download and upload speeds that meet the minimum recommended speeds for their sector by 2024.

In other areas of the state, Great Lakes Energy is conducting a feasibility study to deploy fiber internet service. If the study supports it, a pilot project is planned for the Petoskey district that could be rolled out to other areas in Michigan.

In Alpena, the city council approved a "Wired City" fund and has developed a successful campaign to improve internet infrastructure in the city, including installation of fiber optics cables. This model could be utilized in areas like the City of Grayling.

Issue 4c: Poor Cellular Reception

Cellular phone reception has increased in recent years, but the rural location of the Camp Grayling area poses a challenge. Although Federal Communications Commission (FCC) data shows 3G or better coverage availability by three providers as of 2016, users report many dead spots or weak signal locations throughout the area. Most recently, the SBA Communications Corporation constructed a cell phone tower on Camp Grayling in 2013. AT&T has shown interest in acquiring a lease for a tower in the area.

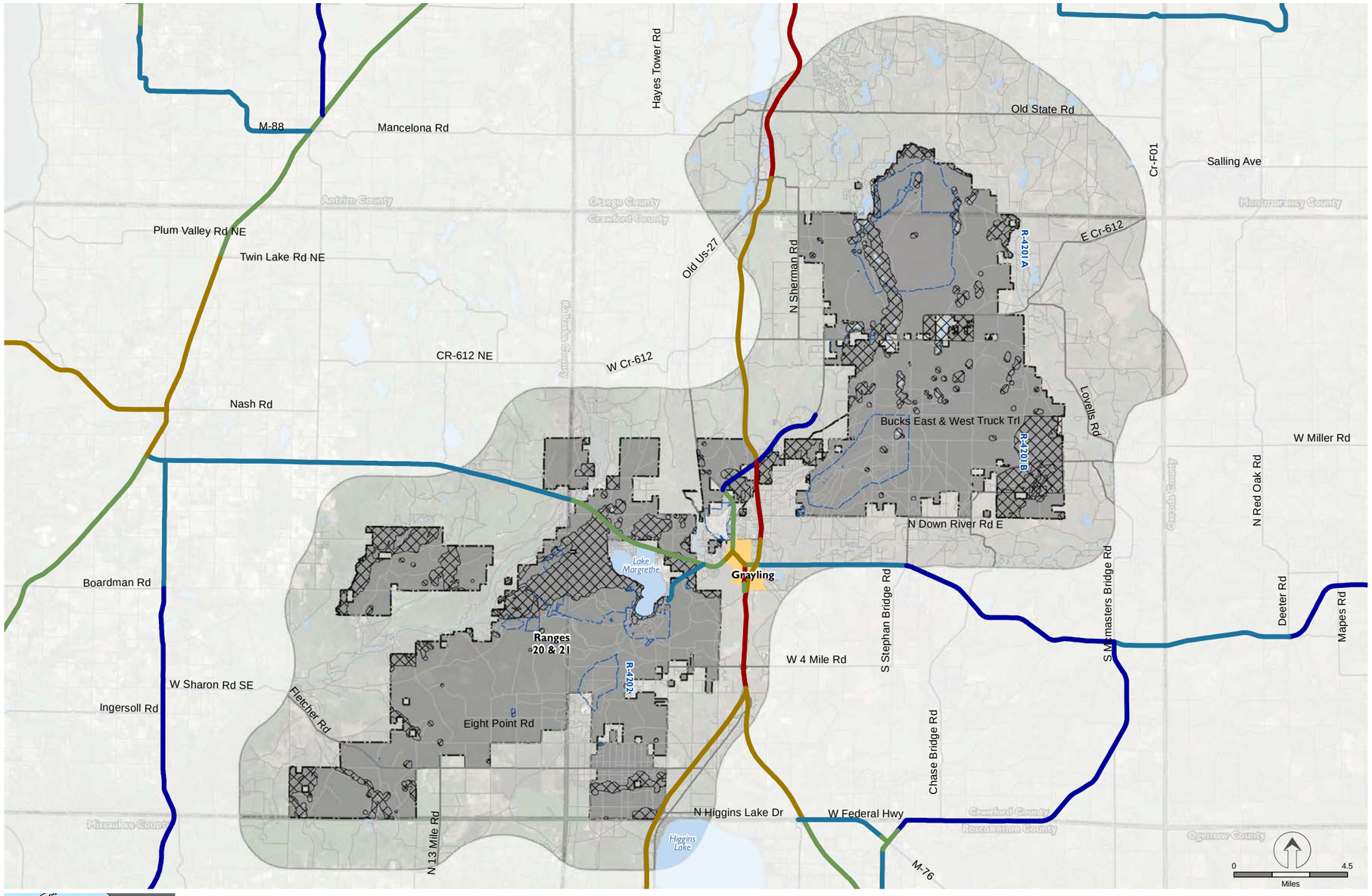
Issue 4d: Traffic

The most recent Grayling Area Transportation Study was published in 2008.

Michigan Department of Transportation (MDOT) data indicates small increases in annual average daily traffic (AADT) and commercial annual average daily traffic (CAADT) numbers from 2015 to 2016 on the state and federal highways and interstates in the Camp Grayling area, with the exception of a large increase in AADT in one section of the I-75 Business Loop south of the junction with M-72. That segment also had the largest AADT of 24,849.

Summer tourist traffic is a concern for local residents, especially as popular events often overlap. Convoys related to training at Camp Grayling can also cause traffic issues and may increase if the mission and number of exercises at the camp increase. This is exacerbated by the existing partial diamond interchange at I-75 and North Down River Road, as it forces some traffic to travel through the city of Grayling to access the interstate.

Figure 2.37 | Camp Grayling JMTC Transportation



Harsh winters and the spring freeze/thaw cycle cause wear and tear on local roadways.

There is also concern regarding increases in traffic congestion stemming from logging truck traffic and the estimated 250 permanent jobs created by the new particleboard plant off 4 Mile Road, particularly because the I-75 exit at 4 Mile Road is considered problematic. However, improvements to the area that are ongoing for the industrial district development are anticipated to alleviate some of this.

In addition, legislation has recently raised speed limits on I-75 and US-127. Due to safety concerns, Crawford County officials are seeking to block the speed limit increase to 65 miles per hour on M-72 East between Grayling and Mio.

The Crawford County Transportation Authority has 16 buses and three vans for public transport. There are seven routes that operate on a dial-a-ride service.

At Camp Grayling JMTC, reconfiguration of the main gate was completed in 2017, allowing for better security and improved traffic flow. The gate is manned by a sheriff's deputy paid for by the MIARNG, which has been cited as an important partnership between the military and community. However, it was noted that the Crawford County Road Commission or the greater community is not always informed regarding Camp Grayling JMTC transportation projects, which can cause potential traffic issues.

Identified Problem intersections

In addition to the overall traffic and road conditions, several individual intersections were identified as trouble spots for the community. Problem intersections identified include Old US-27 and M-93, M-93 and I-75, M-72 and M-93, I-75 and 4 Mile Road, 4 Mile Road and Military Road, and Military Road and I-75. See Figures 2.38-40 for locations.

Recreational pathway through the Grayling area.

Issue 4e: Recreational Access

The region is largely composed of forested land, making it an ideal location for outdoor recreation, including hiking, canoing, hunting, and fishing. Much of Camp Grayling JMTC is open to the public for recreational purposes when not in use for military training.

The MDNR maintains control of logging, mineral extraction, fishing, and hunting on lands leased to the military. However, there is a 14,000-acre area of Camp Grayling where hunting is not allowed, as the area is deemed a game refuge by the terms of the land grant. The MDVA controls recreation access in this area, which is referred to as the Hanson Reserve Lands. Hunting is also not allowed for safety reasons in some areas of Camp Grayling.

Public service announcements from Camp Grayling are released on a weekly basis via the Grayling Regional Chamber of Commerce website and other venues with information regarding access and military operations.

Public Act 288, which was signed by Governor Rick Snyder in 2016, requires the inventory and mapping of all state forest

Figure 2.38 | Camp Grayling JMTC Road Conditions

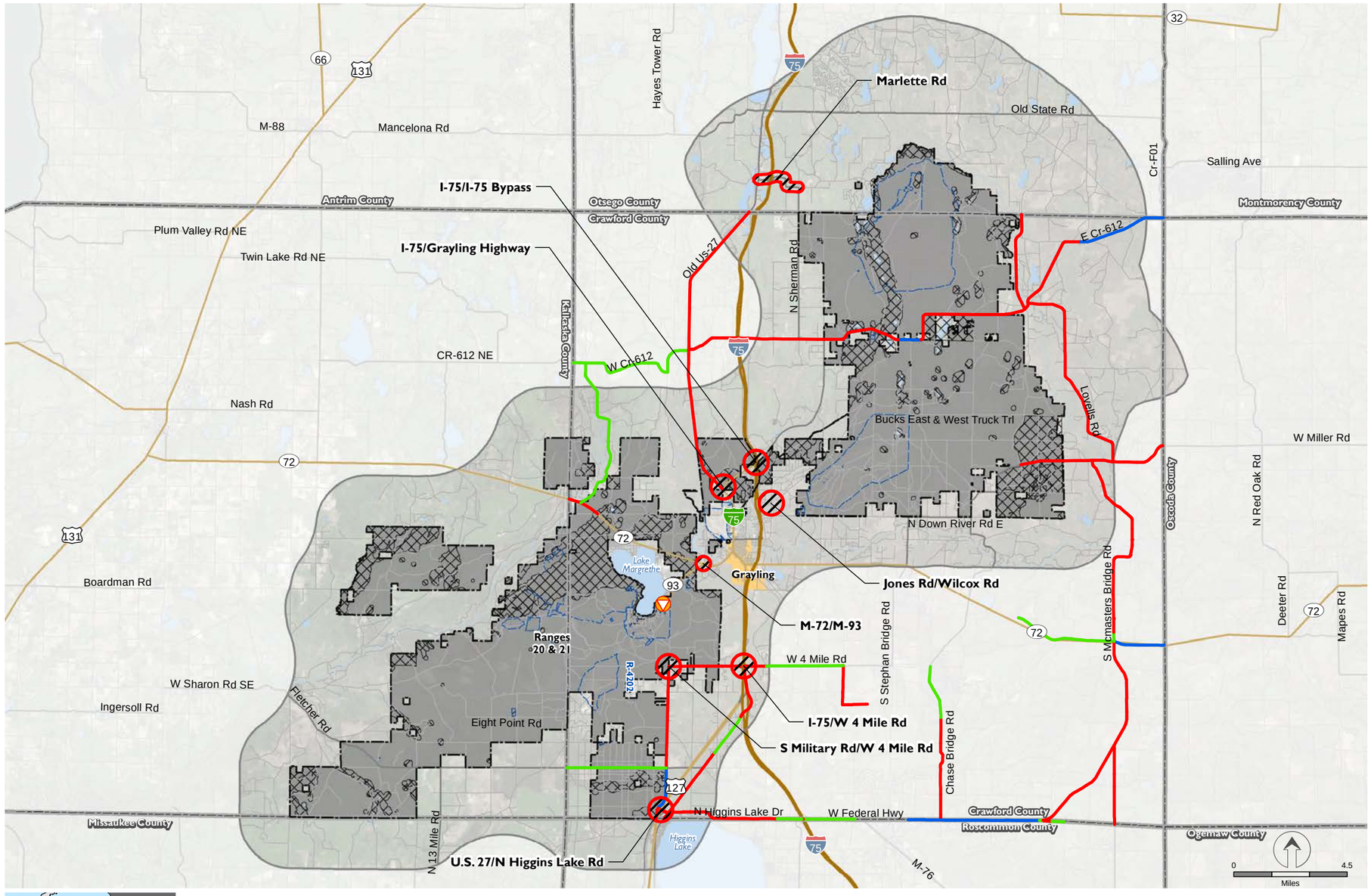
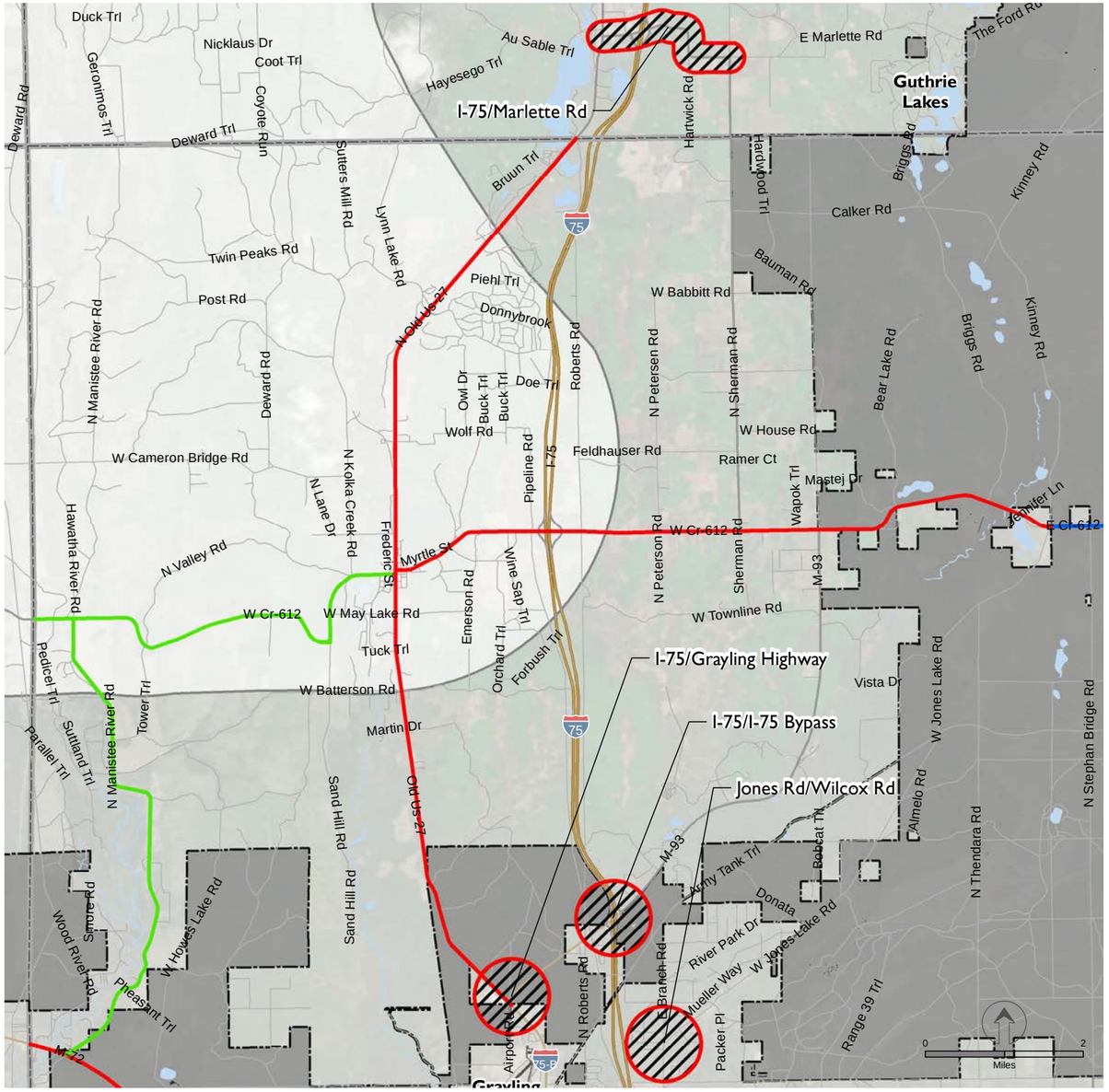


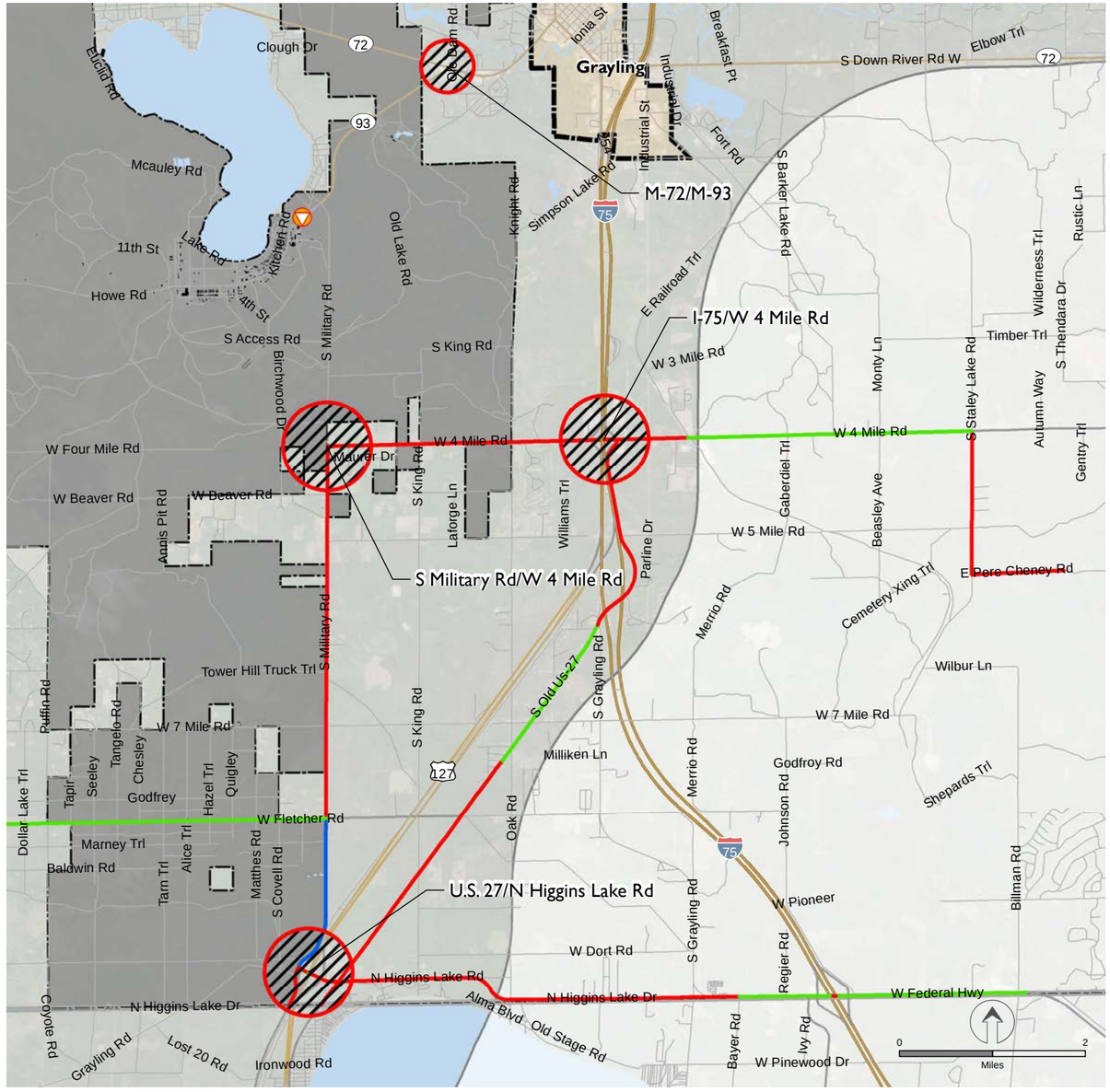
Figure 2.39 | Camp Grayling JMTC Road Conditions – North



- Camp Grayling JMTC
- County Boundary
- Problem Intersection/Road

Crawford County
PASER Rating (2017)
- 1 - 4 Structural Improvements
- 5 - 7 Capital Preventive Maintenance
- 8 - 10 Routine Maintenance

Figure 2.40 | Camp Grayling JMTC Road Conditions – South



- Camp Grayling JMTC
- County Boundary
- City of Grayling
- Access Control Point
- Problem Intersection/Road

Crawford County
PASER Rating (2017)
- 1 - 4 Structural Improvements
- 5 - 7 Capital Preventive Maintenance
- 8 - 10 Routine Maintenance

roads in addition to changes in rules for off-road vehicles (ORVs). This process was completed in the northern Lower Peninsula in 2017, and maps of these roads, including designations of those open and closed to ORVs, are available on the MDNR's website and will be updated annually. Camp Grayling JMTC collaborated with the MDNR for this effort.

Among the land use objectives in the 2014 Grayling Charter Township Master Plan is maintaining road end access sites for public use on rivers and lakes. The master plan also outlines a river protection land use category.

Issue 4f: Poor road condition

Increases in traffic are expected to accelerate the deterioration of roads around Camp Grayling JMTC, and there is particular concern for side roads and dirt roads, which are susceptible to damage from heavy traffic. Maintenance for trail roads, some of which will be newly opened to ORVs, is not funded.

On Camp Grayling JMTC, among those roads noted in need of repair is Headquarters Road. Most major roads around the installation, including Military Road, the western portion of 4 Mile Road, Old US-27, portions of Federal Highway, M-144, and East North Down River Road, are considered in poor condition, with Pavement Surface Evaluation and Rating (PASER) marks of 1-4. Ratings of 1 and 2 indicate failed roads that require reconstruction, while ratings of 3 and 4 indicate that structural renewal is needed.

Traffic to and from the camp contributes to road condition degradation. Much of the equipment brought in for training exercises is transported by rail to Camp Grayling JMTC; however, equipment brought in by truck impacts traffic in and around the installation.

Increased logging traffic is expected to contribute to road damage, as is traffic created by new commercial development, particularly in the 4 Mile Road area. The logging industry does provide funding to the state for road maintenance, which is passed down to the counties, though the amount has not increased in recent years.

Public comments collected through surveys and public meetings revealed a general lack of understanding of the amount of damage caused by military and logging traffic through the area; a public education campaign may help.

Funding has been identified as the primary hindrance to road improvement projects throughout the state. The Crawford County Road Commission's 2017-18 budget identifies $9,945,075 in anticipated revenues and $9,899,757 in proposed expenditures.

Crawford County Proposed Projects

- 2018 Proposed Projects:
  - 4 Mile Road: from the west side of I-75, ease 1.34 miles ($1.2 million [M])
  - Wakeley Bridge Road: from Wakeley Bridge, northerly to the intersection of North Down River road, 2.35 miles ($531,000 [K])
  - South Grayling Road: from Dort Road, northerly to the first curve, .50 miles ($135K)
  - County Road 502: from the south county line, north 1.5 miles to Dry Lake Road ($130K)
  - North Higgins Lake Drive: from Military Road to Old 27, 2,100 feet ($55K)
  - County Road 612: County Road 612 over Big Creek, Bridge rehabilitation ($166K)
- 2019 Proposed Projects:
  - Old US 27 (Hulbert Road north 3.16 miles)
  - County Road 502: from Dry Lake Road, north to M-18, 1.55 miles
  - South Grayling Road: from Fletcher Road to 7 Mile Road, 1.0 mile
- 2020 Proposed Projects:
  - Old US-27 (Otsego County Line south 3.16 miles)
  - 2021 Proposed Projects:
  - Twin Bridge Road: from County Road 612, north 4.01 miles
- 2022 Proposed Projects:
  - Military Road: Fletcher Road, north to 4 Mile Road, 3.7 miles

MDOT Proposed Projects

- Rehabilitate a 6.07-mile section of M-72 from the Kalkaska/Crawford County line to M-93 in 2019

Crawford County Recent Projects

- 2015
  - Hartwick Pines Road from M-93 to County Road 612, completed with Millage Money
  - North Down River Road from Stephen Bridge Road west 2.5 miles, completed with Millage Money
- 2016
  - Sherman Road from County Road 612 North, approximately 1.4 miles
  - County Road 612 between Petersen Road and Sherman Road, approximately 1,800 feet
  - County Road 612 from Jones Lake Road to K.P. Lake Road, 0.90 mile
  - North Down River Road from MATES east, 1.7 miles
- 2017
  - Wakeley Bridge – culvert/bridge deck
  - 4 Mile Road (Oak Road to I-75 southbound ramp, 0.81 miles)
  - Sherman Road (Otsego County Line south 1 mile)
  - Wakeley Bridge Road – culvert/bridge deck
  - South Grayling Road – curves (between Fletcher Road and approximately Dort Road)

MDOT Recent Projects

- I-75 Business Loop bridge, 2016
- M-72 bridge, 2016

2.3.5 Camp Grayling JMTC Community Partnerships Issues

The JLUS process emphasizes the importance of a community-driven planning process which relies on partnerships among Camp Grayling JMTC, communities, and local stakeholders. The JLUS survey results indicated that 62 percent of those participating in the survey believe that Camp Grayling JMTC has a positive impact on the quality of life of surrounding community residents. However, the JLUS process did reveal that stakeholders see communications, public relations, and education as issues that could be improved and, possibly, increase the perspective that Camp Grayling JMTC has a positive impact on quality of life for surrounding community residents.

Issue 5a. Communications/Education

Camp Grayling JMTC has an ongoing public relations effort, implemented by a dedicated community relations specialist. Communicating with stakeholders in surrounding communities, as well as to MIARNG leadership in Lansing and to other stakeholders throughout Michigan, is a critical function of this position. The community relations specialist is one of the principal points of contact for inquiries about what happens at Camp Grayling JMTC when community members have questions or concerns. Although the role of community relations specialist is critical to community partnerships, comprehensive documentation about standard operating procedures for this position has not historically existed. As a result, changes in staffing have affected the efficacy of communication with community partners. Gaps in institutional knowledge about key communication channels, processes, and relationships with community and media partners, can create challenges for new community relation specialists as they fill the position.

The current community relations specialist uses a variety of communication channels to share information with key stakeholders. These communication channels used to distribute information on Camp Grayling JMTC training operations and other programs include email, Camp Grayling JMTC Facebook page, the quarterly Camp Grayling Impact newsletter distributed in both electronic and print, and, to a limited extent, the Camp Grayling JMTC webpage on the MIARNG website maintained in Lansing. When conducting an internet search for Camp Grayling JMTC information, the main MIARNG website is the most official website provided. However, the information provided on this website for Camp Grayling is limited. The community relations specialist is working with Lansing to update the website information to include new leadership. The process for updating website information is slow as a result of coordinating changes through Lansing. Communications requirements from Lansing may preclude a faster process, but it is imperative that the existing website provide key contact information and a link to more regularly updated information on Camp Grayling JMTC, such as the dedicated Camp Grayling JMTC Facebook page.

One issue stakeholders consistently raised during the one-on-one interviews and community meetings is a desire for improved communications with Camp Grayling JMTC. An important communications effort is to update surrounding communities about the weekly range firing schedule. The Camp Grayling JMTC community relations specialist sends out this weekly schedule via an email distribution list. The list includes homeowners and business associations, local elected officials, residents, and media contacts. The weekly range firing schedule is then shared by these stakeholders on various websites such as the Grayling Regional Chamber of Commerce, social media accounts such as the Twitter feed for UpNorthVoice, and email distribution lists such as those maintained by homeowners associations. However, many stakeholders are not aware that Camp Grayling JMTC has an email distribution list intended to distribute this information; there is no information on the Camp Grayling JMTC website or social media accounts on how to request to be added to this email list. Individual residents who don't belong to a homeowners association might not know the email distribution list exists and might not have the information necessary to get on the distribution list. The Camp Grayling JMTC community relations specialist is taking steps to ensure more stakeholders are made aware of this email distribution list and have the opportunity to request to be added to the list.

In addition to circulating the firing range schedule via email, Camp Grayling JMTC has cultivated strong relationships with local media that help distribute this information. Blarney Stone Broadcasting operates radio station WQON Q100.3, covering central northern Michigan, and is partnering with Camp Grayling JMTC to provide listeners with regular up-

Stakeholders participate in a JLUS issue discovery meeting in June 2017.

dates about Camp Grayling operations. WQON recently invited the Camp Grayling community relations specialist and commander to provide daily updates on Northern Strike to listeners. The listener response to the updates was positive, leading WQON to suggest partnering with Camp Grayling JMTC to provide weekly updates throughout the year. The community relations specialist identified a challenge in having local print media, such as the Crawford County Avalanche, include Camp Grayling weekly firing range schedules and other information that would be of interest to local readers.

According to the community relations specialist, the job gets easier with improved stakeholder education. Identification and reporting of unexploded ordnance (UXO) is one area where Camp Grayling JMTC sees a need for development and implementation of an education program in partnership with surrounding communities. A program on UXO would help community members know what to do if they come across historic UXO on public lands to ensure public safety.

Issue 5b. Public Relations and Community Engagement

Public relations and community engagement is another key component of the Camp Grayling JMTC community relations specialist's role. This aspect of the position can be demanding, particularly with only one full-time community relations specialist. The recent groundwater contamination concerns have generated a need for increasing community relations capacity, although these positions will not be permanent.

Camp Grayling JMTC receives a variety of requests for group tours and involvement in community events, such as local parades. Information for stakeholders on how to make these requests is sparse. Often the requests are in the form of an email to the community relations specialist. The community relations specialist attempts to fulfill these requests as much as possible, although there are instances where not enough lead time is provided to fulfill the request. More comprehensive information on how to make these requests and the lead time necessary would possibly allow Camp Grayling JMTC to approve a greater number of requests and expedite the process.

Despite the existing level of community engagement, stakeholders interviewed for the JLUS project often mentioned a desire to have the Camp Grayling JMTC facilities more accessible to the public. Camp Grayling JMTC has received inquiries about opening a visitor interpretative center on-site that would allow the public to experience some of Camp Grayling JMTC without having to request a tour. At the present time, the Crawford County Historical Society Museum in Grayling has a photo display of the history of Camp Grayling in the museum annex.

The strategies to address the issues related to public relations, communications, education, and community involvement are available in Section 4.

Museum in downtown Grayling.

2.3.6 Camp Grayling JMTC Economic Development Issues

Issue 6a: Effect on Property Value Mostly Perceived as Neutral or Positive

A key economic development issue raised by stakeholders through the JLUS process focused on the impact of Camp Grayling JMTC on surrounding property values. Stakeholders participating in the survey are split on the perception of how Camp Grayling affects property values: 50 percent of stakeholders participating in the survey feel that Camp Grayling JMTC decreases property values, 40 percent feel it has no effect, and 10 percent feel it increases property value. News articles covering town halls held by MDEQ and Camp Grayling JMTC on groundwater contamination from the Camp Grayling JMTC airfield indicate residents' concerns about declining property values. Through the community meetings, stakeholders shared stories with the JLUS project team of concerns about home sales due to noise from training operations and real estate agents not being fully transparent with prospective homebuyers about impacts from Camp Grayling. Increased transparency on potential issues related to Camp Grayling JMTC operations such as noise and wildfire could help with managing the perception of the impact on property values.

Issue 6b: Significant Contributor to Local Economy

Improving economic development in the communities around Camp Grayling JMTC is a priority issue identified by stakeholders through the JLUS project, as well as Project Rising Tide – an initiative to provide at-risk communities with economic development tools. Of the stakeholders that participated in the JLUS project survey, 82 percent feel that Camp Grayling JMTC is a significant contributor to the local economy. This perception is validated by information presented in the March 2017 Economic Development Study for the City of Grayling prepared through Project Rising Tide. According to the study, Camp Grayling directly spends $16 million annually in the City of Grayling and attracts over 10,000 soldiers and their families for training during summer, which represents significant military tourism.

Locally contracted services represents a portion of the $16 million spent annually in the City of Grayling. Camp Grayling JMTC entered into a contract with the Grayling Fire Department to provide fire services. Through the one-on-one interviews during the JLUS process, stakeholders raised the issue that the current level of service offered through the existing contract might not be adequate given wildfire threats and increased population due to Camp Grayling JMTC training operations. If a need for increased fire protection services due to Camp Grayling JMTC can be quantified and verified, the data would support increasing contractual services which would lead to additional jobs for Grayling Fire Department.

Issue 6c: Economic Incentivizing and Monitoring

Commitment to spending Camp Grayling JMTC funding at locally owned businesses varies depends on leadership. There are no policy requirements or spending goals for locally-owned businesses for goods and services that are not subject to federal contracting requirements. Therefore, these decisions are subject to the commitment of the leadership at Camp Grayling JMTC, which changes on a regular basis.

While it is understood that military tourism, defined as soldiers coming to Camp Grayling JMTC and the family members that visit surrounding communities to accompany them during training, likely has a significant positive impact on the economy of Grayling and other surrounding communities, it is challenging to quantify the extent of the economic impact and share that information with the public. Through Project Rising Tide, the City of Grayling has identified creating and maintaining a relationship with Camp Grayling JMTC as an economic imperative for the city and its businesses. A mechanism to track the impact of military tourism on the local economy would assist Grayling and other communities in better understanding: 1) how much soldiers and their families spend while training at Camp Grayling and 2) factors that affect trends in military tourism annually and over time.

One factor that influences military tourism and integration of Camp Grayling JMTC trainees into surrounding communities is adequate transportation. Soldiers training at Camp Grayling JMTC do not have access to private vehicles for transportation into Grayling and other communities. Camp Grayling JMTC often invites local food trucks to set up within the Camp Grayling JMTC, but for soldiers to leave, they must rely on public transportation provided by Crawford County Transportation Authority (Dial-A-Ride). Stakeholders participating in the JLUS process mentioned that the early closing hours for Dial-A-Ride make it difficult for soldiers training at Camp Grayling JMTC to go into Grayling and other communities. Stakeholders also identified the challenge of the Dial-A-Ride schedule in the Grayling Economic Development Study developed through Project Rising Tide; however, the study offered no specific recommendations to address this challenge. Improved public transportation is key to improving the integration of Camp Grayling JMTC into surrounding communities as a way to increase economic contributions from military tourism.

Top: Crawford County building in Grayling.

Far Left: An overlook near Guthrie Lakes.

Left: Grayling City Hall and police department.

3

alpena CRTC and community study area

chapter overview

Control tower.

Base operations building.

Troop camp quarters.

Thunder Bay River.

3.1 Alpena CRTC Study Area Overview

3.1.1 How to Read this Chapter

This chapter describes Alpena CRTC and the areas surrounding it. The first section contains a study area overview, which includes existing conditions information about the Alpena CRTC area. A two-mile study area buffer was created around the Alpena CRTC boundary to establish a focus area for this land use study. The next section has a description of the public participation for Alpena CRTC, and then finally, the third section features a discussion of the JLUS issues brought up by local stakeholders and refined by the planning consultant team.

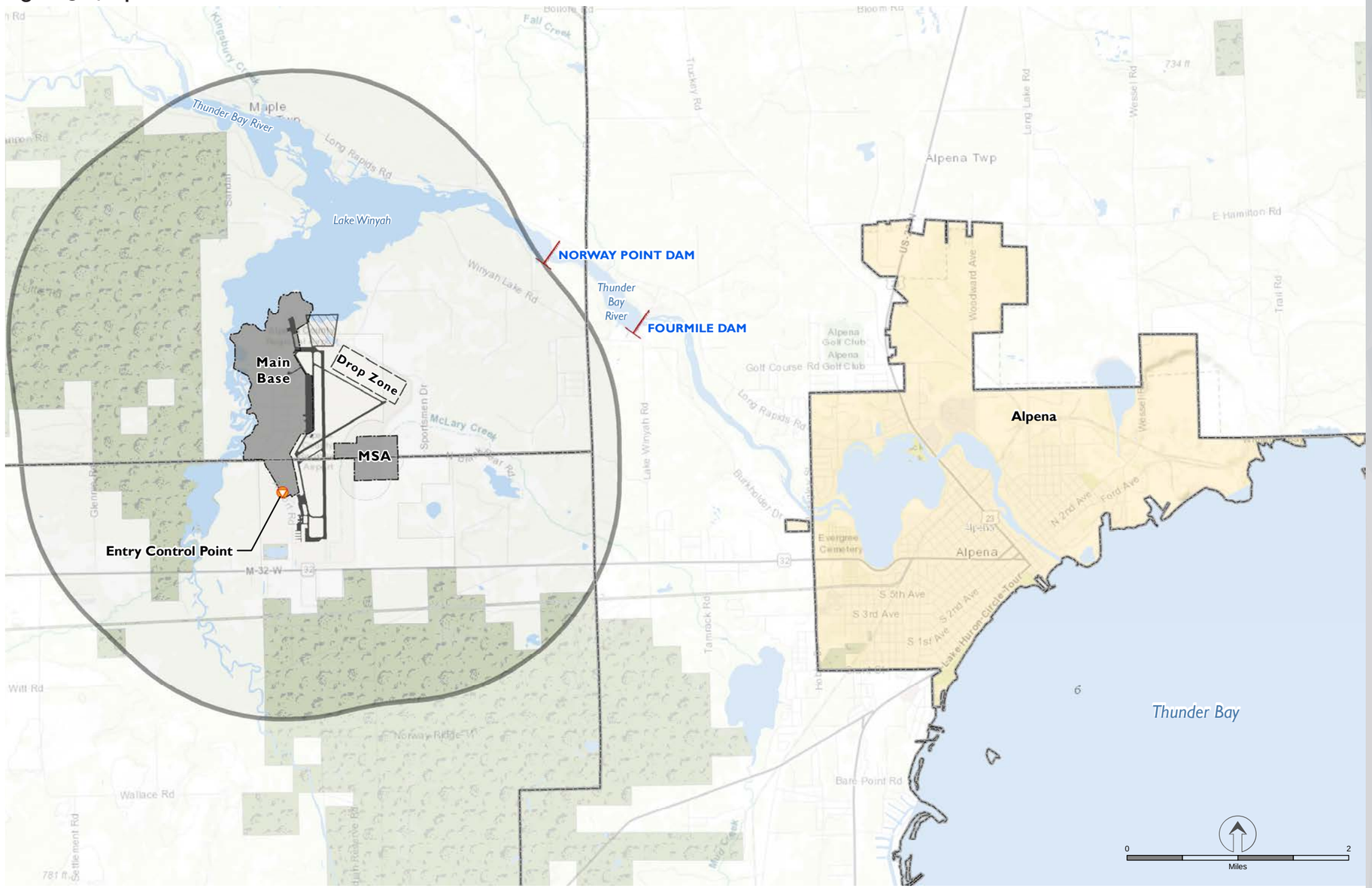
3.1.2 How Alpena CRTC and its Surrounding Area Is Unique

Located adjacent to Lake Huron, Alpena CRTC has access to the largest training airspace east of the Mississippi River, making it an attractive destination for joint forces training. Although there are no assigned aircraft at the base itself, the parking ramp can accommodate F-15s, F-16s, A-10s, C-130s, C-5s, C-17s, KC-10s, KC-135s, and more. The airspace over Lake Huron includes supersonic permissions at altitudes above 30,000 feet above mean seal level (MSL).

Alpena CRTC is a certified Joint National Training Center, one of just four installations like it in the country. It hosts the fourth-largest National Guard Bureau (NGB) training operation, known as Northern Strike. The exercise, originally put on by Air National Guard (ANG), is now jointly hosted with Army National Guard (ARNG) and Camp Grayling JMTC. It brings together about 6,000 service members from 13 states and coalition countries including Canada, Great Britain, Denmark, Latvia, and Poland. Also, a quarter of the joint terminal attack controllers (JTACs) in the Air Force are trained at Alpena CRTC.

The City of Alpena draws on a rich history as a hub of transportation at the intersection of the Thunder Bay River and Lake Huron. Forest and conservation lands surround the base, and recreation opportunities are plentiful. The population is small and aging, as many retirees live in the area.

Figure 3.1 | Alpena CRTC



Alpena CRTC anchors the Michigan Air National Guard presence in the northern part of the state. Residents of the surrounding area have an overall positive view of the base, which is situated 7 miles west of downtown Alpena. Alpena is the largest city in region, and Alpena CRTC is colocated at the Alpena County Regional Airport. Encroachment is minimal and is unlikely to affect Alpena CRTC's mission in the foreseeable future.

3.1.3 Setting

The Alpena CRTC study area is located in Alpena County in the northeast portion of Michigan's Lower Peninsula, approximately 130 miles east northeast of Traverse City and 250 miles north of Detroit. Alpena CRTC spans 630 acres leased from Alpena County; the ANG also utilizes facilities at the Alpena County Regional Airport. Alpena is the most populated city in the area and borders Thunder Bay on Lake Huron. Access to the area is typically via Michigan State Highway 32 (M-32) (east-west) and U.S. Highway 23 (US-23) (north-south). Interstate 75 (I-75) is the nearest interstate at 65 miles west.

The Grayling Air-to-Ground Range, located on Camp Grayling JMTC, is a training range for Alpena CRTC that is covered in the Camp Grayling portion of this JLUS.

The Alpena area has mild summers, with an average daily temperature of 64.3 degrees, and very cold winters, with an average daily temperature of 19.9 degrees. The area averages 29 inches of precipitation annually, with most falling in June, July, and August. The average annual snowfall is 87 inches.

3.1.4 History

Commercial fishing and associated settlement in the Alpena area began around Thunder Bay in the 1830s, and 30 years later, logging began. The city of Alpena was incorporated in 1871, and Alpena Power, which is still in service today, was founded by George N. Fletcher in 1881. By 1900, the population of Alpena was more than 18,000, and railroad lines helped make the city a transportation and industry hub. Paper production and limestone quarrying were other primary economic drivers.

Alpena CRTC began as Captain Phelps Collins Field in 1931 and was Michigan's first state-owned airport. The field was built on land donated by the Alpena Power Company and brothers Harry and Phillip Fletcher. The first hangar was completed in 1937, around the same time that military personnel from Selfridge Field began using the site.

During World War II, the field was taken over by the War Assets Administration in large part to provide air defense for the Soo Locks. Following the war, several facilities built in 1942 were sold or moved and the field was turned over to the county.

A joint use agreement with the National Guard was completed in 1952 and the ANG constructed 62 concrete block buildings in the 1950s.

Airmen listen to a mass air brief during Northern Strike, a large joint exercise hosted annually at Camp Grayling JMTC and Alpena CRTC. (Source: Alpena CRTC Public Affairs)

The site was renamed the Alpena CRTC in 1991. Radar approach and control training, an ANG Medical Readiness Training School, and Air Combat Maneuver Instrumentation missions were added in the early 1990s, and a fire training site and military operations on urban terrain (MOUT) area in the early 2000s.

3.1.5 Mission/Operations

As mentioned in the description of the military and operational section describing Grayling JMTC, these two entities are inextricably linked around the training activities of the combined asset. The JMTC acts as the garrison support function of the Grayling Range, while the Alpena CRTC manages operational aspects of the airspace and training requirements of the visiting units. Additionally, the JMTC naturally handles more of the Army-related activities and Alpena CRTC handles the Air Force-related functions.

The CRTC is collocated with the Alpena County Regional Airport, sharing functional assets including two runways, the primary being 9,000 feet long by 150 feet wide and the secondary crosswind recovery runway being just over 5,000 feet long by 150 feet wide. Taxiways and air navigation equipment are also shared. The airport has a control tower and is owned and operated by Alpena County. It is a moderately busy airport with the majority of traffic being military related.

While the installation does not have any flying units of its own, it supports organizations from all branches of the military throughout the U.S. and coalition partners. Regional

Front entry of Alpena CRTC, which is collocated with Alpena County Regional Airport. (Source: Alpena CRTC Public Affairs)

units supported on a regular basis by the CRTC include:

- 107th Fighter Squadron (FS) out of Selfridge Air Force Base (AFB), Michigan, flying A-10 fighter jets.
- 112th FS out of Toledo, Ohio, flying F-16 fighter jets.
- 69th and 23rd Bomb Squadrons out of Minot AFB, North Dakota, flying B-52 bomber jet aircraft.
- 171st Air Refueling Squadron out of Selfridge AFB, Michigan, flying KC-135 refueler jet aircraft.

Command and control of airspace activities is coordinated through Black Talon Scheduling located on Alpena CRTC. They provide separation services for all aircraft within the SUA of the entire complex from the RA over Lake Huron to the military operations area (MOA) west of the Grayling Range. This is done in coordination with other entities including the Alpena County Regional Airport air traffic control tower, the Grayling Range air traffic control tower, Range Control at Grayling Range and the Minneapolis Air Route Traffic Control Center, which has ultimate authority over the entire region and handles all aircraft in high-altitude airspace.

The CRTC and JMTC work in concert to promote and manage operations throughout the entire complex. This includes jointly funded projects and CRTC-funded projects on the range (an Army asset). Specific to Alpena CRTC are facilities for firefighter training, munitions storage, bulk jet fuel storage, Combat Aviation Patrol capable shelters and maintenance, Joint Terminal Attack Controllers to support range activities, a large aircraft parking apron, operations support facilities for transient units, aircraft maintenance hangars, billeting, dining, and recreational assets.

The installation employs 88 military personnel (ANG), 57 state employees, and 62 contractors with an additional 21 temporary employees during training events. Excluding airmen's personal expenditures, these activities generate a local economic impact of well over $25 million dollars annually.

The installation plays host to many visitors throughout the year for individual and unit training events as well as annual large force exercises including Northern Strike, an NGB-sponsored exercise that involves 55 units from 21 states and as many as three coalition partners from around the world. This event brings as many as 5,500 personnel at one time and flies more than 1,120 sorties out of the airfield.

Possessing the largest amount of military and restricted airspace east of the Mississippi River, and supported by advanced digital airport surveillance radar (DASR) and tracking systems technology, Alpena CRTC has the potential to become the unmanned aerial systems (UAS) destination of choice for the Department of Defense (DOD) and its contractors. The DASR and tracking systems are used by both Minneapolis and Cleveland centers to control and direct airborne craft.

Alpena CRTC has developed a 1 square mile box of airspace specifically for small military UAS missions. This airspace provides a template for a proposed 4-square-mile civilian UAS area of operation. When completed, this area would be capable of supporting conventional, maritime, hand, and catapult launched aerial systems. Launch and recovery support for military UAS is being actively pursued by the CRTC, which may eventually allow flight systems testing, mission training, and DOD validation testing. UAS can now also be flown in Class D airspace when the tower is open.

Based at the Alpena County Regional Airport in Alpena, Northern Michigan Unmanned Aerial Systems Consortium (MUASC) is a UAS consortium and flight test center. MUASC offers 11,000 square miles of airspace dedicated to research and development, certification, qualification, and systems testing for commercial UAS. It includes an MOA that belongs to ANG, with over 30 percent of airspace extending over Lake Huron. MUASC consists of UAS manufacturers, academia, research centers, military, government agencies, and private partners.

Characterized by a low population density with wide, uninhabited expanses, the area is ideal for UAS research, testing, and development. The grant is allowing Alpena to host no-cost training seminars. The seminars promote travel to Alpena, which translates into hotel stays and business for local restaurants. Growing this asset will continue to be an economic benefit to the area.

3.1.6 Demographics

The Alpena CRTC study area for this JLUS is located in Alpena County, the most populated county in Northeast Michigan. Alpena County has a population of 28,599 residents and functions as Northeast Michigan's commercial and cultural center. As of 2017, data shows 10,054 people living in the City of Alpena, while 8,835 reside in the Township of Alpena.

Tourism plays an important role of the area's economy. Throughout the almost 9 square miles that make up the City of Alpena, an abundance of recreational activities are available for its residents and visitors to enjoy year-round.

Alpena also has roots in industrial companies that positively impact Alpena's revenue. Alpena is home to LafargeHolcim cement plant, Besser Company, and a drywall board manufacturing facility owned by Decorative Panels International. In addition to its industrial base, Alpena is also home to many other small businesses along with a community college and a regional medical center.

Alpena CRTC is located just outside of the city, and it is a continued source of economic activity for the local community. Every year the operation brings over 1,000 people to the area. During their days off, many trainees spend money at the local business in the Alpena area. Numerous businesses offer incentives for the troops including a military discount. Alpena CRTC creates thousands of new customers a year for the local economy and also energizes the local housing market with new full-time officers/staff that live off base. Several times a year, the base will host students for a training program that offers them an introduction to the military. People involved in the program often return to the area to hunt, fish, and take advantage of Alpena's many recreational activities.

Population Projections

It is difficult to project population in the Alpena area due to tourism and those living in the area seasonally. Overall population in the area has rapidly been declining since the 1960s. See Figure 3.2, City of Alpena Population Trend, 1900-2010. Alpena residents are aging with few new residents moving in. The distribution is heavily weighted to those of retirement age. This, along with the downturn in the economy in 2009, may have played a role in the shift of the population. Poverty rates are also high in the Alpena area, possibly also contributing to a decline in population. A reliable measure of economic health is the median household income. The median household income of the Alpena CRTC study area is $42,883, higher than the overall Alpena County median income, which is $35,710. Unemployment rates in 2010 were 15.5 percent and have fallen significantly to 7.4 percent in 2017. The City of Alpena is committed to enhancing and promoting its business-friendly climate and future job growth, which over the next 10 years is predicted to be 41.56 percent. The forecasted population of Alpena County looks to increase by the year 2020 from 28,599 to 35,220 residents.

Growth Potential

In an effort to attract skilled talent to the area and curb a decreasing population, Northeast Michigan has put together a 10-year talent plan. The plan focuses on long-term growth, bringing to the region full-time, higher-wage positions in the highest growth industries. The Northeast Michigan 10-year talent plan provides a timeline, best practices and recommendations for assessing and bringing in skilled employees to the region. Northeast Michigan is looking to adequately plan for long-term growth by anticipating industry trends and educational needs. The vision for the future of Northeast Michigan is to fill 10,000 jobs in 10 years. For details, see Table 3.1, Northeast Michigan Industry Forecast.

Figure 3.2 | City of Alpena Population Trend, 1900-2010

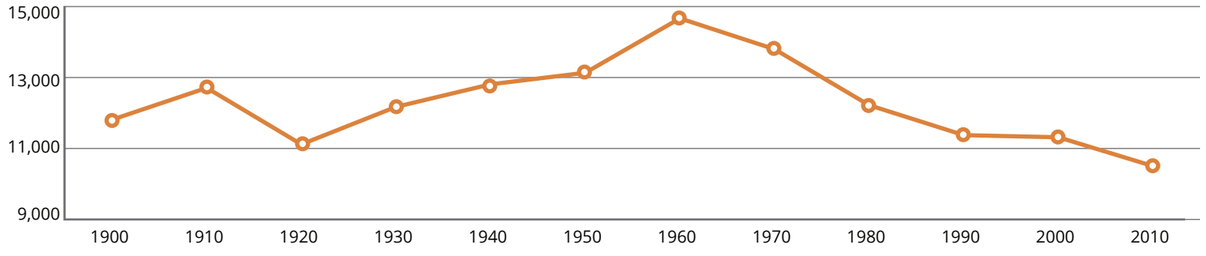


Figure 3.3 | Alpena CRTC Study Area

Table 3.1 | Northeast Michigan Industry Forecast

INDUSTRY	EMPLOYMENT 2012	EMPLOYMENT 2022	PERCENT CHANGE (%)
Retail Trade	10,960	10,860	-0.9
Healthcare and Social Assistance	9,560	10,212	6.8
Transportation and Warehousing	1,460	1,630	11.6
Manufacturing	5,170	5,420	4.8
Construction	2,380	2,780	16.8
Agriculture, Forestry, Fishing and Hunting	1,790	1,850	3.4
Professional and Business Services	2,320	2,620	12.9
Accommodation and Food Services	6,410	6,860	7.0
Leisure and Hospitality	7,530	8,040	6.8
Government	6,270	6,090	-2.9
Financial Activities	2,320	2,360	1.7

Source: http://www.discovernortheastmichigan.org/downloads/rpi_10_year_talent_plan.pdf

Figure 3.4 | Alpena CRTC Study Area Demographics

643
2017 population

46.5
2017 median age

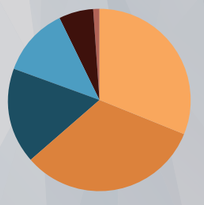
$98,171
2017 median home value

$42,883
2017 median household yearly income[1]

194
number of family households[2]

23%
2011-15 ACS households below the poverty level

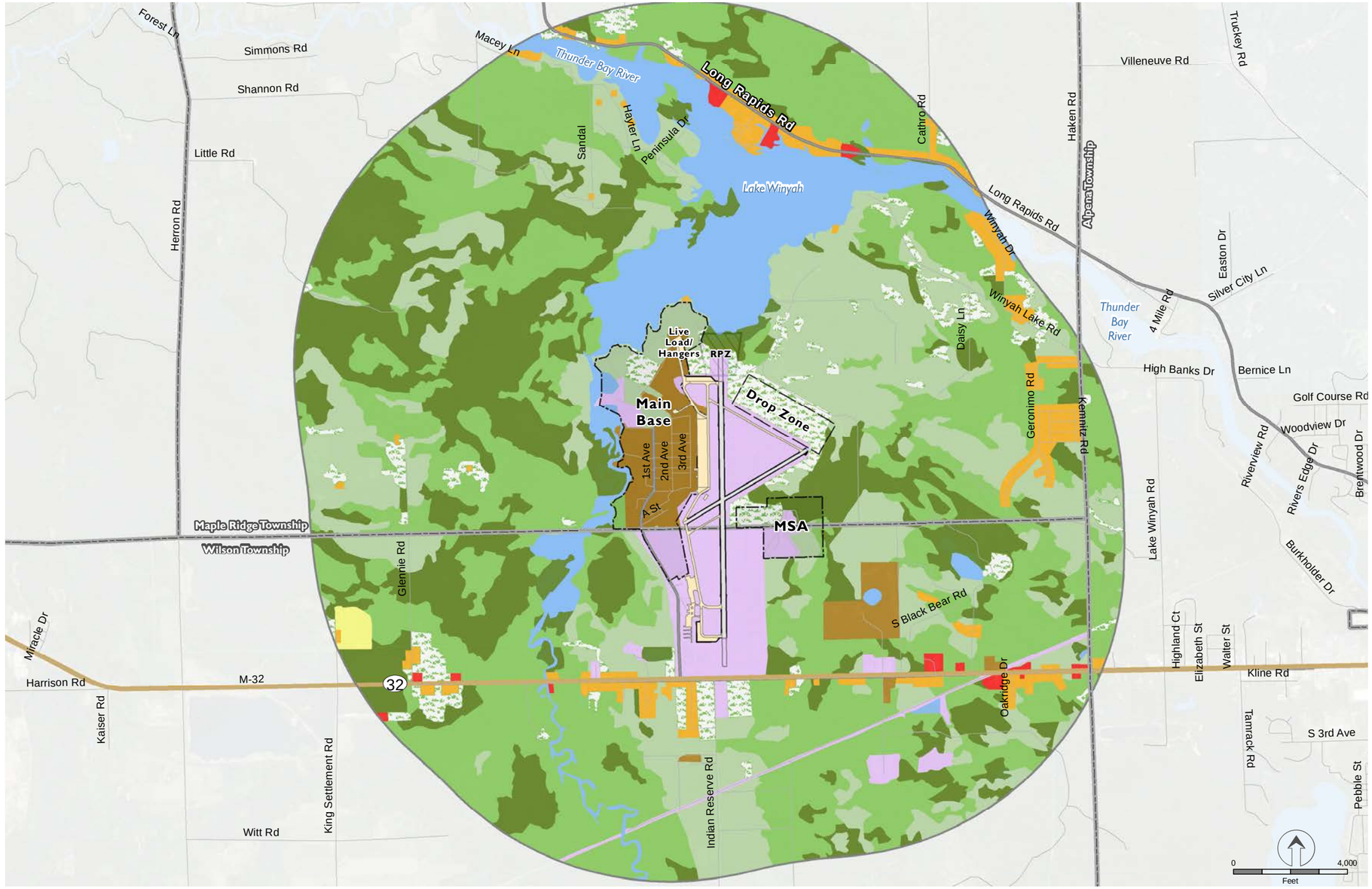
Education attainment



1% < 9th grade
31% high school diploma
32% some college/no degree
17% associates degree
12% bachelor's degree
6% grad/professional degree

1. Esri
2. 2010 US Census

Figure 3.5 | Alpena CRTC Land Use



3.1.7 Land Use

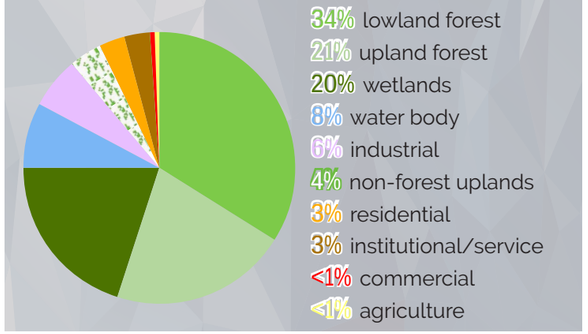
Shown in this section are the various land uses as they exist within and around Alpena CRTC. The divisions of use are categorized into natural areas and those created by a human presence. This manner of organization was used to reconcile the differing land-use categories provided by the townships. Throughout the Alpena CRTC study area, man-made uses are concentrated along major roadways, and in unincorporated portions on the north side of Lake Winyah. Areas of man-made uses consist of commercial, industrial, recreational, and residential uses. These land-use categories do not portray the intensity of the land use in any given area.

The majority of the land use around Alpena CRTC, 87 percent of the total acreage, is natural areas. Natural areas include a mix of forested uplands, lowlands, and wetlands. Among the man-made area, the highest percentage of land is the industrial, extractive, transportation and utility land-use category, in large part due to the Alpena airfield. Among the other land uses, there is a concentration of the Commercial and Residential land uses along thoroughfares in the areas. Agricultural uses are the least represented in the study area.

It should be noted that land use is a portrayal of the actual use of real property and, while it informs zoning, is not considered to be legally enforceable.

The vast majority of the concentrated land uses of the City of Alpena are well to the northeast of this area.

Figure 3.6 | Alpena CRTC Land Use Distribution



3.1.8 Zoning

Zoning can be enforced at the county, township, and city/village levels of government. As it applies to the Alpena study area, the zoning is enforced at the township level by the Maple Ridge, Wilson, and Alpena Townships respectively. Each township applies different names to their respective zoning districts. In order to organize these varying descriptions, the zones have been grouped into seven categories that best fit the overall description of the zone. While the categories do not take into account the intensity of the zone, it does lay out the legal mechanisms available within the Alpena study area that control the use of property. The largest zoned area within the Alpena area consists of Agricultural areas, totaling 62 percent of the total area. Commercial, Residential, and Industrial areas consist of 14 percent of the study area and notably cover more area than the identified land use. These zones are of importance when considering noise and other disruptions concerning uses at the Alpena CRTC, as these zones will likely consist of the majority of occupied spaces.

3.1.9 Incompatible Use

Noise contours were provided at the time of the finalization of this JLUS and the FAA defines the APZs. GIS of the APZs will need to be obtained along with the GIS for the noise contours. A precise analysis of incompatible land use can be completed during the implementation phase of the JLUS when GIS data layers are made available. However, since the bulk of the land uses surrounding the regional airport and Alpena CRTC are agricultural or open space in nature and the City of Alpena is not directly adjacent to the installation, there are fewer complaints related to military operations in the area.

Figure 3.8 | Alpena CRTC Zoning Distribution

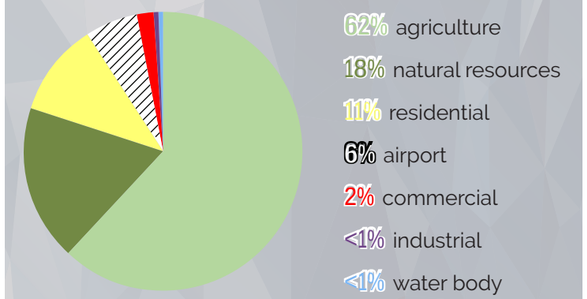


Figure 3.7 | Alpena CRTC Zoning

3.2 Alpena CRTC Public Participation

The public participation process for Alpena CRTC involved a suite of TC/PC meetings, stakeholder meetings, community survey, and one-on-one stakeholder interviews. The initial TC/PC meeting for Alpena CRTC took place on April 24, 2017, at the University Center in Gaylord, Michigan. During this meeting, participants discussed expanding the TC member list, approved the project work plan, and coordinated logistics for the tours.

The Alpena CRTC installation tour for TC/PC members took place on June 1, 2017. The purpose of the tour was to provide TC and PC members with a more detailed understanding of the Alpena CRTC operations, procedures, and facilities.

On June 1, 2017, TC and PC members met at the Great Lakes Maritime Heritage Center, a visitor center for the Thunder Bay National Marine Sanctuary, for a facilitated issues identification discussion. Through this meeting, TC and PC members identified an initial list of strengths, weaknesses, opportunities, and threats (SWOT) related to Alpena CRTC. Community stakeholders met the evening of June 1, 2017, at the Maritime Heritage Center to engage in a similar issues identification discussion using the SWOT method. The JLUS project team advertised for this meeting in the Alpena News and local radio stations. In addition, TC and PC members used their internal outreach mechanisms, such as email distribution lists and websites, to promote the meeting. During the meeting, the JLUS project team presented the JLUS process and facilitated an issues identification discussion. Section 3.3 provides more detail on this process and the results.

After the initial stakeholder meetings, the JLUS project team conducted a series of one-on-one interviews with key stakeholders. Sixty stakeholders participated in the interview process. In addition to interviews, the JLUS project team sought broader stakeholder input through a survey made available on the NEMCOG website for 3 months. A copy of the survey questions is available in Appendix B as part of the Public Participation Plan. Members of the TC and PC used their existing outreach mechanisms, such as websites and newsletters, to help the JLUS project team promote participation in the survey. NEMCOG also provided information to the Alpena News and local radio stations. Subsequent news articles and radio coverage promoted participation in the survey. Stakeholders submitted a total of 137 survey responses.

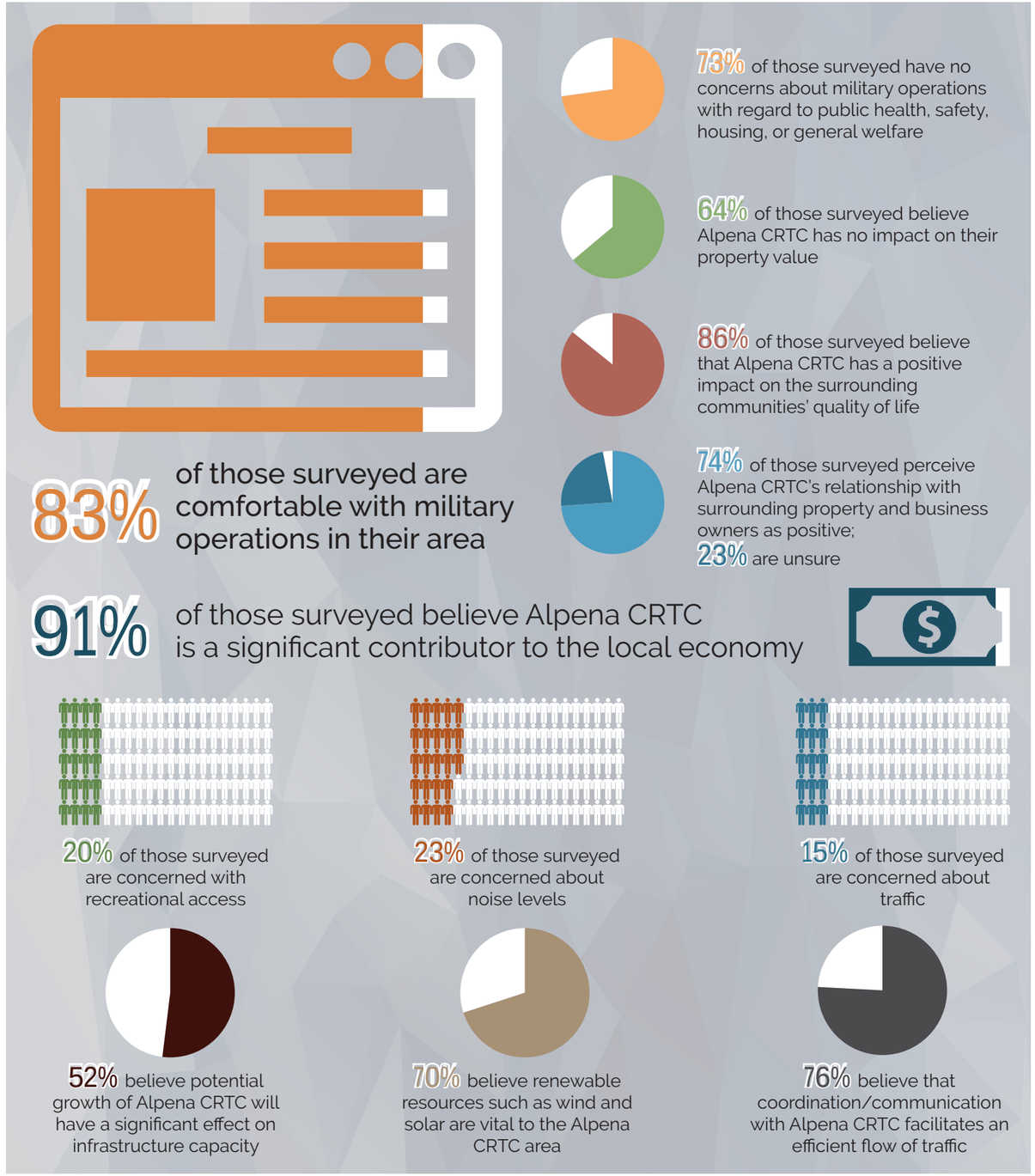
The survey results for Alpena CRTC are presented in Figure 3.9. Overall, the survey responses indicate that a majority of stakeholders sharing their perspective are comfortable with the operations at Alpena CRTC, believe it is a significant contributor to the local economy, and has a positive impact on the quality of life of surrounding communities. Stakeholders responding to the survey have a slightly greater concern about noise from Camp Grayling JMTC (23 percent) than recreational access (20 percent) or traffic (15 percent).

Stakeholder input from the SWOT analysis, the one-on-one interviews, and the survey helped the JLUS Project Team understand the comprehensive universe of issues and prioritize those issues for further strategy development. The second JLUS project stakeholder meeting for Alpena CRTC took place October 11, 2017, at the Alpena County Library. This Alpena community update and input meeting focused on reviewing the JLUS process steps, status, SWOT results, and identification of possible strategies to deal with priority issues identified by stakeholders. Additional news articles and radio coverage discussed this meeting and continued to promote participation in the online community survey.

Additional TC and PC meetings took place in November and December 2017 and continued through the spring of 2018. During these meetings, TC and PC members discussed JLUS project status and action items, data needs, and next steps.

Additional stakeholder meetings, both in-person and via conference calls, took place during 2018 to address details of the recommended strategies for each of the priority issues. During these meetings, stakeholders provided feedback on the strategies, identifying key information that will assist with successful implementation over time. The strategies and associated recommendations and challenges identified by the JLUS project team with input from stakeholders are described in more detail in Section 4.

Figure 3.9 | Survey Highlights



JLUS stakeholders participate in a SWOT analysis during the June discussion meetings.

Figure 3.10 | Alpena CRTC SWOT Results

(Items in the smallest font size got less than 5 votes.)

3.3 Alpena CRTC Issues Overview

3.3.1 Issue Definition Process

The first opportunity for the public and project stakeholders to share thoughts on their proximity to Alpena CRTC was at a series of discussion meetings on June 5, 2017. There, the JLUS project team led TC and PC members through an issues collection exercise to gather input. These issues could be positive or negative.

The issues were sorted into four categories: strengths, weaknesses, opportunities, and threats, and then meeting participants voted on which issues mattered the most to them. Later that same day, the JLUS project team led area residents through the same exercise at a public meeting. The results of that analysis can be seen in Figure 3.10, Alpena CRTC SWOT Results. Larger font size indicates issues that received the most votes. Detailed results are provided in Appendix C. Additional notes and input were gathered during the meetings, as well as during individual interviews with stakeholders.

All of the input from stakeholders, the TC and PC, and the online survey was considered when drafting the final list of issues. The survey was closed on November 30, 2017, with over 200 responses.

Along with stakeholder feedback, a large trove of data from NEMCOG and other local sources was considered, including demographic data, existing studies, and GIS data on land use and other facets of the region.

Six overarching categories emerged:

- Military Operations
- Noise
- Environmental
- Transportation and Infrastructure
- Community Partnerships
- Economic Development

All of the issues raised fell into one of those categories, which are described in more detail on the following pages.

Figure 3.11 | Alpena CRTC Issues Analysis Process

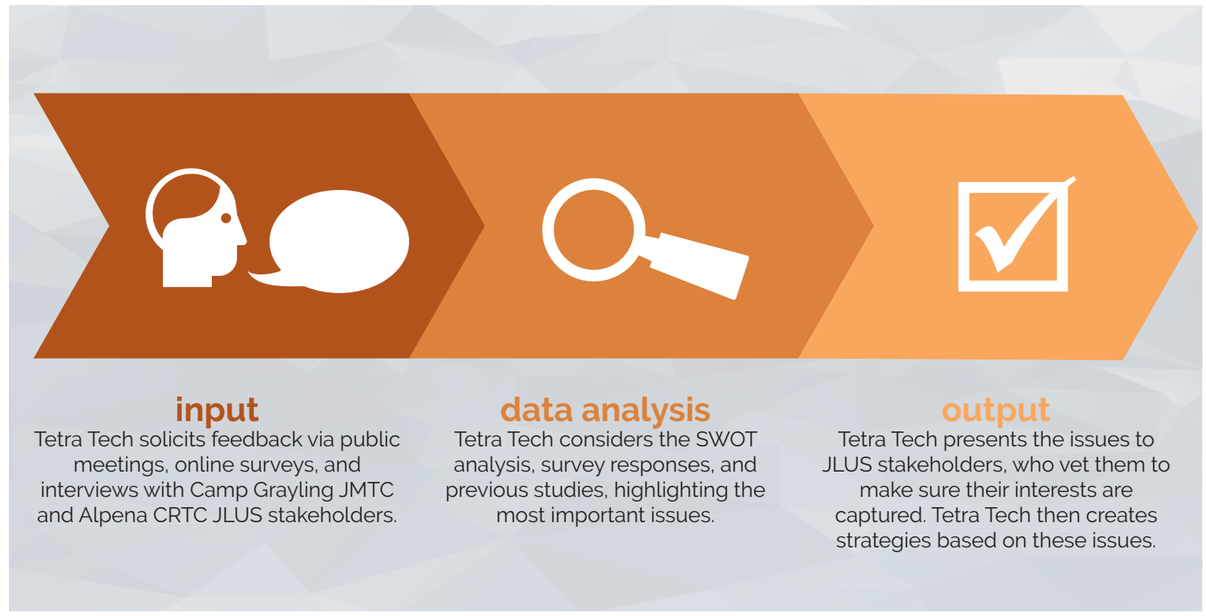


Table 3.2 | Alpena CRTC Issues

ISSUE ID	DESCRIPTION	SOURCE
Noise		
1a	Training/Aircraft Operations are too Low/Fast	SWOT
Military Operations		
2a	Live Munition Impacts to Lake Huron	SWOT
2b	Northern Strike Activity	SWOT
2c	Marine Sanctuary	Interview/Survey
Environment		
3a	PFOS/PFOA Contamination of Groundwater	SWOT
3b	Surface Water Quality (Lakes, Rivers, Streams, Wetlands)	Survey
3c	Groundwater Quality	Survey
Transportation/Infrastructure		
4a	Effects of Growth on Utilities	Survey
4b	Airport Joint Ownership/Land Use Access	Interview/Survey
4c	Road Funding	
4d	Road Condition	
4e	Recreational Access	Survey
Community Partnerships		
5a	Communications/Education	
5b	Public Relations/Community Involvement	
Economic Development		
6a	Significant Contributor to Local Economy and Military Tourism	Survey
6b	Airport Viability: UAS, Freight, Customs Border Patrol	SWOT
6c	Partnership with Sheriff's Department	SWOT

For a complete list of issues, see Appendix C, SWOT Results.

Alpena CRTC has an operations building on Camp Grayling JMTC.

A MIARNG UH-72 Lakota helicopter takes off near a MIANG A-10 Thunderbolt II during Operation Northern Strike at Alpena CRTC. (Source: Alpena CRTC Public Affairs)

3.3.2 Alpena CRTC Noise and Military Operations Issues

Issue 1a: Training/Aircraft Operations are too Low/Fast

The area surrounding the Alpena County Regional Airport is much better defined and controlled than that of Grayling Army Airfield (AAF). A single small housing community off the end of Runway 01 contains less than 60 houses. The clear zone (CZ) of the runway end is clearly delineated on the ground.

The rest of the vast area around this airport is forested, unpopulated land. The airfield is far enough away from the developed area of town that encroachment is not an issue. Criteria establishing protection areas for this airport is Federal Aviation Administration (FAA) Advisory Circular 150/5300-13 because it is a county-owned and operated airfield, even though the majority of air traffic is military related.

Training activities involving aircraft are low and fast when they involve jets engaged in launch or recovery operations. Once departed from the airfield and at a safe distance away, these aircraft typically ascend to above 6,000 feet MSL, which is the floor of the Pike West MOA located directly above this area. The majority of operations are intended to be conducted within these designated airspaces, including transit to and from the ranges.

The Pike East MOA located over Lake Huron is established with a floor down to 300 feet above ground level (AGL). It is possible that aircraft may transit directly from the airfield to this airspace at a lower altitude if going there for training purposes. Typically, these overflights would be restricted to flying no lower than 1,500 feet MSL until safely in the MOA. They would also be directed to avoid overflight of populated areas for safety and noise sensitivity reasons.

It is recommended that cities and counties restrict development of residential neighborhoods within 5 miles of all airports, ranges, or installations.

Issue 2a: Live Munition Impacts to Lake Huron

For several decades, Lake Huron has been a well-known location for the release of bombs, missiles, bullets, and all manner of munitions.

In more recent years this activity has been restricted in order to safely allow other uses of the resource. An area referred to as the R-4207 is restricted airspace (RA) (when activated) over restricted water for the purposes of military training. The lake-bed below is undoubtedly riddled with ages of shrapnel and unexploded ordnance (UXO).

In 1991, a live AIM-9B Sidewinder missile was identified on the shore of Lake Michigan near Cheboygan. It was later determined that it came from similar live-fire training activities conducted in the lake, then dredged up by fishermen and abandoned on the beach.

Alpena CRTC training includes exercises that employ air-to-surface weapons launching into the Lake Huron Overwater Range, approximately 20 miles offshore from Alpena. The Thunder Bay National Marine Sanctuary was designated in 2000 at 448 square miles and expanded in 2014 to 4,300 square miles. When the Thunder Bay National Marine Sanctuary boundary expansion was underway, the 2013 National Oceanic and Atmospheric Administration (NOAA) Condition Report noted that a 1,300-square-mile area has the potential for housing UXO and military-related debris. NOAA's Lake Huron chart 14860 contains a note cautioning mariners against "anchoring, dredging, or trawling in the area due to the possible existence of unexploded ordnance." MDEQ has requested assistance from the U.S. Army Corps of Engineers to evaluate the known munitions in the area and potentially address their findings via the Military Munitions Response Program. Maintaining effective communication between NOAA and Alpena CRTC is key to ensure that Alpena CRTC operations co-exist with this unique freshwater sanctuary.

Issue 2b: Northern Strike Activity

Because it is one of the largest training areas in the United States, the Alpena CRTC/Grayling JMTC complex is a national asset that easily attracts training events like Northern Strike exercise. The inundation by thousands of visitors that need services, supplies, entertainment, vehicles, housing, and the like can impact the community. However, these events also bring a boost to the local economy.

To balance the positive and negative aspects of training exercises, towns should plan and prepare for events as thoroughly as the military does. They should disseminate information about events, shared activities, services offered, and help wanted. They should prepare briefings and informational packages for military personnel to help them find what they are after and educate them on how to avoid areas that should be off-limits to military personnel.

The community-military partnership is key to a successful event of this magnitude. Getting the community involved and engaged will reduce the negative impacts while allowing residents to more directly realize the benefits.

Figure 3.12 | Alpena CRTC Military Operations

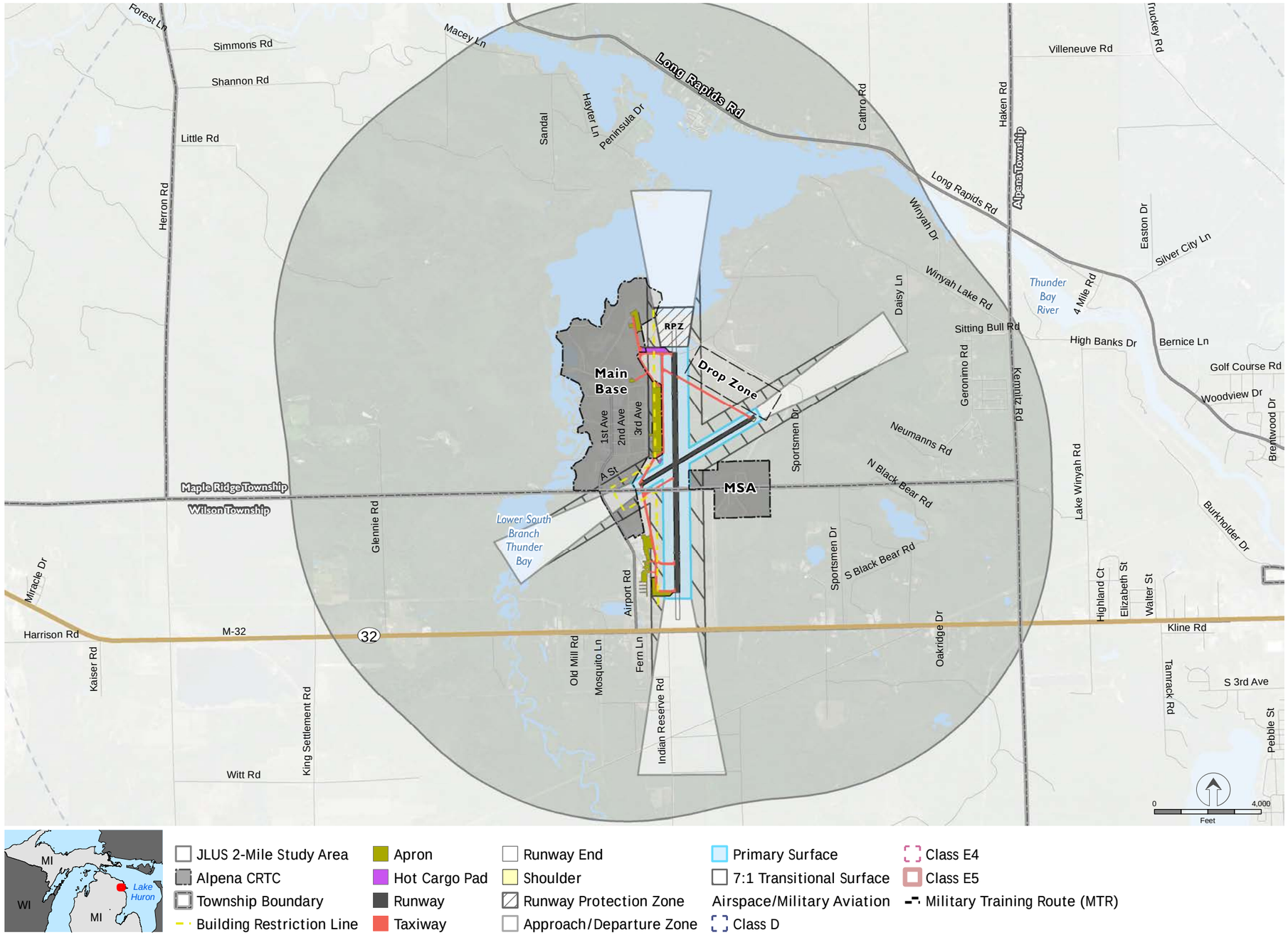
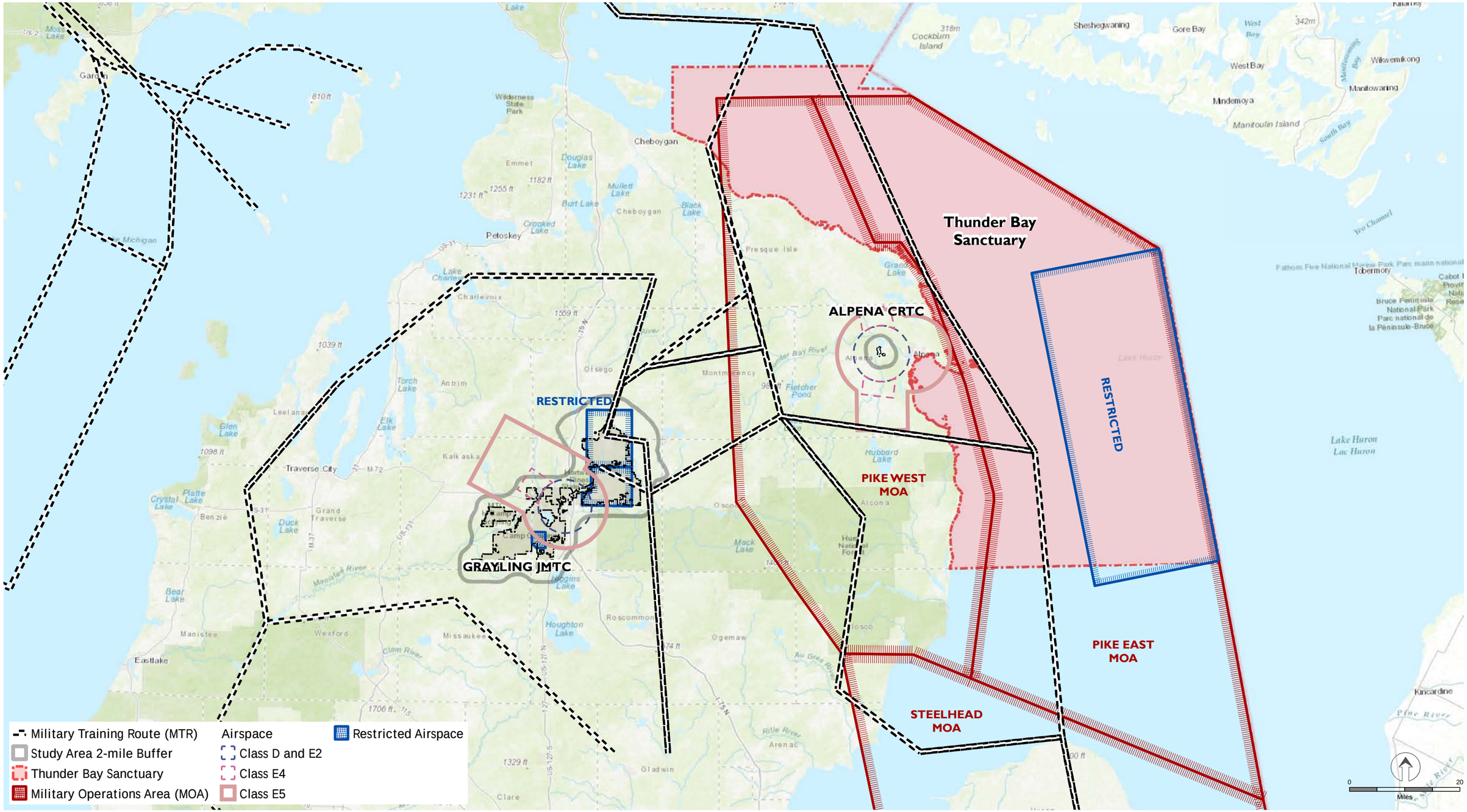


Figure 3.13 | Alpena CRTC Military Operations Overview



Great Lakes Maritime Heritage Center, the visitor center for the marine sanctuary.

Issue 2c: Marine Sanctuary

The Pike East MOA airspace over a large portion of the Marine Sanctuary extends down to just 300 feet AGL and is used for high-speed, low-altitude jet fighter training. The sanctuary was created to protect the shipwrecks and unlike many other marine sanctuaries, the law for Thunder Bay National Marine Sanctuary does not directly protect marine life. There are no identifying notations on sectional charts limiting activities that can be potentially disruptive to marine life.

The greatest asset of the sanctuary are shipwrecks littering the lake bed. Low-level flight activities do not disturb those assets or the divers investigating them. There is the potential for munitions deployment in close proximity to the eastern edge of the marine sanctuary, and aircraft traverse the area with live munitions departing from the Alpena Airport. UXO are known to exist in this area, and most have been identified and marked to prevent accidental contact. However, there is a possibility of otherwise unknown UXO that could be dangerous to divers, fishermen, or recreational boaters.

3.3.3 Alpena CRTC Environmental Issues

Issue 3a: PFOS/PFOA Contamination of Groundwater

Contamination of groundwater and drinking water from wells from perfluoroalkyl and polyfluoroalkyl substances (PFAs, also known as PFCs), is the top environmental concern for Alpena CRTC and Camp Grayling JMTC. The principal contamination source at the Alpena CRTC is considered to be perflourooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) contamination from use of now discontinued aqueous film forming foam (AFFF) fire suppressants. On the national level, PFA/PFC compounds are emerging

Figure 3.14 | Alpena CRTC Noise

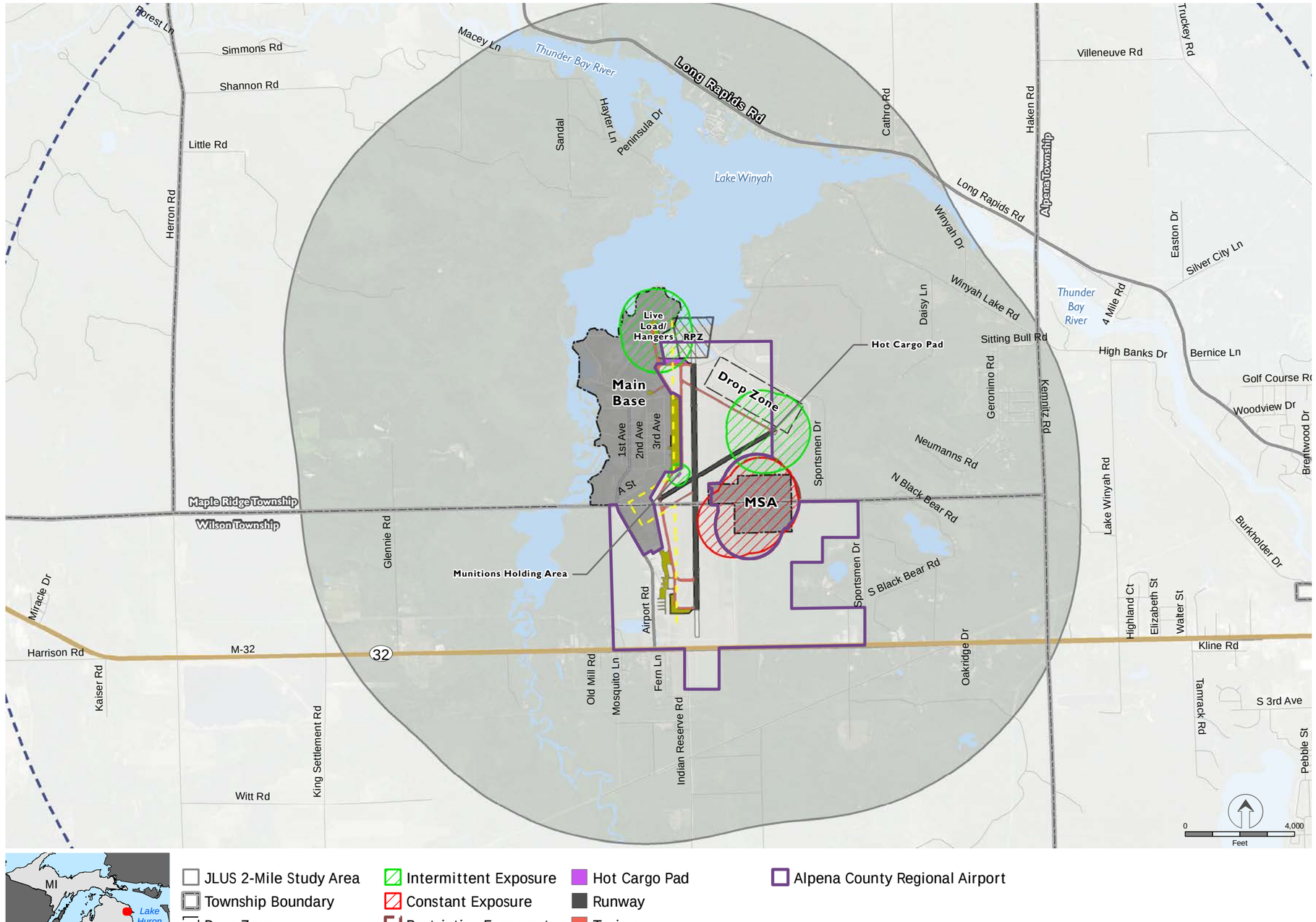
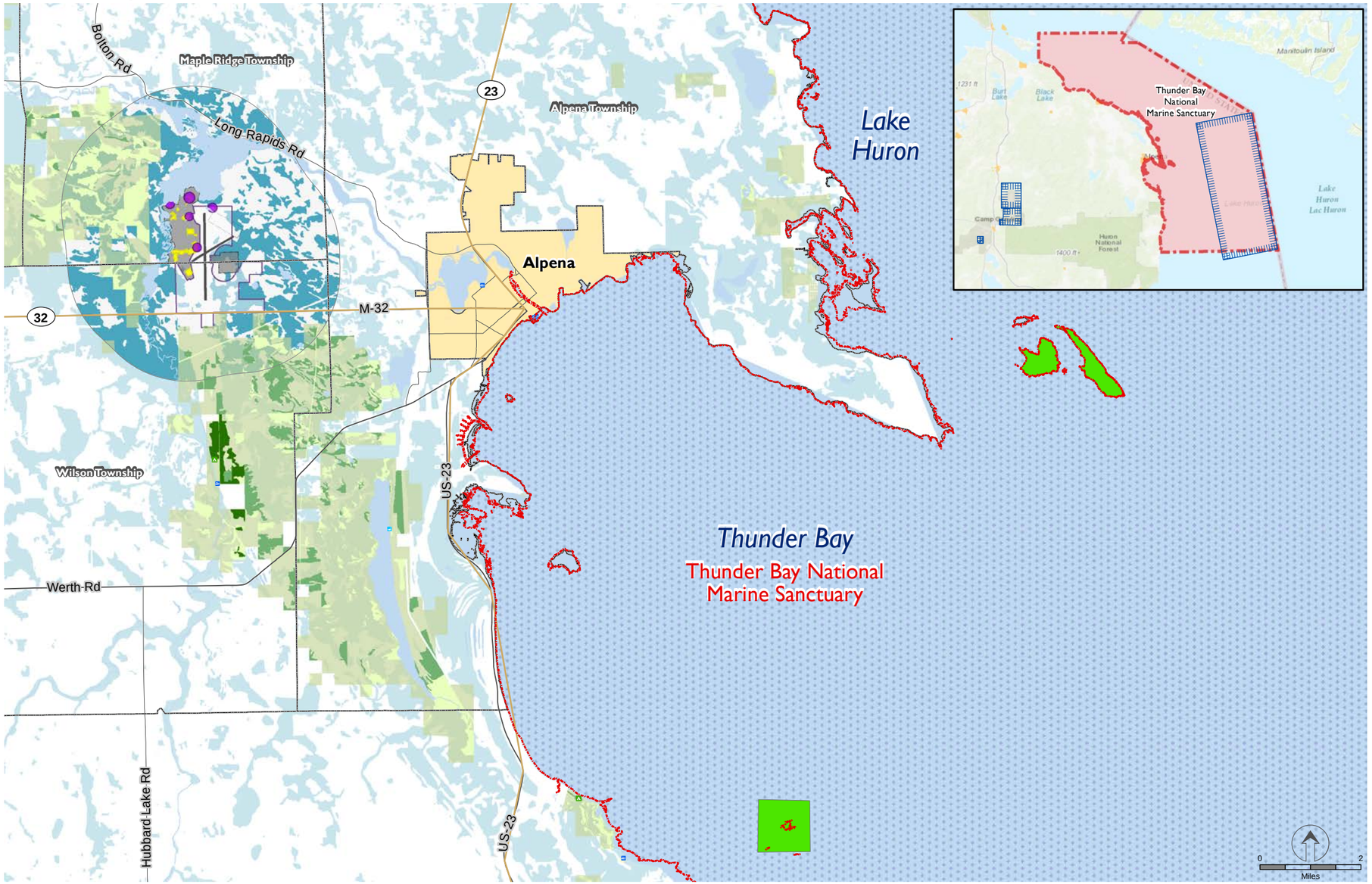


Figure 3.15 | Alpena CRTC Environmental



unregulated contaminants of concern with suspected but largely not understood negative human health effects. A monitoring and analysis program is in place in collaboration with concurrent monitoring, control), groundwater modeling, and remediation efforts by the Michigan Department of Environmental Quality (MDEQ), Michigan Department of Natural Resources (MDNR), Michigan Department of Health and Human Services (MDHHS), and the District 4 Health Department. Information about the contaminants, forms to request well testing, and options for homeowners whose wells have been found to contain the substances may be found on the state webpage dedicated to the PFA contamination issue: https://www.michigan.gov/pfasresponse. Public meeting inputs indicate some residents are finding it difficult to get clear and timely responses from the MDEQ for well testing and for other agency services. Ongoing communications addressing the background, plume tracking, well-testing, and resident options will help residents navigate this issue and improve the resident-base relationship.

Many residents do not use or have regular internet access, so nondigital forms of communication (mailers, hotline phone number) should continue to be emphasized to ensure all residents are fully informed. During public comment, several residents requested more frequent use of local radio, television, and newspapers to not only advertise public meetings but also to convey basic information about the base and issues affecting the public. The latest content from monitoring and control programs and legacy installation restoration program (IRP) should be updated for informational fliers and public outreach materials.

Concern over how wells are selected for testing was frequently raised at the public meetings. Governor Rick Snyder issued Executive Directive No 2017-4 for a PFAS Action Team. In November 2017, the governor directed the leaders

PFOS/PFOA Information

More information is available at https://www.michigan.gov/pfasresponse

If any resident has additional questions regarding this issue, the MDEQ Environmental Assistance Center can be contacted at 1-800-662-9278 or email deq-assist@michigan.gov. Representatives may be reached to assist with your questions Monday through Friday, 8:00 AM to 4:30 PM.

of the MDEQ, MDHHS, Michigan Department of Military and Veterans Affairs (MDMVA), and Michigan Department of Agriculture and Rural Development (MDARD) to immediately establish a Michigan PFAS Action Response Team. The team has been assigned to direct the implementation for the state's action strategy to research, identify, and establish PFAS response actions related to the discovery, communication, and migration of PFAS to the extent practicable.

More information is available at the state web page: https://www.michigan.gov/pfasresponse.

Issue 3b: Surface Water Quality (Lakes, Rivers, Streams, Wetlands)

Alpena CRTC does not routinely test surface water quality. Data on water quality and aquatic ecology in the Alpena CRTC area exist from many governmental and non-governmental organizations. Questions about specific topics like fish population health, site contamination, or trends in ecological health can often be addressed from multiple sources. Sources of existing and ongoing water quality and aquatic ecology survey, assessment and monitoring data in the Alpena CRTC area include:

- MDEQ Procedure 51 biological and ecological trend monitoring
- Part 201 contamination sites
- MDEQ probabilistic water quality monitoring sites
- Environmental Protection Agency (EPA) National Rivers and Streams, National Lakes Assessments, and National Coastal Conditions survey sites
- 303(d) Total Maximum Daily Loads (TMDL) impaired waters
- National Pollutant Discharge Elimination System (NDPES) discharge permit locations (including Alpena County Regional Airport)
- Various data from conservation organizations, citizen-based monitoring studies, and lake associations.

The Michigan Clean Water Corps (MiCorps) is a network of volunteer water quality monitoring programs that supplement MDEQ efforts in collecting and sharing water quality data for use in water resources management and protection programs. MiCorps is administered by the Great Lakes Commission under the direction of the MDEQ and in partnership with the Huron River Watershed Council, Michigan Lake and Stream Associations, and Michigan State University. MiCorps comprises the Volunteer Stream Monitoring Program and the Cooperative Lakes Monitoring Program, which provide training and support for quality assurance, reporting and communications among member organizations. The MiCorps website has an online searchable database with monitoring data for selected waterbodies. Aquatic macroinvertebrate survey data, an indicator of stream ecology health, are available for select streams in study area watersheds such as the AuSable River. Monitoring data for lakes includes basic water chemistry and indicators of nutrient pollution that cause eutrophication and algal blooms. The database also contains invasive species survey data and several technical studies and reports available for download on the MiCorps website at micorps.net/

Issue 3c: Groundwater Quality

Residents near Alpena CRTC are concerned about contamination. Alpena CRTC monitors the water quality at the small-arms range. Environmental managers could consider providing educational materials on area contaminated sites (e.g. MDEQ Part 201 sites). Spills and environmental emergencies are reported to the MDEQ using the 24-hour Pollution Emergency Alerting System (PEAS) Hotline at 1-800-292-4706 or by contacting the MDEQ District Office (Alpena and Grayling area) at 989-731-4920. The public can view spills on Michigan's waterways using the Water Resources Division MiWaters Database: https://miwaters.deq.state.mi.us/.

3.3.4 Alpena CRTC Transportation and Infrastructure Issues

Issue 4a: Effects of Growth on Utilities

Alpena County's population is decreasing overall, though some rural areas are growing and may require additional infrastructure.

Water

Water and wastewater for the area, including Alpena CRTC, are provided by the City of Alpena, which draws water from Thunder Bay.

The city's water treatment plant has capacity of 6.0 million gallons per day, with a maximum daily demand of 3.04 million gallons per day. According to the City of Alpena Comprehensive Plan, the average daily demand is 1.98 million gallons per day.

The 2015 Alpena CRTC Installation Development Plan (IDP) noted that the Alpena CRTC water system was in need of several upgrades, including eliminating dead ends, pursuing Military Construction Cooperative Agreement options with Alpena Township to address maintenance issues, and developing a cooperative agreement with the NGB to add a booster pump so water flow complies with Unified Facilities Criteria (UFC) 3-600-01, Fire Protection Engineering for Facilities. Additional missions at Alpena CRTC would further stress the water system.

The current Alpena County Regional Airport Terminal, which will be replaced in 2018-2019.

Wastewater is treated at the city's water recycling plant, which has a capacity of 5.5 million gallons per day. Capacity to support population and military mission growth is available, as daily treatment averaged 2.3 million gallons per the 2013 Alpena County Master Plan. However, the 2013 IDP noted that Alpena CRTC needed to develop secondary containment for fuels loading/unloading and correct cross-connection issues in the base's wastewater system.

Electric and Gas

Alpena CRTC receives electricity from the Presque Isle Electric and Gas Co-operative, while the City of Alpena is serviced by the Alpena Power Company, which purchases electricity from Consumers Energy Company. Alpena Power Company's website states that its reliability in Northeast Michigan is 99.98 percent. The area receives natural gas from DTE Energy (formerly MichCon). According to the 2013 IDP, several elements of the on-base electrical system are nearing the end of their useful life and require replacement. They are also susceptible to the weather, which causes outages that can affect operations.

Natural gas usage is monitored on base via 30 individual building meters. Alpena CRTC also utilizes propane from Amerigas Propane and has implemented renewable energy sources into recent facility projects, including a geothermal system at the aircraft rescue and fire fighting station and solar photovoltaic panels at Building 115.

For Alpena CRTC, an energy assessment was performed in 2009, which should be updated in the near future. In the surrounding area, Alpena CRTC also has a Green Procurement Program that addresses sustainability strategies.

Issue 4b: Airport joint ownership/land use access

The Alpena County Regional Airport (APN) is a publicly owned airport located 7 miles west of the City of Alpena. The county has leased 647 acres to the MIANG for exclusive use. The lease runs through June 2039. Additionally, a 210-acre area associated with the munitions storage area (MSA) is covered by a restrictive safety easement. The ANG has developed an IDP that details a 20-year plan for the base; the Airport Committee meets once per month.

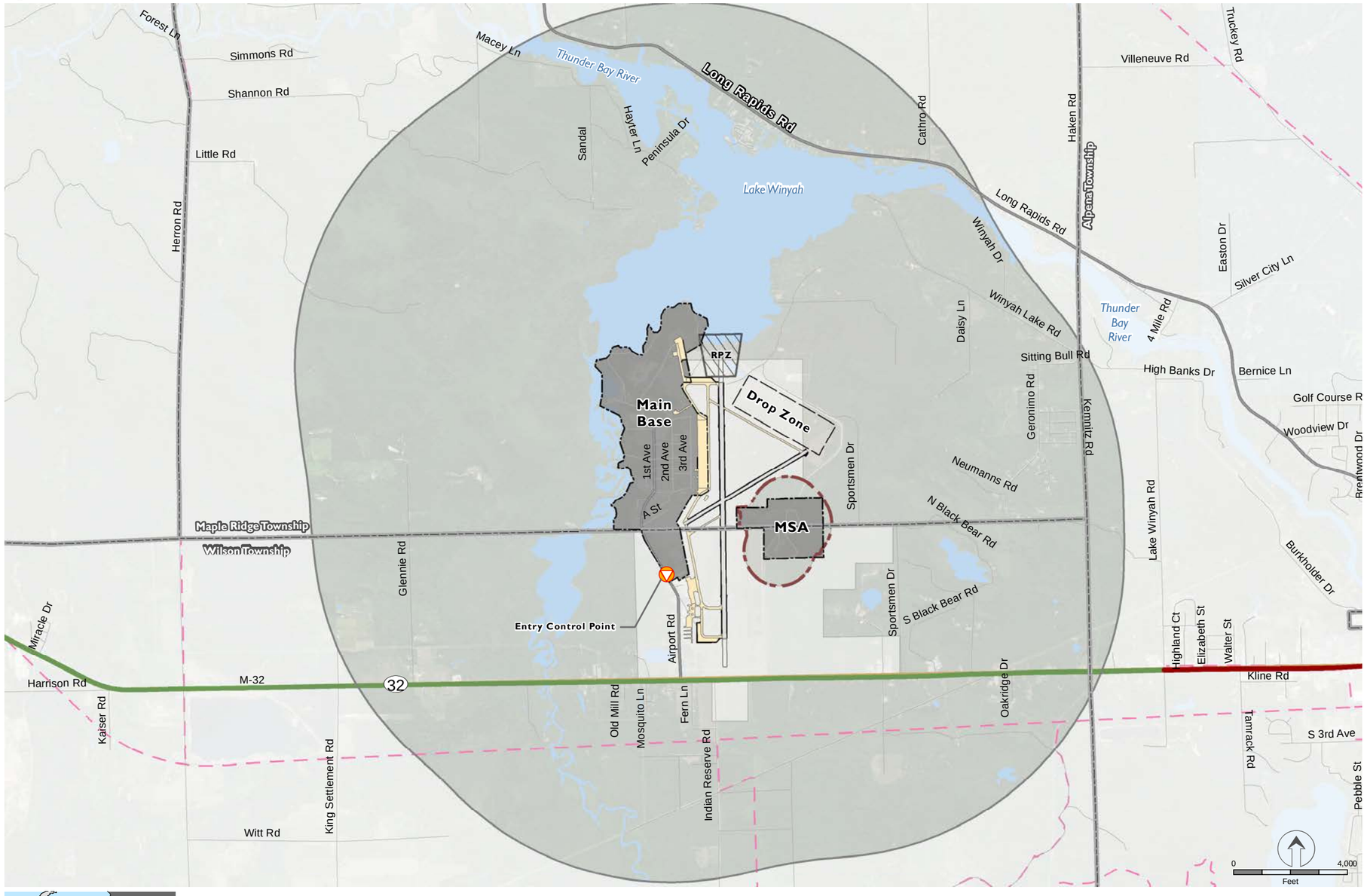
The airport has two runways. Runway 1/19 is 9,001 feet by 150 feet and in good condition. Runway 7/25 is 5,028 feet by 100 feet and in fair condition.

According to the airport's website, of the 20 aircraft based at the field, 12 are single-engine airplanes, six are multi-engine airplanes, one is a helicopter, and one is a military aircraft. FAA data shows 10,409 enplanements at the Alpena County Regional Airport in 2015.

Delta is the only commercial airline that provides service to APN: 21 flights per week to and from Detroit Metropolitan Airport and Pellston Regional Airport. Air freight service is provided by FedEx, UPS, and Airborne Express.

A new $11.9 million terminal building will be constructed in 2018 and 2019 with a combination of federal, state, and local funding. The existing terminal is beyond its useful life,

Figure 3.16 | Alpena CRTC Transportation



is too small, and does not comply with building or air quality codes.

While the community supports expansion of the airport, few residents use the airport, and it is seen as demanding too many resources in terms of law enforcement. It should also be noted that APN no longer has a Homeland Security representative on site, which hinders the availability of international flights, as security for such a flight needs to be arranged.

The airport has its own master plan, which was last updated in 2010.

Issue 4c: Road Funding

The Alpena County Road Commission generally shares costs for road projects with townships and other municipalities; however, this split has not always worked well and will be discussed with township officials.

While the military utilizes roads and public infrastructure, the military does not contribute any funds to the maintenance of these assets. Members of Alpena CRTC primarily use regular passenger vehicles, and use of military vehicles is minimal.

Issue 4d: Road condition

Poor road condition has been cited as an issue throughout the JLUS study area. This is due in large part to inadequate funding for maintenance, which is compounded by many roads reaching the end of their useful lives at the same time.

The Alpena County Road Commission's Approved 2017 Budget, published in February 2017, indicates total revenue of $5,534,559 and total expenditures of $6,257,905.

Alpena CRTC is accessed primarily via M-32, which is a 5 (Fair) on the Pavement Surface Evaluation and Rating (PASER) scale from the City of Alpena to Herron Road. M-32 is ranked a 4 (Poor) from Herron Road east to M-65. Within the City of Alpena, there are several road sections ranked 4, including portions of 11th Avenue, 9th Avenue, 3rd Avenue, 1st Avenue, Johnson Street, Miller Street, Wessel Road, Ford Avenue, Ripley Boulevard and Genschaw Road. Notably, several sections of US-23, a primary tourist route, are also ranked poorly both north and south of Alpena.

Road projects are prioritized based on the condition of the road in question, as well as the amount of traffic.

Several road segments were identified in the 2013 Alpena

County Master Plan as needing improvements:

- Wayne Road
- Indian Reserve Road
- Herron Road
- All gravel roads
- Long Lake Road
- Weiss Road
- Maple Grove Road
- Grant Street
- North Point Shores
- Emerald Acres subdivision
- Misery Bay Road
- El Cajon Road
- Werth Road
- Hubert Road
- Hamilton Road
- Bare Point Road
- Bean Creek Road
- Boilore Road
- Wessel Road
- Pearl Road
- Dietz Road
- Lake Street
- Beaver Lake Road
- Woodward Avenue
- Grover Road
- Dawson Street
- Gutchess Road
- Bloom Road

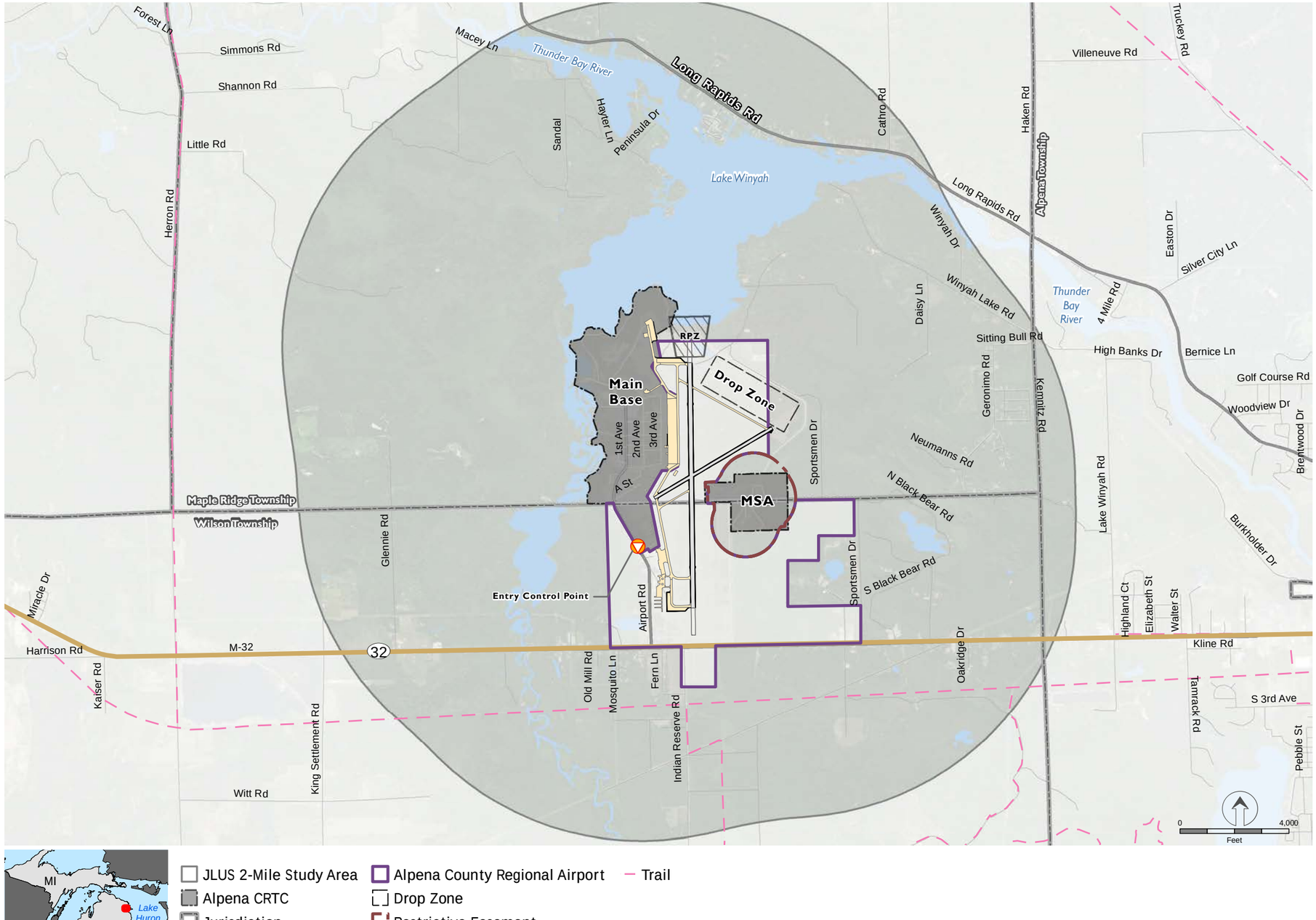
Improvement work has occurred or is planned for many of these areas. For example, a survey and project design project for Bloom Road was approved by the Alpena County Road Commission in December. The project will be completed in anticipation of future reconstruction. During 2017, the major road projects included Indian Road, Naylor Road, El Cajon Road, Gutchess Road and small portions of Gitchi Manitou Road, Murch Drive, and Chippewa Road.

Additional Alpena County projects include reconstruction of Indian Ranch Reserve Road (Werth South for 1.61 miles); resurfacing French Road (2.51 miles), Wolf Creek Road (Nich Hill south 2.1 miles), and Cathro Road (1.7 mils from Long Rapids to Boilore).

The Michigan Department of Transportation (MDOT) does not indicate any Alpena-area road or bridge projects in its 2018-2022 Five-year Transportation Program.

Access to the Alpena CRTC is via Airport Road from M-32. The entry control points (ECPs) do not comply with Air National Guard Handbook (ANGH) 32-1084, Facility Space Standards, or UFC 4-022-01, Entry Control Facilities Access

Figure 3.17 | Alpena CRTC Roads



Great Lakes Maritime Heritage Trail near the waterfront.

Alpena CRTC is located about 7 miles west of downtown Alpena, which is shown above.

Control Points. On base, Hangar Road needs to be resigned to meet design criteria and allow for safe two-way traffic.

Within the Alpena area, the Thunder Bay Transportation Authority operates public transportation, including a Dial-A-Ride Transportation (DART) system that will pick up passengers at their home. The transportation authority also runs a hybrid electric trolley route that provides transportation for tourists as well as locals.

Issue 4e: Recreational access

According to the 2013 Alpena County Master Plan, among the top most-liked aspects of living in the county are access to lakes and water resources, outdoors and the environment (natural resources, wildlife, hunting/fishing, etc.), and recreation. Maintaining and providing access to recreational resources is important to many members of the community.

Alpena CRTC main base, located on the west side of the airport, is bordered by Lake Winyah (also called Seven Mile Pond) to the north and the Lower South Branch Thunder Bay River and Thunder Bay River State Forest to the west.

There is no access to the lake from the south side. Public access is available on the north shore near Norway Dam, which is owned by North American Hydro. A small portion of the lake lies within Alpena CRTC's explosive safety quantity distance arcs. Part of the lake also lies in the airport's accident potential zone.

A family campground (FAMCAMP) at the Alpena CRTC is accessible to anyone who can access the base.

3.3.5 Alpena CRTC Community Partnerships Issues

The JLUS process emphasizes the importance of a community-driven planning process which relies on partnerships among Alpena CRTC, communities, and local stakeholders. The JLUS survey results indicated that 86 percent of those participating in the survey believe that Alpena CRTC has a positive impact on the quality of life of surrounding community residents. The JLUS process also revealed that stakeholders recognize the significance of Alpena CRTC to surrounding communities, leading community partners to find ways to strengthen existing community partnerships and, to use the words of the Alpena Area Chamber of Commerce President and chief executive officer's (CEO) words, "create an increasingly positive image of the CRTC among the general community, and prepare a much stronger network of support for the CRTC in case we should ever need to draw on the assistance of the community to fight on behalf of this incredible asset to our region."

Issue 5a. Communications/Education

Providing accurate and comprehensive information on Alpena CRTC services, facilities, and processes is important not only to potential visiting units, but also surrounding communities. Alpena CRTC does not have a dedicated community relations specialist responsible for coordinating communications and education related to Alpena CRTC activities.

One mechanism for communicating this type of information is through the Alpena CRTC website, maintained by the MIANG. The Alpena CRTC website provides fact sheets on topics such as CRTC history, Alpena events, operations, facilities, and leadership contacts. However, many of the fact sheets and the news provided on the Alpena CRTC website have not regularly been kept up to date. The process for updating website information may be slow as a result of coordinating changes through Lansing.

Communications requirements from Lansing may preclude a faster process, but it is imperative that the existing website provide key contact information for community members. More timely updates to the Alpena CRTC website are necessary to improve communications and education of surrounding residents and business owners, community partners, and potential visiting units. The Alpena CRTC website links to the Alpena CRTC Facebook page, a communication mechanism that provides more timely updates on issues related to Alpena CRTC operations and the surrounding communities. At the inception of the JLUS, the number of followers on the Alpena CRTC Facebook page was less than 200. Upon completion of the JLUS, there are 1.000, which indicates that Facebook is an optimal communication mechanism to reach community members.

Alpena CRTC has a variety of options for educating the local community through educational partners. STARBASE Alpena is located on Alpena CRTC and is an educational nonprofit funded by the DOD providing science, technology, engineering, and math (STEM) programs to local fourth- and fifth-grade students. According to STARBASE, the goal is to "expose youth to the technological environments and positive role models found on military bases and installations." During these education programs, students have the opportunity to tour Alpena CRTC. The relationship of STARBASE to Alpena CRTC and the connection to students, schools, and community provide a unique educational opportunity. In addition to STARBASE, Alpena CRTC has had a strong relationship with Alpena Community College. In 2011, Alpena CRTC established a CRTC scholarship. Announcement of the scholarship highlighted the educational partnerships between Alpena CRTC and Alpena Community College. Alpena CRTC has offered courses and has had Alpena Community College nursing program students participate in patient exercises.

Streetscape in downtown Alpena.

Another key educational partner in the Alpena area is the Thunder Bay National Marine Sanctuary, the only National Marine Sanctuary in the Great Lakes or in U.S. fresh water. The sanctuary is important to Alpena's local economy, drawing tourists to the visit the shipwreck museum, take glass-bottomed boat tours of shallow-water shipwrecks, and dive to explore the shipwrecks. The sanctuary provides a staging area for scientists and researchers studying ecology, natural resources, and maritime archaeology.

Issue 5b. Public Relations and Community Engagement

Public relations and community engagement is another key issue for Alpena CRTC. Without a dedicated community relations specialist, Alpena CRTC must leverage existing community partnerships to aid with public relations and community engagement-related activities. The Alpena Regional Chamber of Commerce has played a role in connecting Alpena CRTC with the community through the Alpena CRTC Community Council. Historically, this council has focused on planning and hosting social events to welcome visiting units to Alpena. In 2015, Alpena CRTC and the Alpena Regional Chamber of Commerce leadership met to discuss a concept of expanding the role of the Alpena CRTC Community Council beyond providing military support. Its more robust role was to include collecting and sharing Alpena CRTC economic value information, public relations to inform community residents about activities taking place at Alpena CRTC, and connecting military families with local support services. While an organizational concept for the expanded role of the Alpena CRTC Community Council was developed, implementing this more robust partnership plan has not yet occurred.

While students participating in educational programs at Alpena CRTC have the opportunity to tour the facilities, requesting public tours requires coordination through the MIANG website and staff in Lansing. A more localized process with dedicated community relations staff could expedite this process. It is obvious that community residents are eager for more interaction with Alpena CRTC and that community partners, such as the Alpena Area Chamber of Commerce, are ready to collaborate to promote that interaction and engagement.

The strategies to address the issues related to public relations, communications, education, and community involvement are available in Section 4 of this document.

3.3.6 Alpena CRTC Economic Development Issues

Operations at Alpena CRTC influence economic development of Alpena and other surrounding communities in numerous and significant ways. This section discusses each of these economic development issues in greater detail.

Issue 6a: Significant contributor to local economy and Military Tourism

The Alpena area sits along the US-23 Heritage Route, which spans the length of the eastern coast of the Lower Peninsula from Standish to Mackinaw City.

While tourism is a critical element of the local economy, it also creates traffic throughout the area. The Alpena Area Convention and Visitors Bureau estimated that upwards of 550,000 people visit the county each year.

Of the stakeholders that participated in the JLUS project survey, 91 percent feel that Alpena CRTC is a significant contributor to the local economy. While it is understood that military tourism, defined as soldiers coming to Alpena CRTC and the family members that visit surrounding communities to accompany them during training, likely has a significant positive impact on Alpena's economy, it is challenging to quantify the extent of the economic impact. A need for mechanisms to quantify the economic impact of military tourism is an issue stakeholders raised during the JLUS process. A mechanism to track the impact of military tourism on the local economy would assist Alpena and other local communities in better understanding: 1) how much soldiers and their families spend while training at Alpena CRTC and 2) factors that affect trends in military tourism annually and over time.

Commitment to spending Alpena CRTC funding at locally owned businesses is a priority by Alpena CRTC. Federal regulations are to be followed for approximately 99.9 percent of the base's purchases. Purchasing locally provides a positive impact to the local economy. Additionally, the local purchases are more likely to be serviced in the future by local business, which is preferred by Alpena CRTC personnel.

Alpena Community College was named one of the top community college in the nation by the Aspen Institute.

Issue 6b: Airport Viability

As a rural airport, the Alpena County Regional Airport relies on subsidies from the FAA based on the number of enplanements. In 2016, the Alpena County Regional Airport failed to meet the 10,000 enplanements needed to qualify for the $1 million FAA subsidy, although a change in federal rules allowing for 2012 enplanement data to qualify allowed the airport to receive the subsidy. In 2017, the Alpena County Regional Airport achieved 10,849 enplanements. Promoting the use of the Alpena County Regional Airport by military families traveling to the area to visit soldiers training at Alpena CRTC and Camp Grayling JMTC will assist with the viability of the airport by increasing enplanements. Plans for a new terminal are in progress and are expected to receive FAA funding for construction, anticipated in 2019. Alpena County Regional Airport is extremely key to the economic development of Alpena and surrounding communities. Ensuring the airport remains fully functioning and viable is a key concern. One issue affecting the local economy is the lack of a customs agent, allowing aircraft emanating from outside the United States to pass through an authorized customs processing facility at Alpena County Regional Airport. Aircraft now must go through customs in Sault Ste. Marie. This results in a loss of revenue for the airport.

Issue 6c: Partnership with Sheriff's Department

The State of Michigan, contracting with the United States Air Force, awards bids for the security jobs at military installations in the state. For over a decade, Alpena CRTC via the state has contracted with the Alpena County Sheriff's Department for security services. This contract provides salaries and benefits for 25 employees, pays bailiffs to provide security in the courts, and helps to pay for equipment and vehicles for the county, including patrol vehicles and dive equipment. Without this contract, Alpena County would struggle to afford some of this equipment and services. The contract helps to alleviate a financial burden on the county's general fund and local taxpayers. In addition, this contract has influenced long-term planning decisions in Alpena County, specifically the decision to locate a new jail to be constructed near the airport to align with the location of security services. As of November 2017, Alpena CRTC and Alpena County reached a 1-year contract extension agreement, with the expectation that a longer contract will be in place before the extension expires. Contract agreements typically last for 5 years. The state serves as a pass-through for the federal dollars. A new contract must go through county attorney review and obtain approval from the county's finance committee and full board of commissioners.

4

implementation plan

chapter overview

4.1 Overview

Elements both physical and political exist that will need to be overcome to achieve the most optimal results of the recommended strategies. Any changes that are undertaken will need to be done under the current confines of the legal system and be in compliance with all applicable laws. Understanding these elements within the confines of the law, the needs of the military, and the concerns of citizens enables the creation of achievable strategies. To prevent the strategies from conflicting and/or contradicting any given law at any level of government, recognition of the hierarchy of laws that exist at various levels of government will be highlighted for proper implementation to occur.

Each of the stakeholders involved in this study is governed by a different set of rules within the governmental hierarchy, with certain entities not subject to laws at a lower level in the hierarchy. The recommendations laid out in this section of the report aspire to be implemented at every level, regardless of subjugation, in order to have all parties involved be willing participants in the ultimate goal of harmonious interaction. The analysis of the various levels of governance will be applied to both Camp Grayling JMTC and Alpena CRTC. Given the unique situations present in each installation, this chapter will separate each of the installations and posit strategies that are unique to each site. Specifically, these strategies will include elements addressing the following:

- Noise
- Military Operations
- Environmental
- Transportation and Infrastructure
- Community Partnerships
- Economic Development

Based on input during the public meetings, the strategies and recommendations outlined in this section will address the needs of both the communities and military installations. Putting into place the recommendations will require diligent consideration of land owners in areas that abut or are within range of the installation. Land values near the installations are affected by not only the missions taking place, but the interface of the installation with the surrounding properties.

4.1.1 JLUS Implementation Team

Implementation of the recommendations will take cooperation of land owners, local governments, and the installations in order to see positive physical results that will translate into better land value for residents and an overall operating equilibrium that will benefit all stakeholders. It is recommended that key community and military stakeholders convene a JLUS implementation team to ensure progress is being made on the strategies and recommendations. The team should be made up of local SMEs, members of the TC and PC, and members of NEMCOG. *Every effort to implement the proposed actions should be taken so that existing and future conflicts can be resolved.*

4.2 Compatibility Tools

There are many existing laws, policies, and other tools in place to help ensure mutually beneficial coexistence of military activities and civilian life. This chapter provides a broad overview of such tools used or applied in evaluating and addressing compatibility issues in the study area focused around Camp Grayling JMTC and Alpena CRTC. The tools listed below are broken up by level of government. This is intended to be a sampling of the tools that are available, not an all-encompassing list.

4.2.1 Federal

Federal law and policies affect many aspects of land use. The following federal programs and policies were assessed to determine their applicability in this JLUS study area.

Federal Aviation Act

FAA Regulation Title 14 Part 77, commonly known as Part 77, defines vertical obstruction compatibility in the vicinity of airfields. Local jurisdictions can assess height restrictions using a formula in this regulation and adjust their local zoning regulations accordingly.

Department of the Army Pamphlet (DA Pam) 385-63: Range Safety

This pamphlet establishes standards and procedures for the safe firing of ammunition, demolitions, lasers, guided missiles, and rockets, and the delivery of bombs for training and target practice. It describes surface danger zones (SDZs) and the appropriate activities that can take place in and around them.

National Guard Regulation (NGR) 385-63: Army National Guard Range Safety Program, Policy, and Standards

This regulation is used in conjunction with DA Pam 385-63 and provides guidance for risk management in range operations. It also prescribes standards and procedures for firing ammunition, explosives, and lasers. It prohibits the use of areas known or suspected to contain UXO from being used for recreational purposes. The ARNG Range Safety Program is established by The Adjutant General (TAG) at the state level. TAG approves SDZ placement.

Army Regulation (AR) 405-10: Acquisition of Real Property and Interests Therein

This regulation outlines the federal government's ability to acquire property, which is only allowed when expressly authorized by Congress, according to U.S. Code. New land can only be acquired if the activity to be accommodated is mission critical, real property already held is insufficient to satisfy mission requirements, and no land held by another military branch or federal agency can satisfy the requirement.

Air Force Instruction (AFI) 90-2001

This document establishes the Air Force Encroachment Management Program with the goal of preventing or reducing encroachment issues around any Air Force installation. It defines responsibilities at all levels from Headquarters Air Force down to the installation level, including the development of Installation Complex Encroachment Management Action Plans (ICEMAPs).

Air Installation Compatible Use Zone (AICUZ) Program

This program works to prevent incompatible development around air installations by promoting compatible land use practices in an effort to preserve public health and safety and protect the military mission. It encourages a collaborative approach, working with local governments to achieve mission-compatible land development. AICUZ guidance reflects land use recommendations for clear zones, accident potential zones, and four noise zones.

4.2.2 Military Installations

Camp Grayling JMTC Real Property Development Plan (RPDP)

The most recent version of the Michigan Army National Guard RPDP, including a chapter containing the Camp Grayling JMTC Site Development Plan (SDP), was published in 2011. The SDP describes the existing conditions of the installation and also proposes recommendations for future development. An analysis of the existing conditions and mission requirements led to the creation of a preferred plan-

ning alternative for the cantonment, airfield, and MATES.

Alpena CRTC IDP

An IDP presents a road map to guide growth and development at air installations for 20 years. The most recent Alpena CRTC IDP was finalized in 2016. It assists ANG leadership and base personnel in prioritizing projects, establishing proper facility siting, implementing functional land use patterns, and coordinating infrastructure improvements. The result should achieve the vision, goals, and objectives of the plan and align with the visions of Air Force higher headquarters.

Integrated Natural Resources Management Plan (INRMP)

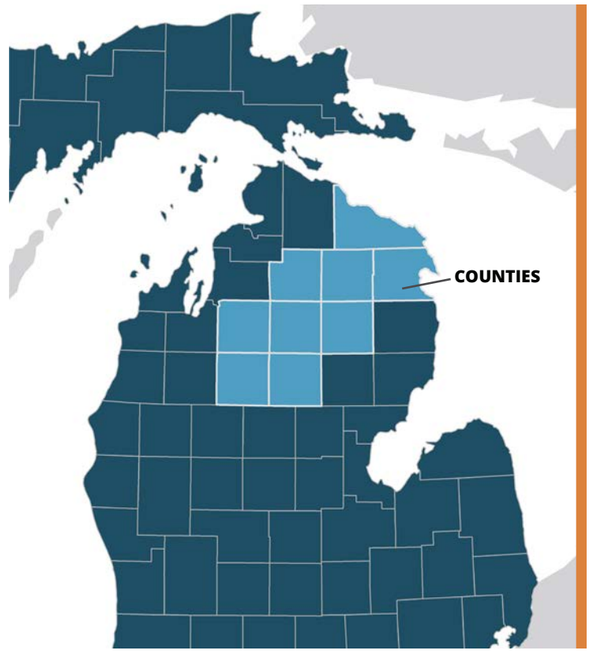
An INRMP was published in 2013 for Alpena CRTC and serves as the primary guidance document and tool for managing natural resources on the installation. Alpena CRTC is comprised of approximately 630 acres over two parcels, all owned by the County of Alpena. Alpena CRTC contains myriad habitats and species requiring monitoring and management. An INRMP helps the installation serve as a steward for the resources they oversee while ensuring its capabilities to sustain its military mission. This document is required under the Sikes Act Improvement Act of 1997, along with DOD and Air Force policy.

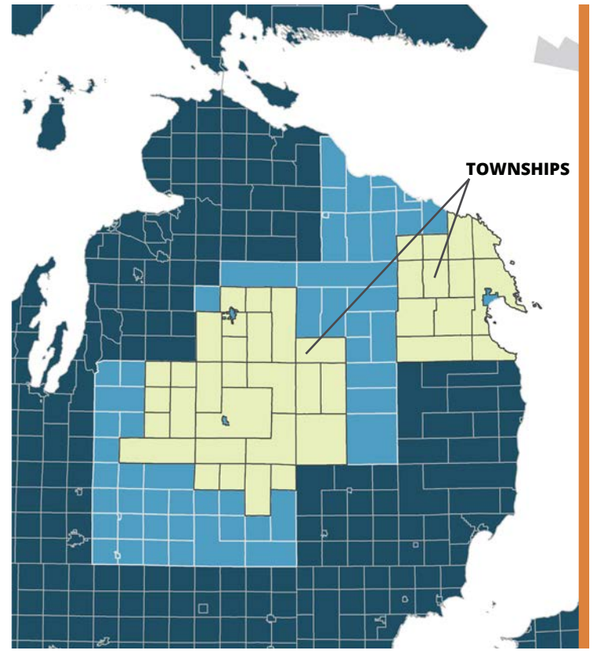
Integrated Cultural Resources Management Plan (ICRMP)

An ICRMP covering Alpena CRTC and the Camp Grayling air-to-ground range was published in 2012. It is meant to be updated every 5 years, depending on available funding and staffing on the military side. It serves as the long-term plan to assign responsibility to manage any cultural resources present on the installations. An ICRMP is required by AFI 32-7065, Cultural Resources Management Program; DOD Instruction (DODI) 4710.02, Interactions with Federally-Recognized Tribes; and DODI 4715.16: Cultural Resources Management.

Note: A cultural resources survey was performed at the Camp Grayling range, and no items of note were identified. The buildings under ANG jurisdiction fall within the Alpena CRTC ICRMP. There is a lack of cultural resources and therefore not extensively discussed in the ICRMP.

Figure 4.1 | Michigan Governmental Hierarchy





4.2.3 State

Current statutes involving the regulation of land-use stem from the constitution of the state of Michigan. There have been four constitutions since the inception of the state in 1837. The current and fourth Constitution was adopted on August 1, 1962. Article VII of the document outlines the powers granted to the various geographical divisions of the state. This portion the Constitution permits the division of the state into three major governmental entities: counties, townships, and villages/cities. Each of these entities are given their own level of power and ability to enforce such statutes they deem necessary.

Per Article VII of the Constitution dictates that these powers "...shall be liberally construed in their favor." In Michigan, the state government is specifically restricted under the constitution as to how it may interact with local governments and may not alter the boundaries of a local government without a vote by the affected residents.

4.2.4 County

Upon becoming a state, Michigan, like most other states, divided itself into county governments. Per Article VII of the Michigan Constitution, each county is bound by a charter and run by a Board of Commissioners elected by citizens in their respective counties.

A county in Michigan is endowed with the power to approve platting, levy taxes, and adopt ordinances as deemed necessary for the benefit of the public. It is also able to work in tandem with townships, cities, and villages in the formation of land-use regulations.

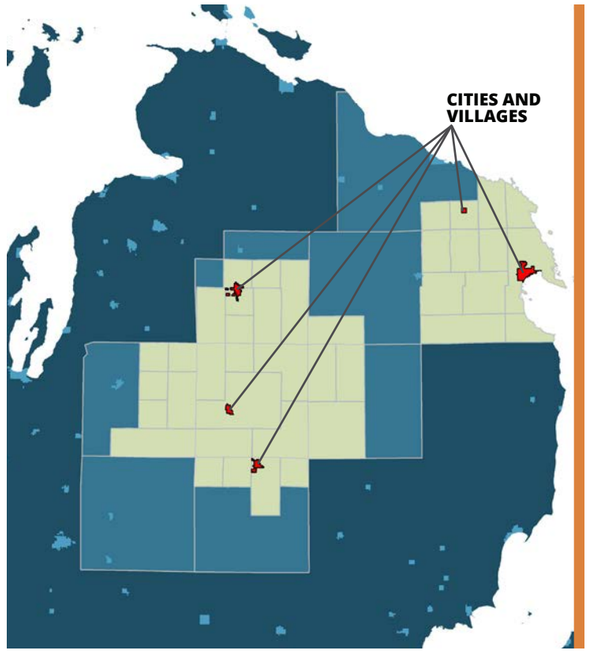
The nine counties affected by this study have been highlighted in the lighter blue.

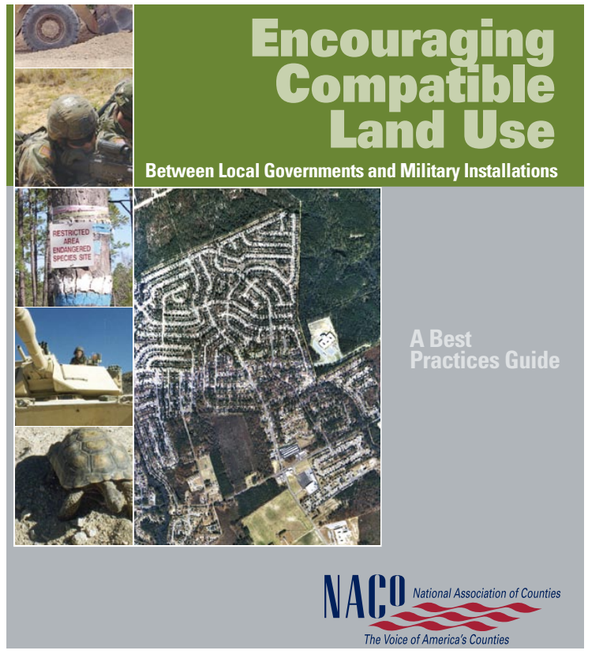
4.2.5 Township

Each county is divided into the townships that were created along with the counties when Michigan became a state. A charter township has been granted a charter, which allows it certain rights and responsibilities of home rule that fall between those of a city (a semi-autonomous jurisdiction in Michigan) and a village. (Unless it is a home-rule village, the latter falls under the authority of the township in which it is located.)

Townships generally are governed through rules outlined in Chapter 41 of Michigan Compiled Laws. Townships may enact and enforce ordinances for public health, safety and general welfare. Ordinances enacted by townships supersede those created by the county, thus allowing for more local issues to be addressed.

Additionally, townships can construct any necessary infrastructure, including sound mitigation treatments and create improvement districts. If necessity requires, the township may acquire parkland and/or places of recreation trough a majority of voters. The 39 townships within the study area are shown in tan.





4.2.6 City/Village

Any area of a township or county may decide to incorporate itself into either a village or a city, depending on the population. Both of these entities are permitted to enact and enforce land-use ordinances within their jurisdiction. These municipal entities are able to prescribe laws that can be customized to highly specific areas in order to achieve certain goals.

The Home Rule City Act resulted from the provisions of the 1908 state constitution, which called for home rule authority to be conferred upon the various local governments in the state. The 1963 state constitution retained these same home rule provisions.

Legal tools for land use available to a village or city can have greater effects on new development, as often these areas will contain the highest concentration of retail and residential amenities. The study area includes five villages and cities, shown in red on the map above. In terms of land-use utilizations, this study primarily focuses on the cities of Grayling and Alpena due to their proximity to military installations.

4.2.7 Other Tools and References

The OEA and other public interest groups, such as the National Association of Counties (NACo), have prepared reference materials for the public about encroachment issues or compatibility concerns. These include:

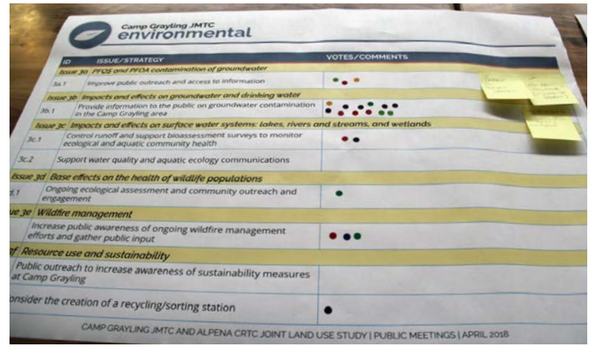
- **ENCOURAGING COMPATIBLE LAND USE BETWEEN LOCAL GOVERNMENTS AND MILITARY INSTALLATIONS:** A guide published by NACo that lists a number of best practices for compatibility, including communication, regulatory approaches, and JLUSs.
- **THE BASE NEXT DOOR:** This video is available on the official OEA YouTube channel and describes the issue of encroachment near military installations when urban development increases, as well as tools that can be used to encourage compatible development.
- **ADDRESSING PFOS AND PFOA:** This presentation, provided by the Deputy Assistant Secretary of Defense and updated in March 2018, provides background on the issue, updates on testing and sampling around the country, various initiatives that have been implemented to protect health and welfare, and other data. It is available on www.oea.gov.
- **READINESS AND ENVIRONMENTAL PROTECTION INTEGRATION (REPI) PROGRAM:** This is a key encroachment prevention tool administered by the Office of the Secretary of Defense (OSD).

4.3 Setting Priorities

The JLUS project team compiled the issues collected for each installation and drafted strategies to address each one. These draft strategies were then presented to the TC and PC. Working groups, a subset of the TC, were formed to study the environmental and economic development issues in detail.

After incorporating comments from the TC and PC, the strategies were further refined and presented to the public in April 2018. Stakeholders were asked to vote on their priority strategies and provide comments and suggestions for anything the project team might have left out. Strategies were classified into high, medium, and low priority based on the input of the TC, working groups, and the public.

Out of the high-priority strategies, the JLUS Implementation Team Action Plan was born. It is presented on the next page, and the individual strategies follow. The implementation team should be made up of members of the TC, PC, and local government and military personnel.



Top Left: The cover of the "Encouraging Compatible Land Use between Local Governments and Military Installations" document published by the National Association of Counties.

Top: Stakeholders voted on the strategies at a public meeting held in Grayling in April 2018. Those votes helped the JLUS Project Team figure out which strategies were the most interesting and important to the public.

Above: The top vote-getting strategies for each installation were implemented into the JLUS Implementation Team Action Plan.

4.4 JLUS Implementation Team Action Plan

Many of the JLUS strategies have actions that overlap. To capture the best use of plan implementation, overarching actions have been defined that will ultimately serve more than one strategy. The JLUS Implementation Team would be charged with tracking these items.

Camp Grayling JMTC

ACTION	STRATEGIES
Create Sensible Military Overlay Zones around Camp Grayling JMTC	1a.4, 1a.5, 2a.1, 2a.2, 2d.1, 2d.2, 5b.4, 6a.1
Commission a Joint MDNR and Camp Grayling JMTC Landscape Plan	1b.1, 1b.2, 1b.3, 4e.1
Conduct a Noise Study	1a.1, 1a.2, 1a.3, 2a.2, 2c.1, 2c.2, 2c.3
Commission a Camp Grayling JMTC Installation Master Plan	2c.2, 2c.3, 2d.1, 2d.2, 3d.1, 3f.2, 4a.1, 4a.2, 4c.1, 4d.1, 5b.5, 6b.4
Update Grayling Area Transportation Study	4d.1, 4d.2, 4d.3, 4d.4, 4e.1, 4f.1, 4f.2, 5b.5
Camp Grayling JMTC Community Outreach and Camp Grayling Community Council	2b.1, 2c.1, 3a.1, 3b.1, 3e.1, 3f.1, 3f.2, 4e.1, 5a.1, 5a.2, 5a.3, 5a.4, 5b.1, 5b.2, 5b.3, 5b.4, 5b.5, 6a.1
Commission a Water Resources Plan for Northeast Michigan	3a.1, 3b.1, 3c.1, 3c.2, 3f.1, 3f.2
Fire Protection Services Agreement	3e.1, 6b.1
Economic Impact, Tracking, and Incentives: Conduct an Economic Impact Study	6a.1, 6b.1, 6b.2, 6b.3, 6b.4, 6c.1, 6c.2

Alpena CRTC

ACTION	STRATEGIES
Create a Military Overlay Zone	1a.4, 1a.5, 1a.6, 2c.2, 4a.2, 5a.6
Conduct an AICUZ Study	1a.4, 1a.5, 1a.6, 2c.2
Alpena CRTC Community Outreach and Alpena CRTC Community Council	2b.1, 2c.3, 3a.1, 3c.1, 4b.1, 4c.1, 5a.1, 5a.2, 5a.3, 5a.4, 5a.5, 5b.2
Commission a Thunder Bay Environmental Impact Study	2a.1, 2c.3, 3a.1, 3b.a, 3b.2, 3c.1, 4e.1
Economic Impact, Tracking, and Incentives: Conduct an Economic Impact Study	5a.3, 5a.4, 5b.1, 5b.2, 6a.1, 6c.1, 6d.1, 6d.2
Commission a Joint NOAA/Alpena CRTC Bathymetric Survey[1]	2a.1, 2c.1
Formalize Thunder Bay Interagency Cooperation[2]	2a.1, 2c.1, 2c.3, 3b.1, 3b.2, 4b.1, 5a.5, 5b.1, 6b.1
Update the Alpena Area-wide Comprehensive Transportation Plan	4c.1, 4d.1, 4e.1

1. This action plan item is described jointly in the writeup for the Thunder Bay Environmental Impact Study.

2. This action plan item is described in the writeup about Alpena CRTC community outreach.

4.5 JLUS Implementation Team Action Plan Details: Camp Grayling JMTC

4.5.1 Create Sensible Military Overlay Zones around Camp Grayling JMTC

The impact on communities from aircraft noise, noise and vibrations from training operations, and population growth in both recreational areas and the City of Grayling are the issues that drive the prioritization of this planning action.

Overlay zones have the potential to be very effective governmental regulatory tools. Since they tailor regulations to specific properties, they can be more politically feasible to implement than other measures and can help communities meet stated goals or address specific inequities.

For the City of Grayling, adding an overlay zone to limit development within the APZs at Grayling AAF is a challenge. This is because most of the area within the city limits of Grayling falls directly within an APZ. An overlay zone should be added to restrict development heights, but it is not feasible to restrict residential and commercial development altogether. Restricting development in APZs has a direct impact on improving safety for general public.

For areas in townships or counties, it is recommended that an overlay zone be added that conforms to the noise contours created by aircraft and training activity at the camp and that also protects the boundaries of the installation from encroachment of development. Although these areas are relatively undeveloped, it is good planning practice to plan for the future, and implementing an overlay zone in these areas now is more feasible than when the area develops more.

Implementing an overlay zone in these areas now will help avoid potential future conflicts between residential areas and noise from Camp Grayling JMTC. A safe distance from ranges, installation, and airfield property boundaries is one consideration. This area could be used for agriculture or other non-populated functions. Industrial activities are a better choice than residential, community, institutional, or educational activities. Language for this overlay zone should be drafted by a legal team specializing in land use law and code development. The legal team will review the zoning for any potential regulatory takings, which can occur when a government regulation restricts the use of private property to the point that the property no longer has any real value. If a taking is identified, funds for reimbursement would be established. See Appendix F for more information.

For the Guthrie Lakes area, it is not advisable to implement an overlay zone because the area is already developed, and an overlay zone would only be implementable on the grounds of reduction of noise conflicts. Additional JLUS implementation actions will address the Guthrie Lakes noise concerns.

4.5.2 Commission a Joint MDNR and Camp Grayling JMTC Landscape Plan

From the inception of this JLUS, noise from military operations has been the predominant concern for residents who live, work, and play in the areas surrounding Camp Grayling JMTC. The abundance of public forest land and the locations of the Au Sable and Manistee rivers make the area popular with outdoor enthusiasts, retirees, and seasonal residents. This recommended landscape plan should consider areas such as parks, beautification of fence lines, and recreation areas.

The MDNR is responsible for timber management and harvest on Camp Grayling JMTC leased lands, though the camp is consulted for compatibility with military operations. MDNR is also responsible for the timber management in the residential areas surrounding Camp Grayling JMTC.

Camp Grayling JMTC and MDNR have worked closely for many years. However, a joint MDNR and Camp Grayling JMTC landscape plan would lay out where tree buffers could be planted near noise-generating activities. In addition, the planning process would assist with better communication about the reasoning behind and timing of timber harvests near residential areas, particularly in light of demands for additional sound-attenuating tree cover.

In addition to noise concerns, wildfire was one of the top safety concerns identified by the community. A landscape plan can provide supporting information and outreach to help increase public awareness of ongoing wildfire management efforts.

4.5.3 Conduct a Noise Study

Camp Grayling JMTC has existing noise contours that are presented in the JLUS. They were created in 2013 and have been updated over the years. Flight paths were not available at the time of this study. A formal AICUZ program would help achieve compatibility between air operations and the communities surrounding Camp Grayling JMTC. The study should include an analysis of major training events, such as Northern Strike. The study would also include flight paths, which would help the community understand impact areas when air traffic increases. Additionally, an AICUZ addresses the protection of health, safety, and the welfare of both the community and military personnel.

Until an AICUZ can be completed, it is recommended that Camp Grayling JMTC work with existing neighbors within the noise contours to provide notifications of training times (see Section 4.5.6). The installation should also look at locating training operations in more remote areas within Camp Grayling JMTC, away from the boundaries, in order to reduce noise conflicts and as a sign of being a good neighbor.

Results of the AICUZ could be used in an overall noise study. The noise issues identified by the public include range operations, not just aircraft. The final recommendations from both studies could then be applied to local zoning. Currently, the City of Grayling has general restrictions against noise that disturbs the peace. Zoning regulations could be updated to include allowed decibel levels and restrictions on the time of day. A variance could be put in place to allow Camp Grayling JMTC to host important training events such as Northern Strike.

The study should consider the collection and analysis of providing ADNL contours for the entire region, specifically including areas where community members have indicated that training noise is disturbing. In addition the study should assess the environmental impact of noise.

4.5.4 Commission a Camp Grayling JMTC Installation Master Plan

The most recent RPDP produced for the MIARNG was published in 2011. Since then, a new UFC was published for DOD master planning, and the ARNG has begun to commission installation master plans (IMPs) for each of its installations. IMPs are presented in a graphic, easy-to-read format with maps and photos to help paint a picture of the present and future conditions of the site.

An updated IMP would lay out a new vision, goals, and objectives for Camp Grayling JMTC planning, along with a preferred development plan that looks 15 or more years into the future. It would document the existing conditions of the site and provide a planning framework and standards to help improve the installation for all who train at the site.

Specific planning objectives about transportation, environmental considerations, surrounding land use, facility standards, and consolidation could affect how Camp Grayling JMTC training activities impact the surrounding communities. An IMP also examines on-base circulation and all access control points, which could be used to better understand road condition issues identified in areas such as Marlette Road (see Figures 2.38-40 in the JLUS).

4.5.5 Update Grayling Area Transportation Study

The Grayling Area Transportation Study is now 10 years old. The goal of the study was to improve access between I-75 and the Grayling area to reduce travel time, reduce complexity of wayfinding, and promote economic vitality. The study centered on Crawford and Roscommon counties.

Although the population has not grown significantly since the study was created, there has been new development and industry in the area in recent years, and MDOT data indicates an increase in both civilian and commercial traffic in the area in the past 2 years.

Along with new industry, the stakeholders attending the JLUS public meetings helped identify several problem intersections (see Figures 2.38-40 for more detail). A new transportation study could help both Camp Grayling JMTC and the communities better understand the source of the issues and provide a path to resolution. An updated study should include Otsego County so all areas of concern identified by the JLUS community are addressed.

Based on this combination of factors, an update to the Grayling Area Transportation Study is recommended. The plan should consider a wide range of transportation and include access to community recreation areas surrounding Camp Grayling JMTC.

4.5.6 Camp Grayling JMTC Community Outreach and Camp Grayling Community Council

Camp Grayling JMTC has an active, dedicated community relations staff member. However, when that staff member is not available, the flow of communication tends to drop off, as seen during the Northern Strike exercise in 2018. Cross training more staff members to fill in during gaps as well as codifying and standardizing communication operating procedures could help with continuity and consistent communication from the camp to the surrounding communities.

A Camp Grayling Community Council should be formalized. This group would leverage community partnerships to support Camp Grayling JMTC with public relations, economic valuation, visiting unit support services, and military family support services. It can capitalize on the work done by Project Rising Tide in the area and use the nearby Alpena CRTC Community Council as an example.

Camp Grayling JMTC Community Council Goals:

- Community Education and Outreach
- Serve as a communication forum Between Camp Grayling and Communities
- Implementation of a formalized written agreement, such as a charter, between Camp Grayling and the surrounding communities
- The charter should include language that a primary objectives of the Community Council is to work together to resolve the noise and transportation issues.
- NEMCOG should provide a document library for all JLUS and Implementation files to include supporting documentation that has been collected as part of this process.
- Develop a 5-year plan to achieve the top JLUS Implementation recommendations (to be identified by the TC/PC).

For Camp Grayling JMTC, a formalized communication plan should include standard operating procedures and be shared with the Community Council to help improve public outreach and access to information. Communication plan items include:

- Educating and informing the public on training traffic routes and operational needs
- Educating and informing the public on upcoming training events that could affect recreation or neighboring communities
- Contact information regarding PFOS/PFOA groundwater contamination
- Public awareness action plan that supports applicable planning efforts, such as the wildfire management plan, transportation plans, Camp Grayling sustainability, etc.
- Public education procedures, outreach mechanisms, and an information repository

4.5.7 Commission a Water Resources Plan for Northeast Michigan

Water quality, impacts on surface water systems, and the protection of groundwater resources were ranked as high priority concerns by the Grayling area communities. There is a wide range of research describing water quality, sediment quality, and the health of aquatic environments and species, but it can be challenging for members of the community to identify and access appropriate and accurate information to satisfy their concerns.

Camp Grayling has a robust environmental team that works with MDEQ to manage and monitor groundwater contamination as well as remediation efforts. However, there are numerous community concerns about the impacts of contamination and sediment runoff from Camp Grayling JMTC for both residents and wildlife habitats.

Improvements coming to the Grayling area, such as the new particleboard plant and a potential new wastewater treatment facility, could create changes in demand for the region's water supply. A water resources plan for Northeast Michigan could ensure supply for the region into the future, protect and conserve water resources, encourage coordination of infrastructure needs, and create a holistic water management approach. A plan will also ensure aging infrastructure is replaced in a reasonable timeframe in order to reduce maintenance costs. The plan should include a supplemental action plan with tools for local governments to help implement the water plan.

4.5.8 Fire Protection Services Agreement

Wildfires have occurred fairly frequently within Camp Grayling JMTC boundaries and surrounding areas. According to the Adaptation Planning for Climate Resilience document published by the MIARNG in 2016, each year Camp Grayling JMTC averages over 100 fires, some of which are caused by the training conducted there. Environmental managers at Camp Grayling JMTC anticipate that the effects of climate change, such as higher global temperatures, will contribute to increased wildfire risk.

Camp Grayling JMTC entered into a contract with the Grayling Fire Department to provide fire services, which expired in mid-2018. Through the one-on-one interviews conducted during the JLUS process, stakeholders raised the issue that the current level of service offered through the expired contract might not be adequate given wildfire threats and increased population due to Camp Grayling JMTC training operations. If a need for increased fire protection services for Camp Grayling JMTC can be quantified and verified by this proposed study, the data would support increasing contractual services, which would lead to additional jobs for Grayling Fire Department.

The recommendation of the JLUS is that upon formalization of the Camp Grayling Community Council, the fire services agreement be revisited. As part of that process, the council should review the Adaptation Planning for Climate Resilience report and implement recommendations related to supporting community-wide cooperative fire protection efforts, especially in areas where wildfire risk may be exacerbated by climate change. This specifically includes working with the City of Grayling to secure funding for long-term structural fire protection, including personnel and equipment.

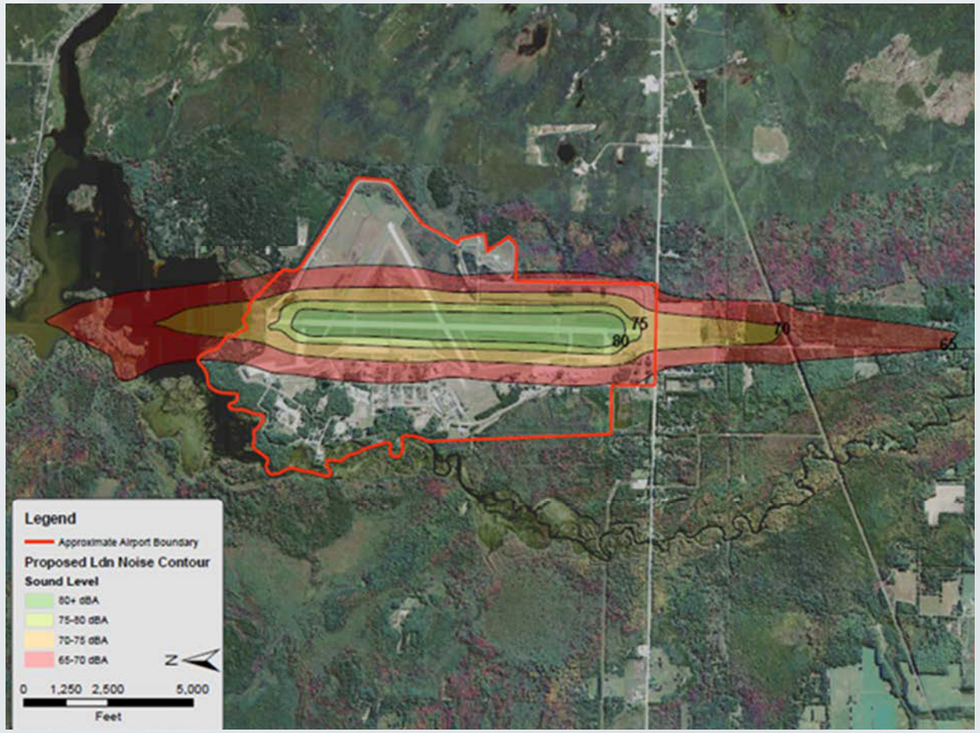
4.5.9 Economic Impact, Tracking, and Incentives: Conduct an Economic Impact Study

Project Rising Tide published an Economic Development Strategy for the Grayling area in 2017. It quantifies the impact of Camp Grayling JMTC on the surrounding area as $16 million annually, but more detail would be helpful to create detailed plans to enhance the local partnership in a mutually beneficial way. An economic impact study could also build on the economic goals presented in the strategy.

Quantifiable economic data on how dollars flow from soldiers training at Camp Grayling JMTC into surrounding communities would help communicate the contributions Camp Grayling JMTC makes to the local economy. As part of the study, examine the potential benefit to local businesses if surrounding tourism bureaus work to create incentives for soldiers' families to extend their stay in the area before or after training.

With quantifiable information, local purchasing goals for Camp Grayling JMTC could be established to help create an operating norm that acknowledges the importance of Camp Grayling JMTC on the surrounding economies regardless of changes in Camp Grayling leadership. In addition, the The Economic Impact Study should include an analysis Camp Grayling's direct and indirect costs to other interests in the area.

4.6 JLUS Implementation Team Action Plan Details: Alpena CRTC



The figure at left, from the 2016 Alpena CRTC IDP Environmental Assessment (EA), shows existing condition DNL contours at Alpena Regional Airport. The inset table lists the area within the existing daily-average DNL contours.

4.6.1 Create a Military Overlay Zone

Residential development around airports and military training areas frequently leads to conflicts between these incompatible land uses. The Alpena area has the opportunity to plan for the future and create zoning to avoid future conflict. This JLUS recommends applying an overlay zone that does not allow for new residential or commercial development in the APZ associated with the Alpena County Regional Airport and Alpena CRTC.

Creation of an overlay zone will help protect the residents and businesses already in the area, and it will help limit the amount of new development that could encroach on Alpena CRTC in the next 5 to 30 years.

Language for this overlay zone should be drafted by a legal team specializing in land use law and code development. The legal team will review the zoning for any potential regulatory takings, which can occur when a government regulation restricts the use of private property to the point that the property no longer has any real value. If a taking is identified, funds for reimbursement would be established.

The overlay zone should restrict all residential and commercial development within the APZ. Further study should be completed to determine the intensity of uses allowed in the overlay zone. For example, the study should examine whether light industrial uses such as a personal storage facility could be allowed or if the zone should be more restrictive and only allow for agricultural uses.

4.6.2 Conduct an AICUZ Study

Noise contours were provided at the time of the finalization of this JLUS. GIS of the APZs will need to be obtained along with the GIS for the noise contours. A precise analysis of incompatible land use can be completed during the implementation phase of the JLUS when GIS data layers are made available.

The noise analysis provided by Alpena CRTC in support of the JLUS is part of the Alpena CRTC 2016 IDP Environmental Assessment (EA). "NoiseMap" is the name of the model within the Air Force that generated the noise contours. An AICUZ study will need to contain noise compatibility and CZ analysis. The assessment from the EA provides a basis for assessing noise and land use impacts from noise at the airport form the IDP projects. It is not an AICUZ but is a good starting point for a plan. The EA noise assessment could be combined with an APZ assessment as shown for Camp Grayling. That information along with land use parcel data can be used to develop an AICUZ study since the data is, the time of publication of the final JLUS, less than 5 years old.

A formal AICUZ program would help achieve and maintain compatibility between air operations and the communities surrounding Alpena CRTC. The study should include an analysis of major training events, such as Northern Strike. The study would also include flight paths, which would help the community understand impact areas when air traffic increases. Additionally, an AICUZ addresses the protection of health, safety, and the welfare of both the community and military personnel.

The AICUZ study could be used to inform and direct guidance for changes to military and installation operations or to create zoning regulations to prevent encroachment.

The study should consider the collection and analysis of providing ADNL contours for the entire region, specifically including areas that have been identified as bothersome to community members.

4.6.3 Alpena CRTC Community Outreach and Alpena CRTC Community Council/ Formalize Thunder Bay Interagency Cooperation

Comprehensive and timely communication with area residents and other key stakeholders is a challenge without a dedicated community relations specialist for Alpena CRTC. Based on the base's current mission size, a full-time community relations specialist position is not likely to be staffed.

The many community partnerships between Alpena CRTC and the community include close cooperation with Thunder Bay Marine Sanctuary personnel to maintain the integrity of preserved sites and the ecology within the sanctuary. However, formalizing communications to assist with achieving common goals is needed.

This JLUS recommends that Alpena CRTC leverage any communication standard operating procedures that are developed by Camp Grayling JMTC. In addition, the installation and local leaders should convene an expanded Alpena CRTC Community Council with the Alpena Area Chamber of Commerce. Goals of the Alpena CRTC Community Council include:

- Formalizing communications with NOAA regarding operations over Thunder Bay National Marine Sanctuary
- Author and promote a cooperation story with Thunder Bay National Marine Sanctuary
- Strengthen the existing partnership with Alpena Community College
- Promote STARBASE as an asset connected to Alpena CRTC

4.6.4 Commission a Thunder Bay Environmental Impact Study/Commission a Joint NOAA/Alpena CRTC Bathymetric Survey

In 2002, NEMCOG prepared the Thunder Bay Watershed Initiative. Phase II of the plan was released in 2004. Since that time, the Thunder Bay National Marine Sanctuary has expanded from 448 square miles to 4,300 square miles. When the Thunder Bay National Marine Sanctuary boundary expansion was underway, the 2013 NOAA Condition Report noted that a 1,300-square-mile area has the potential for housing UXO and military-related debris. This is both an environmental and safety concern.

MDEQ has requested assistance from the U.S. Army Corps of Engineers (USACE) to evaluate the known munitions in the area and potentially address their findings via the Military Munitions Response Program (MMRP); however, it remains unfunded.

The sanctuary extends down to just 300 feet AGL and is used for high-speed, low-altitude jet fighter training. There are no identifying notations on sectional charts limiting activities that can be potentially disruptive to marine life.

The JLUS recommends that MDEQ, Alpena CRTC, USACE, NOAA Office of National Marine Sanctuaries (ONMS), Thunder Bay National Marine Sanctuary, the EPA, and the State of Michigan should all be stakeholders in the study.

Outcomes of the Thunder Bay Environmental Impact Study should address the impact of military training activities over and within the R-4207 range on wildlife, historic and archaeological preservation, recreation, commercial uses of the lake, and military training requirements.

In addition, Alpena CRTC, in conjunction with the U.S. Navy and U.S. Coast Guard, should conduct a survey of the waters in and surrounding the range to determine if any UXO or dangerous conditions exist. These areas at the very least should be identified and protected from accidental or intentional intrusion with specific focus on the adjacent marine sanctuary, where a great deal of underwater activity occurs.

4.6.5 Economic Impact, Tracking, and Incentives: Conduct an Economic Impact Study

Quantifiable economic data on how dollars flow from soldiers training at Alpena CRTC into surrounding communities would help communicate the co to ntributions Alpena CRTC makes to the local economy. As part of the study, examine the potential benefit to local businesses if surrounding tourism bureaus work to create incentives for soldiers' families to extend their stay in the area before or after training.

With quantifiable information, local purchasing goals for Alpena CRTC could be established to help create an operating norm that acknowledges the importance of Alpena CRTC on the surrounding economies regardless of changes in Alpena CRTC leadership.

4.6.6 Update the Alpena Area-wide Comprehensive Transportation Plan

Poor road condition has been cited as an issue throughout the JLUS study area. Road projects are prioritized based on the condition of the road in question, as well as the amount of traffic. The Alpena Area-wide Comprehensive Transportation Plan was completed in 2003. It was prepared for Alpena County, the City of Alpena, Alpena Township, Alpena Public Schools, the Alpena County Road Commission, and MDOT.

There have been road improvements since that time; however, several road segments were identified in the 2013 Alpena County Master Plan as needing improvements. An updated transportation plan could help both Alpena CRTC and the surrounding community better understand the source of any issues and provide a path to resolution. The plan should consider a wide range of transportation and include access to community recreation areas surrounding Alpena CRTC.

Top: Downtown Alpena.

Bottom Left: Alpena City Hall.

Bottom Right: The shore of Lake Huron.

Members of the TC and PC were involved with the project from the start. See Appendix B, Public Participation Plan, for more information on how stakeholders were engaged throughout the JLUS process.

Figure 4.2 | JLUS "Toolbox"

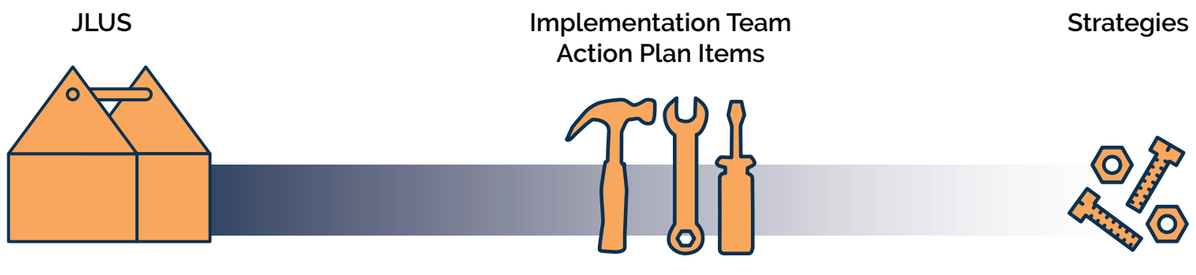
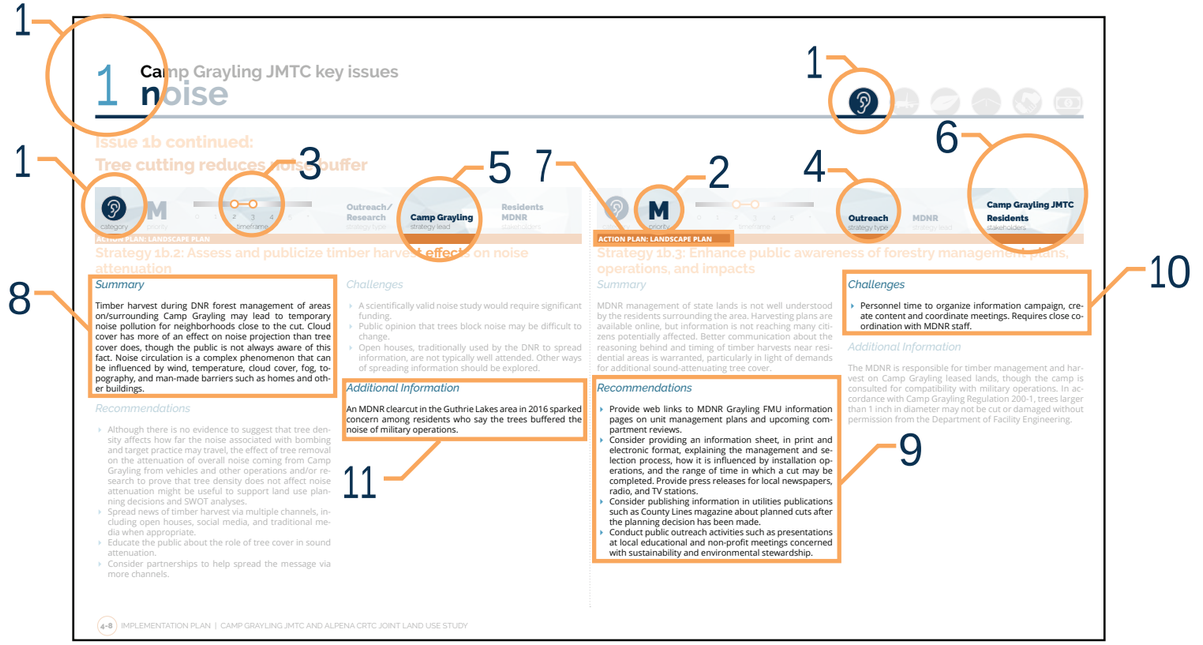


Figure 4.3 | Strategy Page Legend



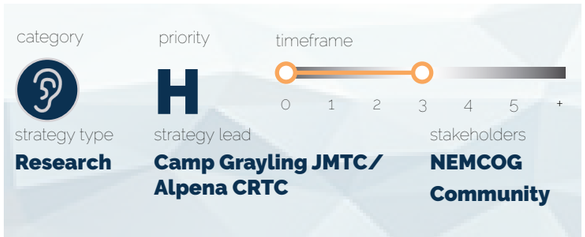
4.7 Implementation Plan Overview and Guidelines

The following pages present the proposed compatibility strategies for the JLUS. A summary table presenting the strategy information for each base is provided in Appendix D. The strategies are presented here in a more graphic format, which includes the following elements:

- **1. CATEGORY:** This refers to the six primary categories that issues were sorted into: noise, military operations, environmental, transportation and infrastructure, community partnerships, and economic development. Each category is numbered and has a corresponding icon, which are visible along the very top of each page. The icon that corresponds with the category being discussed on that page is dark blue.
- **2. PRIORITY:** The letters H (high), M (medium), and L (low) appear here. The priorities are described in more detail in Section 4.3.
- **3. TIMELINE:** A shaded bar indicates the suggested timeline for the strategy in years. The timeline starts at 0, for strategies that can be implemented right away, and ends at 5+, for strategies that are projected to take more time.
- **4. STRATEGY TYPE:** This is another way of classifying the strategies to indicate the type of action that might be required to implement it. Choices include research, such as a new study; outreach, or finding new ways to engage the public; funding, or finding new ways to pay for improvements; partnership, or forming new groups and alliances; and regulatory, or changing laws or other rules to improve encroachment issues.
- **5. STRATEGY LEAD:** This is the group or groups that would logically spearhead each strategy. The JLUS implementation team would need to follow up periodically with each group on the status of their actions.
- **6. STAKEHOLDERS:** This list includes any entities that could be affected or who may help implement it.
- **7. IMPLEMENTATION TEAM ACTION PLAN ITEM:** This bar indicates which key action in the Implementation Team Action Plan the strategy supports.
- **8. SUMMARY:** This provides a broad overview of the strategy, the underlying issue, and why it needs to be implemented.
- **9. RECOMMENDATIONS:** These are the concrete steps that will need to be taken by the strategy lead(s) to implement the strategy.
- **10. CHALLENGES:** Significant known roadblocks that could affect the strategy's implementation are listed in this section.
- **11. ADDITIONAL INFORMATION:** This covers anything else that relates to the strategy in question that is important for the public and other stakeholders to know.

1 Camp Grayling JMTC key issues
noise

Issue 1a:
Impact of aircraft noise on communities



ACTION PLAN: NOISE STUDY

Strategy 1a.1: Conduct a noise study

Summary

Current and accurate information with ADNL contours is needed in order to assess the impacts to surrounding community functions. This data could be used to inform and direct guidance for changes to military and installation operations or to create zoning to prevent encroachment.

Recommendations

- Contract the collection and analysis of providing ADNL contours for the entire region, specifically including areas that have been identified as bothersome to community members.
- Use that information when making zoning regulation changes to prevent residential, commercial, or service functions from being sited within the 65 ADNL contour.
- Work with the military to alter training activities to reduce the noise impact to existing sensitive areas where possible. (Note: In many cases, existing ranges cannot be relocated or inactivated because of economic and logistical reasons.)
- AICUZ recommendations should specifically address areas where the 65 ADNL noise contours extend past the installation boundary.
- Provide residents already living within the 65 ADNL contour with information about how to mitigate noise (see Strategy 1a.2).

ACTION PLAN: NOISE STUDY

Strategy 1a.2: Educate the public on residential sound attenuation

Summary

Noise at military ranges is inherent in their function, and for residents that live near these activities, adjustments to their existing environment may be the only reasonable solution. Sound attenuating strategies can be applied to existing structures and environments to help reduce sound vibrations. It should be noted, however, that the most effective strategy to combat noise disruption is distance separation.

Recommendations

- Provide workshops that educate the community on what causes sound vibrations, how they travel, how they can be reduced, and what levels are tolerable for different functions. Provide visual aids depicting the noise contours measured through the activities detailed in Strategy 1a.1.
- Create information to be posted on publicly accessible websites providing this same information, with contact numbers for questions, comments, and additional information.
- Make specialists available to residents for one-on-one consultation or evaluation of specific structures, with recommendations for implementation of sound attenuating systems or strategies.

ACTION PLAN: NOISE STUDY

Strategy 1a.3: Establish no-fly zones over sensitive areas

Summary

For certain, high-disturbance areas where sensitive functions already exist, no-fly zones can sometimes be established on a temporary basis. Sensitive areas could include dense residential areas, critical wildlife habitats or areas of environmental interest. These no-fly zones are typically set at 1,500 feet above ground level for a distance of approximately 1,000 feet from the subject function. This applies to both fixed-wing and rotary-wing aircraft.

Recommendations

- Specifically identify sensitive functions and their locations that require reduced noise vibration. Conduct analysis to determine the source and frequency of the disturbance. Evaluate other noise reduction techniques first to see if the disturbance can be mitigated as identified in Strategy 1a.2.
- Work with officials from Grayling JMTC and Alpena CRTC to evaluate their operations to see if changes can be made that would allow for a higher floor level over the identified location. If determined to be acceptable, work with installations, airspace managers, and the FAA to alter navigational charts and procedures to establish the no-fly zones.
- If operations cannot be altered efficiently or economically, identify locations and means for relocating the function away from the disturbance.

Additional Information

Certain training or operational functions may require use of this airspace and may not be relocatable for economic or logistical reasons. If this is the case, it would be more appropriate to relocate the subject function to an area that meets the newly established zoning criteria, placing it farther from the noise-generating activity as identified in Strategy 1a.4.

Issue 1a continued: Impact of aircraft noise on communities

category: M | priority | timeframe: 0 1 2 3 4 5 +

Regulatory (strategy type) | **Camp Grayling JMTC / Alpena CRTC** (strategy lead) | **NEMCOG, Residents** (stakeholders)

ACTION PLAN: MILITARY OVERLAY ZONE

Strategy 1a.4: Conduct an analysis of property ownership under the restricted airspace and near the airfield.

Summary

In Grayling Township, approximately 82 percent of land is federal, military, and state land. Many homes, some in residential neighborhoods, are very close to airport runways, ranges, artillery firing positions, bombing ranges, and vehicle maintenance facilities. All of these activities, and others, are consistent with the training that is regularly conducted at Camp Grayling, the Grayling Range, and the airspace surrounding them. In one instance, portions of restricted airspace for Grayling Range resides over property that is not owned by the government. Subsequently, residential properties are under an area where unrestricted air activities are conducted, including many that are deemed hazardous to the public. It is current FAA and DOD policy that all property under restricted airspace be owned by the government or subject to a conditional use agreement with the land owner that there will be no domestic use of the property. In another instance, residential neighborhoods exist within one of Grayling Army Airfield's clear zones and APZs.

Recommendations – Grayling Range

- Conduct an analysis of property ownership under the R-4201A and B restricted airspace to determine the status of ownership or lease agreement. Provide mapping of boundaries and data including owner's name, location, contact information, valuation of property, and current use of property.
- Conduct an Environmental Assessment to determine the feasibility of proposed acquisition of the property.
- Properties that cannot be acquired should seek establishment of conditional use lease agreements with property owners.
- If large portions of property are found to be unattainable, work with the FAA to redefine restricted airspace boundaries to exclude those areas. This may severely impact operational capabilities at the range.
- A noise study should also include an analysis of the environmental impact of noise.

Recommendations – Grayling Army Airfield

- Conduct an analysis of the airfield and surrounding properties to identify potential for displacing Runway 32 to the northwest or creating a new runway with an orientation generally north-south. This would allow for the existing residential neighborhoods to remain without endangering residents' safety or negatively affecting mission objectives.

category | priority: H | timeframe: 0 1 2 3 4 5 +

Regulatory (strategy type) | **Grayling, Alpena, Crawford County** (strategy lead) | **NEMCOG, Community** (stakeholders)

ACTION PLAN: MILITARY OVERLAY ZONE

Strategy 1a.5: Noise reduction for buildings within 65 ADNL noise area

Summary

Camp Grayling should consider construction of noise barriers in areas where noise extends into local communities. Noise barriers similar to the solid obstructions built between the highway and neighborhoods. While, they do not completely block noise, the barriers can reduce overall noise levels. According to the Federal Highway Administration, effective noise barriers typically reduce noise levels by 5 to 10 dB.

Recommendations

- Update building codes for all applicable governing entities.
- Create incentives for existing buildings to update their soundproofing.
- Explore available federal funding for sound abatement.

Challenges

- Requiring increased soundproofing could cause an increase in price for new structures.
- Monetary aid for existing residents to upgrade their structures could be limited and may not be enough to cover the full costs.

Issue 1b: Tree cutting reduces noise buffer

category | priority: H | timeframe: 0 1 2 3 4 5 +

Regulatory (strategy type) | **Camp Grayling JMTC, MDNR** (strategy lead) | **NEMCOG, Residents, U.S. Forest Service** (stakeholders)

ACTION PLAN: LANDSCAPE PLAN

Strategy 1b.1: Plant trees in areas where it is appropriate and allowed

Summary

Selective tree planting could potentially alleviate some of the disruption caused by military training. It has been determined that these will have the greatest effect if near the source or near the receiver. Most military training activities would not allow the existence of tree stands near those activities for operational or safety reasons. This suggests that the most appropriate location for adding trees to help attenuate noise would be at the receiving end, or very near the homes being disturbed.

Recommendations

- Work with military training proponents to determine if any tree buffers could be planted near noise-generating activities and identify those locations specifically. Then, work with the installation and the US Forest Service to determine the proper species and placement of tree stands for greatest effect.
- Establish funding streams and a volunteer work force from the community and the military to hold a planting day activity. Ensure the event and activities are well publicized.
- Work with residents to understand how best to repair their own environment to reduce sound vibration impact to their homes as defined in Strategy 1a.2.

Issue 1b continued:
Tree cutting reduces noise buffer

category: noise | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach/ Research | strategy lead: Camp Grayling | stakeholders: Residents MDNR

ACTION PLAN: LANDSCAPE PLAN

Strategy 1b.2: Assess and publicize timber harvest effects on noise attenuation

Summary

Timber harvest during DNR forest management of areas on/surrounding Camp Grayling may lead to temporary noise pollution for neighborhoods close to the cut. Cloud cover has more of an effect on noise projection than tree cover does, though the public is not always aware of this fact. Noise circulation is a complex phenomenon that can be influenced by wind, temperature, cloud cover, fog, topography, and man-made barriers such as homes and other buildings.

Recommendations

- Although there is no evidence to suggest that tree density affects how far the noise associated with bombing and target practice may travel, the effect of tree removal on the attenuation of overall noise coming from Camp Grayling from vehicles and other operations and/or research to prove that tree density does not affect noise attenuation might be useful to support land use planning decisions and SWOT analyses.
- Spread news of timber harvest via multiple channels, including open houses, social media, and traditional media when appropriate.
- Educate the public about the role of tree cover in sound attenuation.
- Consider partnerships to help spread the message via more channels.

Challenges

- A scientifically valid noise study would require significant funding.
- Public opinion that trees block noise may be difficult to change.
- Open houses, traditionally used by the DNR to spread information, are not typically well attended. Other ways of spreading information should be explored.

Additional Information

An MDNR clearcut in the Guthrie Lakes area in 2016 sparked concern among residents who say the trees buffered the noise of military operations.

category: noise | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: MDNR | stakeholders: Camp Grayling JMTC Residents

ACTION PLAN: LANDSCAPE PLAN

Strategy 1b.3: Enhance public awareness of forestry management plans, operations, and impacts

Summary

MDNR management of state lands is not well understood by the residents surrounding the area. Harvesting plans are available online, but information is not reaching many citizens potentially affected. Better communication about the reasoning behind and timing of timber harvests near residential areas is warranted, particularly in light of demands for additional sound-attenuating tree cover.

Recommendations

- Provide web links to MDNR Grayling FMU information pages on unit management plans and upcoming compartment reviews.
- Consider providing an information sheet, in print and electronic format, explaining the management and selection process, how it is influenced by installation operations, and the range of time in which a cut may be completed. Provide press releases for local newspapers, radio, and TV stations.
- Consider publishing information in utilities publications such as County Lines magazine about planned cuts after the planning decision has been made.
- Conduct public outreach activities such as presentations at local educational and non-profit meetings concerned with sustainability and environmental stewardship.

Challenges

- Personnel time to organize information campaign, create content and coordinate meetings. Requires close coordination with MDNR staff.

Additional Information

The MDNR is responsible for timber management and harvest on Camp Grayling leased lands, though the camp is consulted for compatibility with military operations. In accordance with Camp Grayling Regulation 200-1, trees larger than 1 inch in diameter may not be cut or damaged without permission from the Department of Facility Engineering.

Issue 2a:
Flight paths over homes

category: H priority | timeframe: 0 1 2 3 4 5 + | Regulatory strategy type | NEMCOG Planners strategy lead | NEMCOG Residents stakeholders

ACTION PLAN: MILITARY OVERLAY ZONE

Strategy 2a.1: Create sensible military overlay zones around Camp Grayling JMTC

Summary

Communities and residential areas surrounding Camp Grayling JMTC have grown since the inception of the camp. This has created issues regarding noise, disruption or the possibility of accident. While the land use surrounding the camp is regulated, it does not adequately address the many affects of the camp on residences and businesses. It is recommended that the base work with existing neighbors within the noise contours to notify neighbors of training times. The installation should also look at locating training operations in more remote areas within Camp Grayling in order to reduce noise conflicts and as a sign of being a good neighbor.

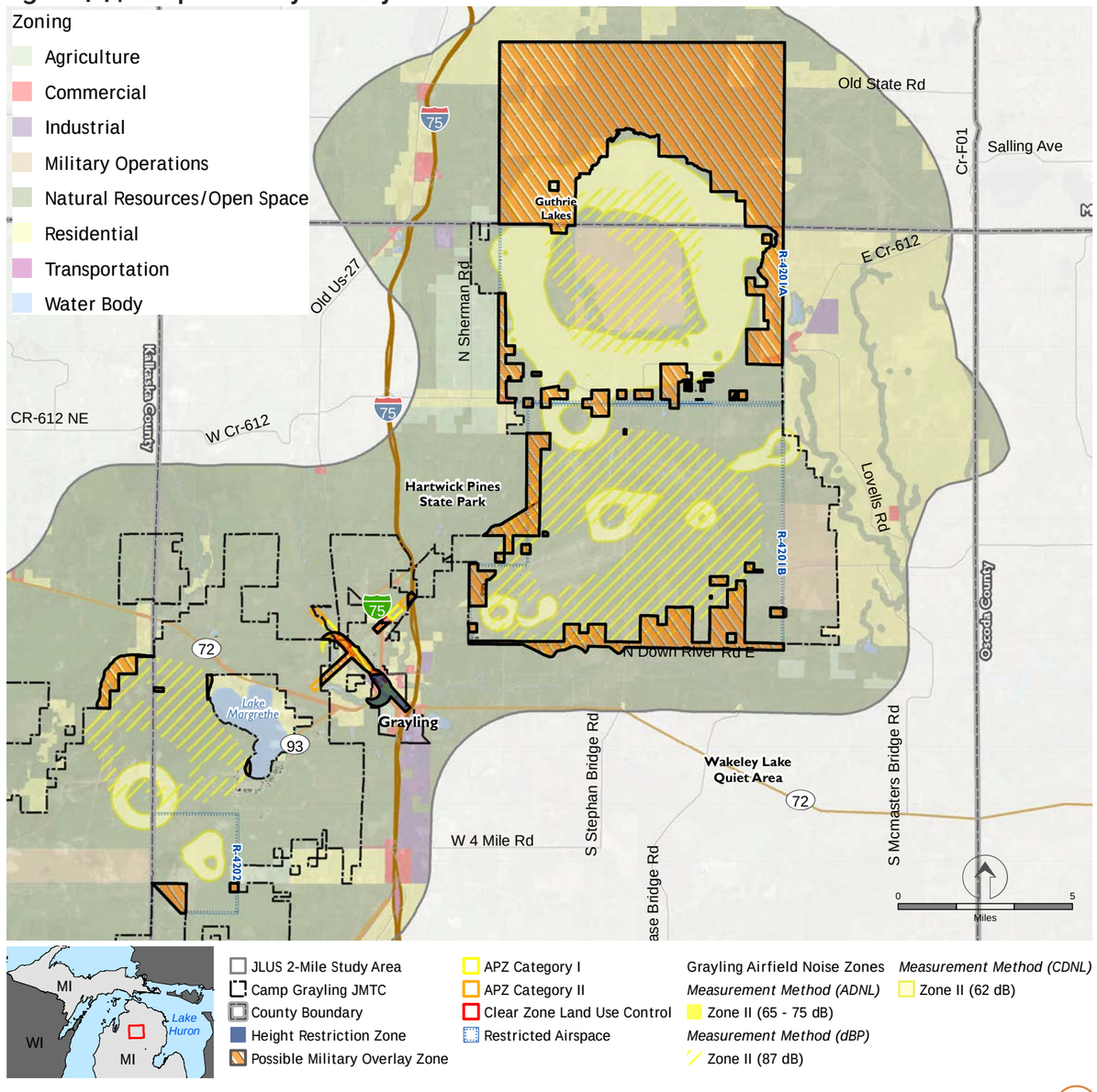
For the City of Grayling, adding an overlay zone to limit development within the APZs at Grayling AAF is more difficult to implement than in the Alpena area. This is because much of the limits of Grayling are directly within an APZ. An overlay zone should be added to restrict development heights, but it is not feasible to restrict residential and commercial development altogether.

For areas in townships or counties, it is recommended that an overlay zone be added that conforms to the noise contours and that protects the boundaries of the installation from encroachment of development. Although these areas are relatively undeveloped, it is good planning practice to plan for the future, and implementing an overlay zone in these areas now is more feasible than when the area develops more. Implementing an overlay zone in these areas now will help avoid any potential future conflicts between residential areas and noise from Camp Grayling JMTC.

Recommendations

- Language for this overlay zone should be drafted by a legal team specializing in land use law and code development. The legal team will review the zoning for any potential takings. If a taking is identified, funds for reimbursement would be established.
- Work with community leaders such as city and county planning departments to change zoning maps and codes to identify the areas around military installations and ranges as military overlay zones. Use noise contour mapping as defined in Strategy 1a.1, or newer noise data as it becomes available, to define the extent of the overlay zone following guidance for acceptable noise levels per function. Establish restrictions that only allow compatible land uses in these zones.
- Include a reference to Camp Grayling JMTC in site plan review standards in local zoning ordinances.
- Consider establishing similar restrictions under known flight paths (see Strategy 2a.2), keeping in mind that flight paths may change to suit different types of military training in the future.
- Establish height restriction zoning overlays for airport runway clear zones that extend beyond the border of the installation. These should restrict all development so as to adhere to the applicable airfield criteria.

Figure 4.4 | Sample Military Overlay Zone



2 Camp Grayling JMTC key issues military operations

Issue 2a continued: Flight paths over homes

ACTION PLAN: NOISE STUDY
MILITARY OVERLAY ZONE

Strategy 2a.2: Educate the public on existing established flight paths

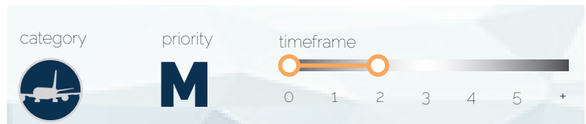
Summary

Well-established flight paths help the military reduce confusion between pilots and controllers, and they also streamline training activities, which improves safety, economy, and efficiency. The JMTC/CRTC training area encompasses a vast airspace both horizontally and vertically, which is utilized by a number of entities including governmental, commercial, and private users. It also has an impact on land owners at lower altitudes. Established traffic routes for training activities are carefully delineated where they affect the lowest number of these individuals. Yet, certain activities at certain times do have a negative impact on some residents. This is unavoidable within the requirements of the training curriculum. However, educating the public can help alleviate the stress caused by these occurrences. This is already occurring, but it should be encouraged and continued.

Recommendations

- Work with military and community leaders to put together educational briefings on training activities along established flight paths. Explain the types of activities, altitudes, aircraft utilized, times, and purpose so the community understands the need and importance of the activity as well as where and when they will occur. This type of briefing should be conducted on a recurring basis in order to maintain positive community outreach. It could be tailored to communities where noise is more of an issue, such as Guthrie Lakes, and repeated more often in these areas.
- Establish a website that identifies training schedules that the public can use to educate themselves about these activities. Include call-in numbers or email addresses for them to submit comments about issues. Note: Antiterrorism force protection (ATFP) protocols may prevent the public release of this type of information.
- Continue to hold outreach events like air shows that serve to inspire, educate and inform the community about military training activities at the installations.

Issue 2b: Noise and vehicular disruption from MATES



ACTION PLAN: COMMUNITY OUTREACH

Strategy 2b.1: Educate the public on traffic routes and needs

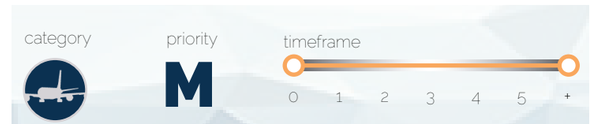
Summary

Concerns were voiced regarding the noise and traffic disruption caused by the MATES. This facility is used to repair and store equipment used at the training range and installation. It is located near the range because the majority of traffic flows between those locations. Also, the noise and disruption inherent in the activity is in keeping with that land use type. Unfortunately, logistics requires movement of vehicles among the arrival/departure location (Grayling AAF), the installations, and the MATES. The most direct route travels through the city of Grayling, which can at times be disruptive.

Recommendations

- Community leaders should work with military leaders to develop educational materials that explain operational needs, locations of travel, times, and types of equipment being transported. These should be disseminated through public means such as public service announcements and local newspapers, and through community forums like town hall meetings, where questions can be asked and concerns addressed directly.
- Noise disturbance should be addressed with a military overlay zoning action as addressed in Strategy 2a.1.
- Consider adding an interchange at North Down River Road as described in Strategies 4d.1 and 4d.3.

Issue 2c: Noise and vibration from night training



ACTION PLAN: NOISE STUDY
COMMUNITY OUTREACH

Strategy 2c.1: Educate and inform the public about night training

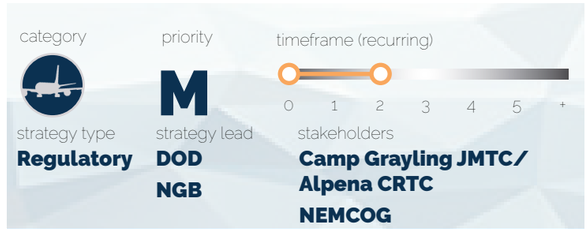
Summary

Because war is not a 9-5 job, training for night-time operations is as essential as daylight training. It is, however, intentionally conducted with lesser frequency for sake of adjacent communities. And yet, it inevitably causes disturbance to slumbering residents. Those most impacted live closest to the range, but the noise vibrations carry an impact for all in the region by comparison to daytime activities simply due to a lack of competing disturbances. Foreknowledge of the event won't make it any less disturbing, but it may help the community better cope.

Recommendations

- Affected community leaders should work with military leaders to identify and publish schedules of night-time training events. These should be provided to the public in a variety of delivery methods including print and electronic formats. They should identify locations, start times, and duration.
- Community and military leaders should work together to present information about the need for and types of military training conducted in the region. This should be presented in a town hall format, allowing citizens to ask questions and freely comment on their issues.

Issue 2c continued:
Noise and vibration from night training



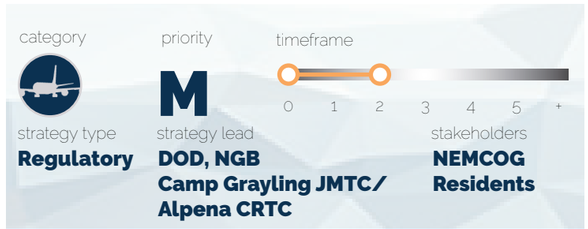
Strategy 2c.2: Identify specific locations where night training is particularly disruptive and identify alternatives

Summary

Different types of training are conducted in different locations on the range. Identifying those locations and associating them with the various training activities can help the community and the military better understand how, where, and why certain training activities are more or less disruptive. These data points can then be used to determine if changes can be made to alleviate community unrest.

Recommendations

- A study should be prepared that creates a database comparing night-time training activities and reports of disruption from citizens by location, time, level of disruption, extent of disruption, etc. This could be an ongoing exercise allowing a greater understanding of the impact of training activities on residents by a multitude of factors including but not limited to proximity, types of training events, attenuation efforts, and disruption spread mapping.



Strategy 2c.3: Confine military arms testing and range use to areas adjacent to state-owned lands

Summary

Restriction of arms testing to areas adjacent to state-owned lands has the opportunity to bring the arms testing away from highly populated areas.

Recommendations

- Create buffer zones that emanate from the adjacent lands into Camp Grayling where arms testing will occur.

Issue 2d:
Population growth may encroach on the mission

Strategy 2d.1:Establish zoning regulations that prevent encroachment, particularly near potentially dangerous and noise-generating activities

Summary

Military overlay zoning to help alleviate noise disturbances is the same action needed to help prevent dangerous or incompatible adjacencies. The most prominent example of incompatible encroachment on military activities is the town of Grayling residential neighborhoods lying within the airport runway clear zone and accident potential zones. Zoning regulations would identify areas for different types of development that are in keeping with the known and planned activities of the community.

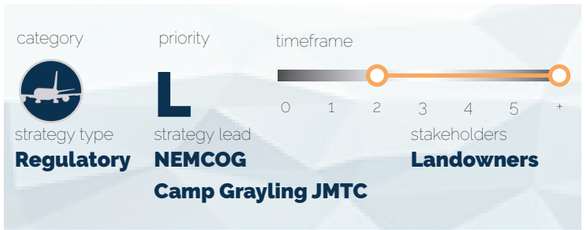
As towns and installations grow to meet new demands, these two entities will inevitably come together in unhealthy or unsafe ways. Military overlay zoning can serve to eliminate this type of incompatible encroachment by maintaining a buffer zone surrounding military installations. The designation of growth areas for both the community and the military will also benefit both in predetermining the direction that best suits those activities.

Recommendations

- Community leaders strive to understand the issues affecting health, safety, and livability of their communities and create regulating criteria that provides for compatible land use supporting both community needs as well as those of military operations that are integral to the area.
- Designate buffer zones and future growth areas for the community and military installations based on current and future planning documents.
- Engage military subject matter experts (SMEs) to review plans for residential development that is to be located near installations as a condition of approval.

2/3 Camp Grayling JMTC key issues
military operations/environmental

Issue 2d: Population growth and mission encroachment



ACTION PLAN: MILITARY OVERLAY ZONE
INSTALLATION MASTER PLAN

Strategy 2d.2: Purchase land around installations to control growth

Summary

As a means to combat encroachment beyond regulation, land purchase would ensure adequate buffer zones and secure growth areas.

Recommendations

- Military and civic organizations should independently establish land purchase programs or foundations that define the need for land purchase, identify areas of greatest priority, work through regulatory and entitlement issues, raise funding, and purchase or receive the grant of properties.
- Research real property exchange (RPX) program used by the Army Guard to see if something comparable can be done here.

Issue 3a: PFOS and PFOA contamination of groundwater

ACTION PLAN: COMMUNITY OUTREACH
WATER MASTER PLAN

Strategy 3a.1: Improve public outreach and access to information

Summary

Residents using the breached aquifer are concerned about the safety of their drinking water. The health effects and extent of contamination are still being researched and are not completely understood, which contributes to citizen concern about health and economic impacts. Continuing and improving ongoing communications between Camp Grayling/MDEQ and surrounding residents through public meetings, print and electronic media, and call center assistance will help provide updated information, mitigate uncertainties, ensure that those affected have access to exposure mitigation options, while enhancing public relations.

Recommendations

- Provide easy-to-find links on the Camp Grayling JMTC website home page to information pages on Michigan.gov and the EPA website. Include an up-to-date summary of the MDEQ monitoring program status along with links. Consider adding maps, graphics, or interactive content to provide a clear message.
- Increase non-web-based outreach to residents.
- Continue to hold frequent town hall public meetings.
- Increase transparency about how wells are selected for testing.
- Consider providing a clearer explanation of why some wells are not accepted for testing, including a visual representing the understood risk associated with different neighborhoods around the base, including maps of known contamination sites, monitoring wells and any plume models as they become available.

Challenges

- Effort would require dedicating personnel time to update the base website content, create information sheets, and coordinate print campaigns.

PFOS/PFOA Information

More information is available at https://www.michigan.gov/pfasresponse

If any resident has additional questions regarding this issue, the MDEQ Environmental Assistance Center can be contacted at 1-800-662-9278 or email deq-assist@michigan.gov. Representatives may be reached to assist with your questions Monday through Friday, 8:00 AM to 4:30 PM.

Issue 3b: Impacts on groundwater/drinking water

ACTION PLAN: COMMUNITY OUTREACH
WATER RESOURCES PLAN

Strategy 3b.1: Provide information to the public on groundwater contamination

Summary

Groundwater contamination in the Camp Grayling area results from exposure to a wide range of toxic compounds, chemicals, metals, and petroleum byproducts that are introduced into soils and groundwater from industrial, manufacturing, and transportation activities. While the PFA contamination issue receives the most attention, the public is also concerned with groundwater contamination from other sources and how it may effect drinking water from wells and the general environment.

Recommendations

- Provide a base webpage link to MDEQ information regarding groundwater contamination – this should include the link to DEQ Online Services, which includes their Environmental Mapper utility.
- Provide current bulletins on spills and plume status (as available) for any sites on the installation in a bulleting format via website and as a script for public inquiries.

Challenges

- Requires personnel time to maintain bulletins and webpage.

Issue 3c:
Impacts and effects on surface water systems: lakes, rivers and streams, and wetlands

category: environmental | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Regulatory | strategy lead: MDEQ, NEMCOG | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH
WATER RESOURCES PLAN

Strategy 3c.1: Control runoff and support bioassessment surveys to monitor ecological and aquatic community health

Summary

Runoff of contaminants and sediment into surface waters is an ongoing threat to water quality and aquatic community health. Best management practices such as establishing riparian buffer zones and ongoing monitoring and bioassessments of important water bodies like Lake Margrethe and reaches of the Upper Manistee and AuSable rivers will help mitigate and control the effects of erosion and runoff.

Challenges

- Maintaining the survey actions from year to year may be difficult with a turnover of volunteers.
- Outside funding sources or volunteer expertise will be required to assess the samples taken by citizen volunteers.

Recommendations

- Review existing watershed management plans that overlay installation properties for assessment data and best management practices.
- Promote ongoing grant-funded watershed level research and planning concerned with non-point source pollution, erosion, and runoff.
- Continue to identify and assess areas at risk for non-point source contaminant/sediment runoff and apply best management practices to control erosion and runoff.
- Communicate plans and progress to the public, include actual vs. perceived effects of installation operations on roads and erosion sites.

category: environmental | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: NEMCOG | stakeholders: Residents, MDNR

ACTION PLAN: COMMUNITY OUTREACH
WATER RESOURCES PLAN

Strategy 3c.2: Support water quality and aquatic ecology communications

Summary

Public interest in water quality and aquatic ecological health is spurred by topics such as chemical contamination, fish advisories, nutrient pollution, sedimentation, climate change, habitat loss, and invasive species. There is a wide range of research describing water quality, sediment quality, and the health of aquatic environments and species, but it can be challenging for citizens to identify and access appropriate and accurate information to satisfy their concerns. Sometimes there are public misperceptions about the location and sources of contamination, including incorrectly attributing causes to installation operations. In its role as a key community stakeholder and environmental steward, Camp Grayling could host or sponsor development of a centralized clearinghouse of information resources that includes maps and narrative summarizing scientific facts.

Challenges

- Requires professional staff commitment/graduate level expertise to organize and edit research information and resources. Probably would require participation of partnering conservation organization and funding.

Recommendations

- Develop or sponsor development of a web-based clearinghouse that summarizes facts and organizes resource links concerning surface water quality and aquatic ecological health in Camp Grayling watersheds.
- Consider developing or sponsoring development of a Story Map presentation describing surface water quality, aquatic biology, and aquatic ecological health in the Camp Grayling area hosted on the installation website or collaborative organization website (i.e. Huron Pines).
- Conduct public outreach activities such as presentations at local educational and non-profit meetings concerned with sustainability and environmental stewardship.

Issue 3d:
Effects on the health of wildlife populations

category: M priority | timeframe: 0 1 2 3 4 5 + | Research Outreach strategy type | Camp Grayling MDNR strategy lead | Residents stakeholders

ACTION PLAN: COMMUNITY OUTREACH
INSTALLATION MASTER PLAN

Strategy 3d.1: Ongoing ecological assessment and community outreach and engagement

Summary

Many citizens are not aware that the DNR is ultimately responsible for management of the land (surface resources) on which Camp Grayling operates. Educating the public about this cooperative relationship and the commitment to habitat and wildlife preservation would be beneficial. Frequent communication of wildlife surveys (e.g. fish and benthic community health) and promoting new surveys of wildlife populations would increase public trust and alert installation and DNR staff to perceived or actual problems.

Recommendations

- Public outreach concerning current environmental management that is done on the installation to meet DNR land use requirements and beyond.
- Publicize results of upcoming comprehensive species survey being done in conjunction with a Camp Grayling JMTC INRMP update.
- Expand and maintain species habitat map layers on installation property that describe connectivity and monitor habitat fragmentation trends.
- Distribute an ongoing newsletter about the environmental management and monitoring on the installation, such as the Lake Margrethe Watershed Management Plan.
- Organize public tours of the protected and managed areas.
- Conduct public outreach activities such as presentations at local educational and non-profit meetings concerned with sustainability and environmental stewardship.
- Use citizen volunteers as appropriate and involve them in species protection as possible.

Challenges

- Maintaining the survey actions from year to year may be difficult with turnover of volunteers.
- Outside funding sources may be required to pay for the official surveys.

Issue 3e:
Wildfire management

category: M priority | timeframe: 0 1 2 3 4 5 + | Outreach strategy type | Camp Grayling JMTC MDNR strategy lead | Residents MDNR stakeholders

ACTION PLAN: COMMUNITY OUTREACH
FIRE PROTECTION AGREEMENT

Strategy 3e.1: Increase public awareness of ongoing wildfire management efforts and gather public input

Summary

Wildfires within the base and surrounding areas remain an ongoing public concern. The MDNR is responsible for wildfire control on state and leased lands, including large areas of volatile jack pine forest. Prescribed burns are a common management tool that may cause alarm when perceived as wildfires.

Recommendations

- Conduct open houses in conjunction with MDNR to explain wildfire management plans and cooperative practices. Invite Camp Grayling personnel to participate.
- Capture public comments and concerns for future wildfire and forestry management strategies.
- Provide information and links on the installation website and social media to MDNR information on MDNR open houses, forestry management plans, and prescribed burn processes, risks, and schedules.
- Set up a hotline that could inform area residents via recording on prescribed burns or other activity.
- Provide emergency response protocol education.

Challenges

- Effort would require dedicating personnel time to update the installation and MDNR website content, create information sheets, and coordinate mailers.
- Consistent language across platforms and agencies is essential to spreading a clear message to residents.

Issue 3f:
Resource use and sustainability

category: environmental | priority: L | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: Camp Grayling JMTC | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH
WATER RESOURCES PLAN

Strategy 3f.1: Public outreach to increase awareness of sustainability measures at Camp Grayling JMTC

Summary

Camp Grayling has a comprehensive waste-reduction program and is on track to become the first DOD triple-net-zero installation, whereby the installation's net energy use, water use, and waste output would effectively be zero. The camp has also implemented renewable energy measures and a lead/metals/munition removal program. The base has won awards for its sustainability actions. Public outreach detailing these efforts should alleviate public concerns with installation impacts on local resources and environment and promote public perceptions of environmental stewardship.

Recommendations

- Provide detailed information on the installation website about the waste reduction program.
- Consider a public broadcast, newspaper article, or letter to the editor describing the installation waste reduction program. Distribute a press release to local print and television media.
- Conduct public outreach activities such as presentations at local educational and nonprofit meetings concerned with sustainability and environmental stewardship.

Challenges

- Effort would require dedicating personnel time to create and update informational fliers and press releases, update the installation website content, and coordinate publicity efforts with media outlets.

category: environmental | priority: L | timeframe: 0 1 2 3 4 5 + | strategy type: Regulatory | strategy lead: Camp Grayling JMTC, NEMCOG | stakeholders: Residents

ACTION PLAN: INSTALLATION MASTER PLAN

Strategy 3f.2: Consider the creation of a recycling/sorting station

Summary

In addition to communicating the installation's commitment to waste reduction, providing recycling space on or near the installation or contributing to the county recycling program would encourage municipal waste reduction and create interaction between the installation and residents.

Recommendations

- Assess the feasibility of a combined use recycling drop-off/sorting/transfer station on or adjacent to the installation, utilizing the Grayling Charter Township Recycling Center as the endpoint.
- Consider partnering with environmental organizations and using volunteers to coordinate facility upkeep.
- Consider use of installation vehicles/equipment as an in-kind contribution to facilitate recycling and community access to waste management programs.
- Organize a partnership to work on developing collaborative recycling and renewable energy programs. This could be lead by NEMCOG, the region's designated planning agency for solid waste management.

Challenges

- Coordinating transportation of materials to the center.
- Funding for program initiation and ongoing operation.

4 Camp Grayling JMTC key issues
transportation and infrastructure

Issue 4a:
Effects of growth on utilities

category: **L** (priority) | timeframe: 0 1 2 3 4 5 +

strategy type: **Regulatory** | strategy lead: **Grayling Charter Township** | stakeholders: **Residents, MDNR**

ACTION PLAN: INSTALLATION MASTER PLAN

Strategy 4a.1: Continue to monitor capacity and community growth

Summary

The Grayling Charter Township Master Plan requires the monitoring of water, sewer, septage disposal/treatment, and natural gas services and the need for expansion, such as that caused by the development of the Arauco North America particleboard plant, particularly as existing systems age. A feasibility study was completed in 1999 for expanding the sewer system in Crawford County.

Recommendations

- Investigate ways to share military and civilian assets or energy strategies.
- Explore public-private partnership opportunities for future development of water and wastewater treatment.
- Pursue state grants to fund replacement projects.
- Update feasibility study on sewer system.

Challenges

- Energy improvements and ensuring service may be dependent on private companies in some cases.
- Funding is inadequate to replace infrastructure.

category: **M** (priority) | timeframe: 0 1 2 3 4 5 +

strategy type: **Regulatory** | strategy lead: **Camp Grayling** | stakeholders: **City of Grayling, Residents**

ACTION PLAN: INSTALLATION MASTER PLAN

Strategy 4a.2: Plan for possible mission expansion

Summary

The utility requirements of additions to or expansion of training missions should be investigated and integrated into existing installation plans.

Recommendations

- Develop an Installation Capacity Analysis to determine existing capacities and requirements.
- Align growth with existing sustainability and net-zero plans, which may include implementation of new sources of renewable energy.

Challenges

- Energy improvements and ensuring service may be dependent on private companies in some cases.
- Turnover at the installation can be problematic for long-term planning efforts.

Issue 4b:
Improve internet access

category: **L** (priority) | timeframe: 0 1 2 3 4 5 +

strategy type: **Regulatory** | strategy lead: **City of Grayling** | stakeholders: **Residents, County, Military**

Strategy 4b.1: Encourage the growth and use of high-speed internet services

Summary

The internet has become so widely used within modern society that a lack of high-speed internet service can be detrimental to a community, diminishing educational and career development opportunities for residents; commercial, healthcare, and governmental functions; and social interaction and community support.

Recommendations

- Contribute to state-wide efforts to plan digital and communications growth, such as through the Building of the 21st Century Commission and Michigan Infrastructure Council.
- Develop a "wired city" vision similar to that of the City of Alpena; consult the North East Michigan Fiber Consortium for guidance.
- Prioritize high-speed internet for schools to enhance educational and career development opportunities.
- Develop and conduct digital literacy and technical skills programs for the public.
- Consider a financing program to allow consumers to fund internet infrastructure.
- Collaborate with Camp Grayling to expand service north of the city.

Challenges

- Demand may not warrant additional infrastructure.
- Private companies, rather than government bodies, determine service availability.
- The low density of the population means a low return on investment for service installation.
- Installing communications infrastructure is difficult and costly.
- Set-up costs for broadband connections may be prohibitive for rural residents and small businesses.
- Monthly rates for high-speed service or costs of new technology may be too expensive for residents.
- There may be a lack of interest in, of knowledge of, various internet services and capabilities and the potential positive effects on quality of life.

Issue 4c:
Poor cellular reception

category	priority	timeframe	strategy type	strategy lead	stakeholders
	L	0 1 2 3 4 5 +	Regulatory	Camp Grayling JMTC Surrounding Communities	Residents MDNR

Strategy 4c.1: Grow cellular services

Summary

Developing a stronger cellular communications network would enhance quality of life for residents and increase the ability to utilize cellular service for necessary functions such as emergency notifications, etc.

Recommendations

- Map existing cellular towers by carrier and identify any areas where coverage is poor.
- Engage service providers regarding the implementation of a new cell tower.
- Lease military land for an additional cell tower.
- Consider community-wide wifi as an alternative in areas where that option is more cost-effective.

Challenges

- Demand may not warrant additional infrastructure.
- The cost-benefit ratio for investing in technology upgrades may be low for cellular service providers.
- If the number of providers is limited, there is less incentive to provide competitive pricing for consumers.

Issue 4d:
Traffic and road network

category	priority	timeframe	strategy type	strategy lead	stakeholders
	M	0 1 2 3 4 5 +	Regulatory	Camp Grayling JMTC Surrounding Communities	Residents MDNR

ACTION PLAN: INSTALLATION MASTER PLAN TRANSPORTATION STUDY

Strategy 4d.1: Streamline Camp Grayling traffic

Summary

While recent construction to the main gate improves access to the installation, the transportation network within the installation boundaries requires attention.

Recommendations

- Update the transportation plan for Camp Grayling.
- Communicate plans with the county road commissions and MDOT.
- Adjust the convoy schedule to avoid high-traffic times.
- Publicize the convoy schedule.
- Work with city, county, and state law enforcement to assist military convoys to flow through the city.
- Consider joint funding for transportation projects that may benefit access to and from Camp Grayling, such as a project at I-75 and North Down River Road; county road improvements; Industrial Road connection from Four Mile Road north to M-72.

Challenges

- Resources for a transportation plan may be limited.
- Publishing convoy movements may pose a security risk.
- Local law enforcement may not have availability to escort convoys.

category	priority	timeframe	strategy type	strategy lead	stakeholders
	H	0 1 2 3 4 5 +	Regulatory	NEMCOG City of Grayling	Residents County Military

ACTION PLAN: INSTALLATION MASTER PLAN TRANSPORTATION STUDY

Strategy 4d.2: Improve traffic flow and safety throughout the Grayling area

Summary

Inefficient traffic patterns create safety and quality of life issues. Identifying and addressing problem areas will enhance the community for residents, businesses, visitors, and Camp Grayling JMTC. Growth (including the Arauco North America particleboard plant), ongoing and planned road projects, and increased speed limits on highways and interstates may lead to more accidents or other vehicle issues in the coming years.

Recommendations

- Update the Grayling Area Transportation Study, which was last published in 2008.
  - Focus on the major intersections identified and developing solutions to improve circulation and safety.
  - Include planned and ongoing improvements to the industrial area around Four Mile Road.
  - Adjust timing of traffic lights within the City of Grayling for more efficient traffic flow following the results of the traffic pattern study.
- Encourage pedestrian traffic and alternative modes of transportation in downtown Grayling to reduce congestion, particularly during the summer tourist season.
  - Develop a bike share program at Camp Grayling that allows soldiers and visitors to borrow bicycles, allowing them to travel downtown and within the area.
  - Install bicycle racks in conjunction with the Grayling Trail Town Master Plan.
  - Lighting, benches, street art, and trash receptacles can enhance the walkability of the area.
- Monitor proposed development or land transactions, such as the Kirtland Community College Health Sciences Campus and nearby business development proposed in the Grayling Charter Township Master Plan near the Four Mile Road/I-75 interchange, for potential effects on circulation and other locations regarding Camp Grayling use.
- Increase the local law enforcement presence to help with safety and security issues arising from increases in traffic and speed limits.
- Continue staffing the Camp Grayling main gate.
- Monitor the identified problem intersections.
- Partner with the military and law enforcement to escort convoys.
- Improve I-75/North Down River Road interchange to improve confusion and traffic congestion issues.

Challenges

- Lack of funding for road maintenance and improvement is a state-wide issue.
- The rural environment does not easily support carpool, bus, or alternative transportation forms on a day-to-day basis.
- Local efforts to retain posted speed limits on M-72 within Crawford County may be unsuccessful.
- Commercial and military growth is anticipated.

Issue 4d continued:
Traffic and road network

category: 
priority: **H**
timeframe: 0 1 2 3 4 5 +
strategy type: **Develop-ment**
strategy lead: **Crawford County Road Commission**
stakeholders: **NEMCOG, Camp Grayling, City of Grayling**

ACTION PLAN: TRANSPORTATION STUDY

Strategy 4d.3: Improve the I-75/ North Down River Road interchange

Summary

The existing I-75/North Down River Road interchange causes confusion and traffic congestion issues. Improving the intersection would create a more efficient traffic pattern, particularly for traffic to and from Camp Grayling, as well as create an opportunity for a commercial development.

Recommendations

- Develop and analyze multiple courses of action to address the intersection.
  - Develop a full interchanges by adding southbound ramps to I-75.
- If grant opportunities are identified, solicit assistance for grant writing to fund the project.
- Consider joint or military funding for the project.

Challenges

- The I-75/North Down River Road issue is a community priority, but efforts to obtain funding for this project have not yet been successful. The project cost was estimated at $1.64 million in 2008. This is not a state or federal priority.
- Private residences and the Au Sable River along the west side of I-75 may limit options for development.

category: 
priority: **L**
timeframe: 0 1 2 3 4 5 +
strategy type: **Regulatory**
strategy lead: **Grayling Township, City of Grayling**
stakeholders: **Camp Grayling, Grayling Township**

ACTION PLAN: TRANSPORTATION STUDY

Strategy 4d.4: Create a landmark and a symbolic entrance to Camp Grayling JMTC

Summary

Create a landmark structure at the entrance to Camp Grayling.

Recommendations

- Build an iconic entrance to Camp Grayling to create a better sense of place and connection to the surrounding environs.

Challenges

- Funding for construction.

Issue 4e:
Recreational access

category: 
priority: **H**
timeframe: 0 1 2 3 4 5 +
strategy type: **Outreach**
strategy lead: **Camp Grayling JMTC, Surrounding Communities, MDNR**
stakeholders: **Residents, MDNR**

ACTION PLAN: COMMUNITY OUTREACH
TRANSPORTATION STUDY
INSTALLATION MASTER PLAN
LANDSCAPE PLAN

Strategy 4e.1: Ensure appropriate recreational access and increase public outreach

Recommendations

- Maintain the joint MDNR/Camp Grayling mapping effort instituted by Public Act 288 and publicize the results.
- Open the camp to the public for recreation on set days.
- Consider a land swap to provide public access to rich recreational areas in exchange for other lands more suitable to military training.
- Update the City of Grayling recreation plan in order to support applications for MDNR recreation grants.
- Increase situation awareness at the installation boundary by adding signage, a red-flag system to denote training exercises are ongoing, etc., to mitigate safety issues.
- Communicate public service announcements and closures via various methods, including social media or text updates for interested parties.

Challenges

- Ensuring safety for both military personnel and civilians is critical when the public is allowed access to areas where military operations take place.
- Locked gates are sometimes ignored by the public.

Issue 4f:
Poor road condition

category: 
priority: **M**
timeframe: 0 1 2 3 4 5 +
strategy type: **Regulatory**
strategy lead: **Multiple**
stakeholders: **Residents, Camp Grayling**

ACTION PLAN: TRANSPORTATION STUDY

Strategy 4f.1: Improve road network

Summary

Although road planning and improvements are continually ongoing, overall road condition in the area needs improvement. The poor condition of roads and bridges creates safety hazards for local residents and service members as well as added vehicle maintenance costs.

Recommendations

- Utilize PASER, traffic counts, and traffic crash data to prioritize projects.
- Develop options for an alternate truck route (Four Mile Road to Military Road) in a coordinated effort between Grayling Charter Township and the Crawford County Road Commission.

Challenges

- Funding for road improvements and maintenance is a state-wide and national issue.
- Military, commercial, and tourism growth support economic growth but increase road deterioration.
- Projects may not take place for several years.

Issue 4f:
Poor road condition

ACTION PLAN: TRANSPORTATION STUDY

Strategy 4f.2: Increase funding for road projects and maintenance

Summary

Road projects are costly, and aging roads, culverts, and bridges pose significant maintenance problems throughout the area that cannot all be addressed through the current limited funding availability and streams.

Recommendations

- Align road and infrastructure projects and schedules to save costs.
- Explore ways to monetize summer tourism for road repair projects, such as through a paid parking system in downtown Grayling.
- Pursue a public-private partnership (P3), particularly for areas of new development.
- Investigate funding agreements with the military for county roadway maintenance, such as the Defense Access Road Program.
- Investigate partnerships with major players in the logging industry and wood products industry.

Challenges

- Most of the land (82 percent) in Crawford County is state or federally owned, so funding is hard to come by. Each county receives a uniform amount of money to maintain dirt roads through state lands.
- Taxes or public funding sources are unpopular, and public perception of the causes of road damage may not be conducive to getting people to vote for increased taxes.
- The military and private companies may not be interested in partnerships.

Issue 5a:
Communications/education

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5a.1: Document a comprehensive standard operating procedure (SOP) for communications/community relations at Camp Grayling JMTC

Summary

The person in the position of community relations specialist develops a significant amount of institutional knowledge about effective communications. Changes in staffing over time could result in a loss of that institutional knowledge without comprehensive documentation of communications and engagement processes and procedures. Creating an SOP for communications and community relations at Camp Grayling JMTC will ensure staffing changes don't result in a loss of knowledge or a gap in outreach activities, as well as documentation of the history of existing community partnerships and relationships.

Recommendations

- Draft a comprehensive SOP for communications and community relations at Camp Grayling JMTC, including processes, procedures, key dates, lessons learned, existing community partnerships, evaluation metrics, and future communication goals.
- Share portions of the SOP with important community partners for feedback.
- Submit SOP to Camp Grayling JMTC leadership for review and feedback.
- Establish schedule for regular review and update of the SOP.
- Provide a regular report of communications and educational activities to Camp Grayling JMTC leadership and key community partners, allowing participants to provide recommendations for continuous improvement and expansion of successful activities.

Challenges

- Funding and time limitations to support development of the SOP while meeting the demands of day-to-day communication responsibilities.
- Only one dedicated community relations specialist to meet the communication needs of Camp Grayling JMTC.

Issue 5a continued: Communications/education

category: Outreach | priority: L | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: Camp Grayling JMTC | stakeholders: Residents, Local Media

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5a.2: Use relationship with Blarney Broadcasting as a model for expanding media reach

Summary

Blarney Broadcasting recognized a benefit to listeners by inviting Camp Grayling JMTC staff to provide daily updates on Northern Strike activities and extended this invitation to a year-round weekly update for listeners at no cost to Camp Grayling JMTC. This type of community partnership with local media has the potential to serve as a model for other media partners by providing consumers with information.

Recommendations

- Craft a strategy for improving Camp Grayling JMTC reach into local media, including coordinating one-on-one meetings to discuss how to improve the installation's reach and potential partnerships.
- Develop a case study using the partnership with Blarney Broadcasting to share with other local media.
- Connect with local freelance writers to pitch Camp Grayling JMTC stories.

Challenges

- Local media staffing and budget constraints may affect interest and ability to craft partnerships based on the Blarney Broadcasting model.

category: Outreach | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: Camp Grayling JMTC | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5a.3: Develop a public education program on UXO

Summary

Stakeholders could find historic UXO on public property adjacent to Camp Grayling JMTC from the past 100 years of operation. A public education program focused on identifying UXO, who to contact if it is found, and the historic operations of Camp Grayling would address public safety concerns and inform local residents about the history of Camp Grayling. The program could be developed and implemented in partnership with local organizations, including school districts, Hanson Hills Recreation Area, and businesses.

Recommendations

- Convene a working group to discuss a public education program and possible delivery opportunities, including school, recreation, and business representatives.
- Create educational materials based on format recommendations provided by working group.
- Conduct a pilot educational program to obtain feedback and make adjustments to content as necessary.
- Train key community partners on educational program.
- Distribute materials to key community partners.
- Publicize via Facebook and other media outlets.

Challenges

- Limited time and resources for Camp Grayling JMTC community relations specialist to engage in program development without supplemental staff members.

category: L | priority | timeframe: 0 1 2 3 4 5 + | Research: strategy type | Camp Grayling JMTC: strategy lead | Residents: stakeholders

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5a.4: Ensure web resources include access to Camp Grayling contact information and resources

Summary

Updates to the Camp Grayling JMTC webpage on the Michigan Army National Guard website involve a centralized process coordinated through Lansing. This process hampers the ability to keep the webpage up-to-date. Adding links to Camp Grayling JMTC's Facebook page, editions of Camp Grayling Impact newsletter, and listing the contact information for the Camp Grayling community relations specialist on this webpage will allow stakeholders seeking more in-depth information a way to obtain those resources from the Michigan Army National Guard website.

Recommendations

- Provide Lansing with a request to add links to Camp Grayling Facebook page, as well as editions of Camp Grayling Impact newsletter.
- Engage in a discussion with Michigan Army National Guard Public Affairs staff in Lansing for ideas on how to keep the Camp Grayling JMTC webpage relevant with new educational content and expedite the process for webpage updates.
- Implement strategy to ensure Michigan Army National Guard website reflects broader suite of Camp Grayling JMTC educational resources, including who to contact with questions on specific topics.

Challenges

- Limited Michigan Army National Guard Public Affairs staff in Lansing to implement changes in an expedited manner.
- Limitations on the type of information Michigan Army National Guard is able to post on existing website.

Issue 5b:
Public relations/community involvement

category: M | priority | timeframe: 0 1 2 3 4 5 + | strategy type: Research | strategy lead: Camp Grayling JMTC | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5b.1: Inform community partners on process to request Camp Grayling JMTC tours and participation in community events

Summary

The process for requesting Camp Grayling JMTC group tours and involvement in community events is not publicly available in a clear, comprehensive manner. An effort to make the process and criteria available electronically and in print would help community partners go through the proper channels for these requests and reduce the number of questions that the community relations specialist needs to answer on this topic. Also, look for more ways to let the public view training or arms testing from a safe distance.

Recommendations

- Develop a concise document on the availability of group tours, the tour timeframe and content, and the process for requesting, including lead time necessary to schedule a tour and the necessary request forms.
- Develop a concise document on the availability of Camp Grayling JMTC to participate in community events such as parades and festivals. Include the criteria for events, options for participation (e.g., color guard, speaker, fly over), and provide the necessary request forms.
- Provide overview of the process on Michigan Army National Guard website, Camp Grayling Facebook page, and in the Camp Grayling Impact newsletter.
- Establish a process for emailing or mailing forms and responding to requests.
- Document in an overall SOP for future reference.

Challenges

- Limited time and resources for Camp Grayling JMTC community relations specialist to develop materials without supplemental community relations staff.
- Possible need for review of processes by Michigan Army National Guard Public Affairs staff.

category | priority: H | timeframe: 0 1 2 3 4 5 + | strategy type: Staffing | strategy lead: Camp Grayling JMTC | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5b.2: Expand Camp Grayling JMTC community relations staff

Summary

The current level of staffing for community relations activities may not be sustainable to support the need for more robust public relations and community engagement activities, as well as the need for additional staff to manage unexpected issues that affect the surrounding communities. This has been demonstrated through the need to increase current community relations support with temporary staffing to handle public relations surrounding the groundwater PFAS issue at Camp Grayling JMTC.

Recommendations

- Review community relations staffing in light of community relations needs and goals for Camp Grayling JMTC to identify increased staffing needs.
- Present staffing analysis to Camp Grayling JMTC leadership and Michigan Army National Guard.
- Create alternative staffing plan that identifies how to maximize existing resources and leverage community partnerships to assist in achieving community relations and engagement goals if additional budget is not available to increase community relations staffing levels.

Challenges

- Federal budget limitations to hire additional community relations specialists.

category | priority: L | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: Camp Grayling JMTC | stakeholders: Residents, Chambers of Commerce

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5b.3: Develop an interpretative visitors' center/history center at Camp Grayling JMTC

Summary

Community residents and tourists have voiced an interest in a facility near Camp Grayling JMTC that would provide an educational opportunity and some access to Camp Grayling JMTC facilities. A visitors' center would provide taxpayers with an on-site educational opportunity at a location that would not interfere with training operations or security protocols.

Recommendations

- Develop a visitors' center concept and proposal with Camp Grayling JMTC leadership to present to Michigan Army National Guard leadership for consideration.
- Explore possibility for public-private partnerships and resources to fund a Camp Grayling JMTC visitors' center that would serve as another local tourist attraction.
- Convene local committee to participate in design and development of visitors' center if MIARNG leadership provides preliminary approval to pursue the project.
- Consider involving Camp Grayling JMTC in current museum revitalization project.

Challenges

- Federal and prviate budget limitations to invest in facility development.

5 Camp Grayling JMTC key issues
community partnerships

Issue 5b continued:
Public relations/community involvement

category: Regulatory | priority: H | timeframe: 0 1 2 3 4 5 +
strategy type: Regulatory | strategy lead: Grayling Township, City of Grayling | stakeholders: Developers, Residents, Local Governments

ACTION PLAN: MILITARY OVERLAY ZONE
COMMUNITY OUTREACH

Strategy 5b.4: Revise respective zoning ordinances for governmental entities within the APZ

Summary

Local zoning codes should be updated to restrict height of new structures within the APZs.

Recommendations

- Update zoning codes in all applicable governmental entities.
- Zoning code update will also include a site review component for new structures in the APZ.
- Codify site plan review process, including timeframes.
- Include a reference to Camp Grayling JMTC in site plan review standards in local zoning ordinances.
- Any new structure must undergo review to ensure compliance with new zoning codes.
- Require new facilities to match height limits mandated by the APZ and require site plan review for any new structure built on a property within the APZ.
- Create a survey and registry of any current building that does not meet the new requirements.

Challenges

- Increase of regulatory requirements for residents and businesses.

category: Partnership | priority: M | timeframe: 0 1 2 3 4 5 +
strategy type: Partnership | strategy lead: Camp Grayling JMTC, City of Grayling | stakeholders: Residents, Local Governments

ACTION PLAN: COMMUNITY OUTREACH
INSTALLATION MASTER PLAN
TRANSPORTATION STUDY

Strategy 5b.5: Collaborate on joint-use conference/community center

Summary

Camp Grayling JMTC lacks a conference center on base. The City of Grayling has taken on a feasibility study to look into adding a 500-1,000-person center. The city plans to buy land near the city center and will propose it for the location of the new facility if the feasibility study is favorable.

Recommendations

- Increase local and regional multimodal transportation to allow soldiers on Camp Grayling JMTC to access the new center.
- Partner with Camp Grayling JMTC staff to discuss potential events to host at the center that would benefit residents on- and off-post.

Challenges

- Funding new construction may be difficult.

category: M | priority | timeframe: 0 1 2 3 4 5 +
Outreach (strategy type) | Project Rising Tide, Camp Grayling JMTC (strategy lead) | Residents, NEMCOG (stakeholders)

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5b.6: Convene a Camp Grayling JMTC Community Council

Summary

Camp Grayling JMTC can assist in convening the Camp Grayling JMTC Community Council. This group would leverage community partnerships to support Camp Grayling JMTC with public relations, economic valuation, visiting unit support services, and military family support services. It can capitalize on the work already done by Project Rising Tide in the area and also use the nearby Alpena CRTC Community Council as an example.

Recommendations

- Discuss group membership with Camp Grayling JMTC leadership and key community partners.
- Create a proposal for the formation of the group.
- Convene a planning session to develop a formal strategy for the Camp Grayling JMTC Community Council, including membership, goals, meeting schedule, and priority activities.
- Implement the strategy and evaluate effectiveness over time.
- Report on Camp Grayling JMTC Community Council successes to Camp Grayling JMTC leadership and key community partners.

Challenges

- Existing time demands on Camp Grayling JMTC community relations specialist are many.
- Potential requirements for Michigan Army National Guard to review communications materials developed in conjunction with community partners prior to distribution.

Grayling Township offices.

Issue 6a: Effect on property value mostly perceived as neutral or positive

category	priority	timeframe	strategy type	strategy lead	stakeholders
	M	0 1 2 3 4 5 +	Outreach	JLUS Implementation Committee Rising Tide Initiative	Camp Grayling County Econ. Dev. Lead Local Realtors

ACTION PLAN: MILITARY OVERLAY ZONE
COMMUNITY OUTREACH
ECONOMIC IMPACT STUDY

Strategy 6a.1: Develop communication materials that highlight the potential impacts from Camp Grayling JMTC for future home buyers

Summary

Creating print and online communication materials that local communities and Realtors can provide to prospective home buyers would address stakeholders' concerns about a lack of transparent information about the potential impacts from Camp Grayling JMTC that local homeowners might experience due to training operations. In addition to communicating about potential negative impacts such as noise and wildfire, communication materials should also highlight the positive impacts of Camp Grayling on property values, such as benefits to the local economy.

Recommendations

- The JLUS Implementation Committee (made up of members from Camp Grayling JMTC, property owners, Project Rising Tide, Gaylord and Grayling Chambers of Commerce) and Realtors will work together to craft information for electronic and printed formats that highlights potential impacts of living near Camp Grayling JMTC.
- Tailor materials to highlight impacts specific to different communities because of the variations in effects.
- Distribute draft informational materials to local stakeholders for review and comment.
- Distribute final informational materials to Realtors, Chambers of Commerce, homeowners associations, libraries, and other community organizations for distribution to residents and prospective home buyers.

Challenges

- Implementation requires stakeholder buy-in; there may be differences in opinion about level of information to provide about Camp Grayling JMTC operations in materials.
- Distribution would be voluntary, and stakeholders may choose not to share information, depending on level of support for the project.

Issue 6b: Significant contributor to local economy

category	priority	timeframe	strategy type	strategy lead	stakeholders
	H	0 1 2 3 4 5 +	Research	Camp Grayling JMTC	Residents Grayling Fire Dept County Econ. Dev. Lead

ACTION PLAN: FIRE PROTECTION AGREEMENT
ECONOMIC IMPACT STUDY

Strategy 6b.1: Fire protection services needs study

Summary

Camp Grayling JMTC has contracted with the Grayling Fire Department for structural fire suppression. Local stakeholders feel there is a need to reassess the current levels of contracted services given the changes in Camp Grayling JMTC. Conducting a fire protection services needs study will determine if the current levels of service are adequate.

Recommendations

- Review Adaptation Planning for Climate Resilience report and implement recommendations related to supporting community-wide cooperative fire protection efforts, especially in areas where wildfire risk may be exacerbated by climate change, specifically working with the City of Grayling to secure funding for long-term structural fire protection, including personnel and equipment. (http://www.resilientmichigan.org/downloads/final_report_miang_web.pdf)
- Address additional Grayling Fire Department personnel for structural fire suppression as part of the 5-year update to the 2014 Crawford County Hazard Mitigation Plan and incorporate Camp Grayling JMTC seasonal demographic information under economic impact, as well as include Camp Grayling JMTC as a partner in developing and implementing this plan. (http://www.discovernortheastmichigan.org/docview.asp?did=430)
- Contract for an independent fire services needs study using local and Camp Grayling JMTC resources.
- Seek grants to fund study via NEMCOG and/or coordinate with Camp Grayling-funded study.
- Reevaluate the current contract and, if necessary, modify the contract based on the findings of the study.

Challenges

- If Camp Grayling JMTC increases its own fire protection services or there are budget cuts from Lansing, there could be a loss of fire protection jobs in Grayling Fire Department.

Grayling Fire Department.

6 Camp Grayling JMTC key issues
economic development

Issue 6b continued:
Significant contributor to local economy

category: $ | priority: M | timeframe: 0 1 2 3 4 5 +
strategy type: **Outreach** | strategy lead: **Camp Grayling JMTC** | stakeholders: **Grayling Business Owners, County Econ. Dev. Lead**

ACTION PLAN: ECONOMIC IMPACT STUDY

Strategy 6b.2: Local purchasing goal for Camp Grayling JMTC

Summary

Local purchasing goals for Camp Grayling JMTC would help establish an operating norm that acknowledges the importance of Camp Grayling JMTC on the surrounding economies regardless of changes in Camp Grayling leadership.

Recommendations

- Work with MIARNG leadership in Lansing to identify and set local purchasing goals for Camp Grayling JMTC for goods and services not subject to federal and state contracting laws to demonstrate commitment to economic development of surrounding communities.
- Track and report progress toward local purchasing goal for goods and services that are not subject to federal and state contracting laws to help quantify annual impact on local economy.
- As possible, inform chambers of commerce and local businesses know when troops will be in the local area.

Challenges

- Federal law controls contracting requirements, which often awards contracts to the lowest bidder.
- May be difficult due to the contracting requirements for goods and services over a certain dollar amount.

category: $ | priority: M | timeframe: 0 1 2 5+ 4 3
strategy type: **Outreach** | strategy lead: **City of Grayling** | stakeholders: **Grayling Business Owners, County Econ. Dev. Lead, Gaylord, Michigan Works!**

ACTION PLAN: TRANSPORTATION STUDY
ECONOMIC IMPACT STUDY

Strategy 6b.3: Expanded public transportation from Camp Grayling JMTC to surrounding communities to support military tourism

Summary

Additional public transportation options, such as a partnership with Gaylord public transportation services, or an extended schedule for Crawford County Transportation Authority Dial-A-Ride could allow trainees to shop, eat, and use local services within communities surrounding Camp Grayling JMTC. This would promote military tourism and increase the economic contributions of Camp Grayling JMTC to local communities.

Recommendations

- Survey Camp Grayling JMTC about public transportation needs and share results with Gaylord public transportation providers and Crawford County Transportation Authority Dial-A-Ride. Continue partnerships and conversations already in progress.
- Coordinate a discussion session to identify challenges with expanding Dial-A-Ride services and identify other possible options for expanding public transportation services from Camp Grayling JMTC to local communities.
- Participate in larger community-wide discussions about expanded Dial-A-Ride and other public transportation services through implementation of Project Rising Tide economic development strategy.
- Consider a pilot program with expanded Dial-A-Ride or other public transportation service and track both usage and economic impact.

Challenges

- Limited staffing resources at Crawford County Transportation Authority Dial-A-Ride may limit ability to expand schedule.
- Limited funding resources to implement Project Rising Tide economic development strategy.
- Soldiers have limited free time during training.

category: $ | priority: L | timeframe: 0 1 2 3 4 5 +
strategy type: **Development** | strategy lead: **Camp Grayling JMTC** | stakeholders: **Grayling Township, Camp Grayling, FAA, MDOT, County Econ. Dev. Lead**

ACTION PLAN: INSTALLATION MASTER PLAN
ECONOMIC IMPACT STUDY

Strategy 6b.4: Increase public use of the Grayling AAF

Summary

Expand commercial and/or general aviation uses at the Grayling AAF.

Recommendations

- Foster ongoing dialog with Camp Grayling JMTC airfield manager.
- Utilize the current remediation of runways as a way to promote an increase in both general and commercial aviation use.
- Reach out to airlines about the addition of commercial flights to the airfield.

Challenges

- Convincing an airline that commercial flights are economically viable.
- Coordinating nonmilitary aviation with military operations and security issues associated with a military-owned and -operated airfield.

Issue 6c:
Economic incentivizing and monitoring

ACTION PLAN: ECONOMIC IMPACT STUDY

Strategy 6c.1: Economic tracking and reporting mechanisms to quantify annual military tourism impact

Summary

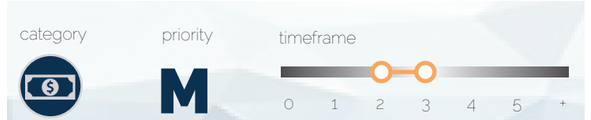
Quantifiable economic data on how dollars flow from soldiers training at Camp Grayling JMTC into surrounding communities would help communicate the contributions Camp Grayling JMTC makes to the local economy. This type of information would assist in communicating the benefits of Camp Grayling JMTC to current residents, prospective home buyers, and decision makers at the local, state, and federal levels.

Recommendations

- Conduct benchmarking research on other Army National Guard and training installations' efforts to track economic impact of operations on local communities.
- Convene a brainstorming session to share benchmarking results and identify potential economic tracking mechanisms to monitor the spending flow from Camp Grayling JMTC trainees in local communities. Mechanisms discussed during the JLUS process include a survey of Camp Grayling JMTC soldiers during their stay with an incentive to participate or a Camp Grayling JMTC discount card accepted at local businesses.
- Identify the most feasible tracking mechanisms from the brainstorming session and develop a monitoring plan and reporting schedule.
- Share information about the economic monitoring initiative with Camp Grayling JMTC soldiers and families.
- Collect data and analyze findings.
- Report to key stakeholders participating in brainstorming session.
- Identify next steps to adapt the monitoring approach based on findings.
- Prepare informational materials to share findings with media, decision makers, and other key stakeholders.
- Consider forming a group like Target Alpena Economic Development Corp. to handle this strategy and involve community partners.

Challenges

- Resource limitations to support economic monitoring mechanism development and implementation over time.
- Potential lack of widespread participation in tracking that will limit the ability to comprehensively quantify military tourism spending flow.



ACTION PLAN: ECONOMIC IMPACT STUDY

Strategy 6c.2: Economic incentives to generate military tourism

Summary

Soldiers at Camp Grayling JMTC often bring family members into the area during training exercises. Local businesses will benefit if surrounding tourism bureaus work to create incentives for soldiers' families to extend their stay in the area before or after training. Discounts or vacation packages could create incentives that expand military tourism associated with Camp Grayling JMTC.

Recommendations

- Convene a working session among tourism bureaus and local business representatives to identify possible incentives for trainees and their families
- Identify and develop most feasible incentives.
- Create marketing campaign to promote incentives in partnership with Camp Grayling JMTC.
- Create an identifier for businesses that give military discounts, such as a window sticker with a logo.
- Monitor incentive effectiveness.
- Report findings to work group.
- Adapt incentives based on findings.

Challenges

- Resource limitations to support working group efforts and campaign to market incentives.

1 Alpena CRTC key issues
noise

Issue 1a:
Training/aircraft operations are too low/fast

Strategy 1a.1: Educate the public on the flight paths used for military aircraft

Summary

Training for fighter jet aircraft is often conducted at high speeds and low altitudes due to the necessity of pilots being able to operate under those conditions when in wartime situations that require detection avoidance for close air support activities. These activities, that are often considered dangerous to non-participating aircraft, are directed by criteria to be conducted within SUA like designated and activated MOAs. The MOA over Alpena and the surrounding area is called the Pike West MOA and it is established between a floor of 6,000 feet above MSL and a ceiling of 18,000 feet above MSL. Over Lake Huron exists the Pike East MOA, which is established with a floor of 300 feet above ground level (or surface of the water) and a ceiling equal to the Pike West MOA. This suggests that low altitude training is conducted over Lake Huron or at altitudes well above disturbing levels.

This does not however, include the need for take-off and landing from Alpena County Regional Airport, which by its nature requires low altitude flight near the airfield. These activities are typically conducted at the slowest speeds possible. Jet traffic also occurs along what are know as MTRs, when pilots need to transit from one place to another. These routes exist at 500 feet AGL for slow speed visual flight rules (VFR) flight and between 1,500 feet above MSL to 18,000 feet above MSL for fast movers. That altitude is high enough to effectively eliminate the disruption.

Recommendations

- Identify specific locations of stated disruption and determine the reason for those flights, what altitudes, velocities and types of aircraft are flying. Acquiring tail identification of the aircraft, aircraft type, date and time of the incident will allow for more specific identification in order to determine the purpose of those flights. This data can then be used to evaluate the need for changes to operating procedures or the need for change of flight paths.
- Completion of a noise study as described in Camp Grayling JMTC Strategy 1a.1 will also help determine trouble spots and potential encroachments on military training areas.

Strategy 1a.2: Discourage residential uses via zoning

Summary

Residential encroachment around airports and other military training areas, ensures conflict between these incompatible land uses. Establishing military and airfield overlay zone regulations will help reduce encroachment of incompatible land uses near these activities, identified as disturbing to residents.

Recommendations

- Community leaders should review existing zoning regulations and establish or bolster military and airfield overlay zones designed to prevent conflict between incompatible land uses. These zones should restrict land use around airports and military installations to industrial or agricultural uses and strictly disallow residential, commercial, or community functions.

Additional Information

Noise contours and airfield imaginary surface maps should be used when establishing the boundaries of these restrictive overlay zones. The 65 ADNL noise contour should establish the closest proximity that residential neighborhoods should be allowed near airports. Also, no residences should be allowed within clear zones or accident potential zones or within the approach departure corridors of the major runways.

Strategy 1a.3: Work with FAA and Alpena Regional Airport to control aircraft flight paths

Summary

The FAA, airport air traffic controllers, and military operations personnel regularly work to define flight paths of air traffic as a means to deconflict disturbance to citizens living near areas of operation. Input from residents on known disturbance areas, types of disruption, times, altitudes, etc. can help them better adjust to the needs of the community.

Recommendations

- Community leaders working with the controlling entities should hold regular townhall-style meetings to discuss air traffic as it relates to disturbances identified in the community. This will give valuable data to controllers and give residents an opportunity to air their grievances.
- Airport noise abatement procedures (NAPs) should be reviewed and adjusted to reduce disturbances.
- Completion of the noise study recommended in Alpena CRTC Strategy 1a.6 will provide necessary information for decision making and evaluation of complaints.
- For specifically identified sensitive areas, work with officials from Alpena CRTC to evaluate operations to see if changes can be made that would allow for a higher floor level over the identified location. If acceptable, work with installations, airspace managers, and the FAA to alter navigational charts and procedures to establish no-fly zones with a floor of 1,500 feet above MSL or higher.

Issue 1a continued:
Training/aircraft operations are too low/fast

category | priority | timeframe (0 1 2 3 4 5 +) | **Regulatory** strategy type | **NEMCOG Planners** strategy lead | **Residents** stakeholders

ACTION PLAN: MILITARY OVERLAY ZONE

Strategy 1a.4: Create a military overlay zone for Alpena CRTC

Summary

Given the relative distance between the City of Alpena and the Alpena CRTC, operational interaction between the two has been limited. There are, however, still areas of low-density development that surround the Alpena CRTC that could be affected by its operations.

Applying an overlay zone that does not allow for new residential or commercial development in the APZ associated with the Alpena County Regional Airport and Alpena CRTC is recommended. The overlay zone should restrict all residential and commercial development within the APZ. Further study should be completed to determine the intensity of uses allowed in the overlay zone. For example, the study should examine whether light industrial uses such as a personal storage facility could be allowed or if the zone should be more restrictive and only allow for agricultural uses.

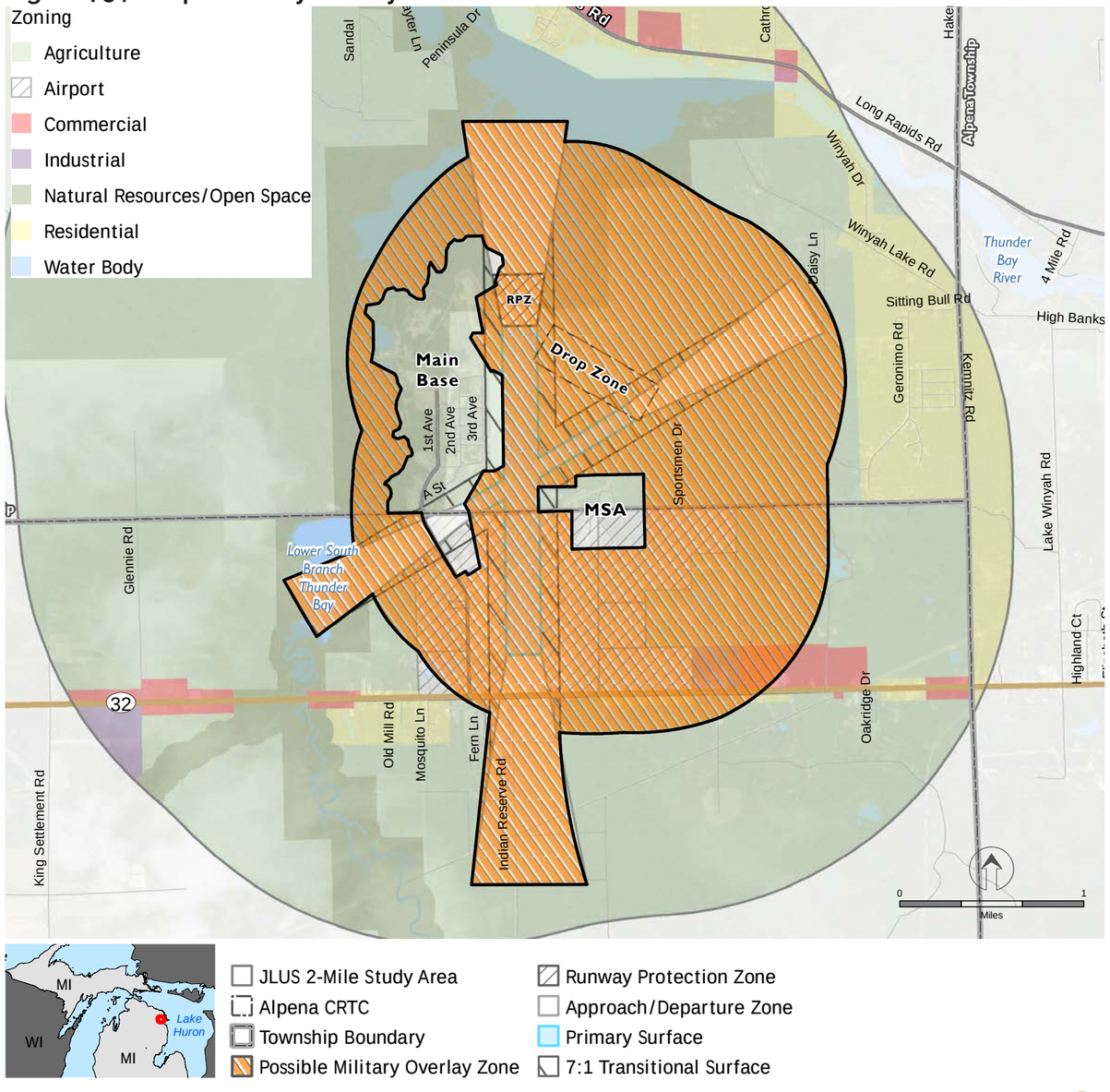
Creation of an overlay zone will help protect the residents and business already in the area, and it will help limit the amount of new development that could encroach on Alpena CRTC in the next 5 to 30 years. The new Alpena overlay zone will be created with the following elements:

- **ACCIDENT POTENTIAL ZONES (APZS):** Currently the APZs have minimal amounts of development, however, future denser development that could occur will need to be addressed with additional regulation that match FAA height restrictions.
- **MUNITIONS STORAGE AREA (MSA):** Given the highly explosive and volatile nature of munitions the overlay zone will include a one-mile buffer that will surround the MSA. This portion of the overlay zone will likely include use restrictions due to the nature of the storage area.
- **DROP ZONE/NOISE:** Operations in this area could be of issue and necessitate the creation of a one-mile buffer in this area. The main issue will be noise not only in the drop zone area, but throughout the other parts of the CRTC. A noise study will need to be conducted in the future to help refine the boundaries of this part of the overlay.

Recommendations

- Language for the overlay zone should be drafted by a legal team specializing in land use law and code development. The legal team will review the zoning for any potential takings. If a taking is identified, funds for reimbursement would be established.
- Work with community leaders such as city and county planning departments to change zoning maps and codes to identify the areas around military installations and ranges as military overlay zones. Use noise contour data as defined in Strategy 1a.5 and new data once noise study is complete to define the extent of the overlay zone following guidance for acceptable noise levels per function. Establish restrictions that only allow compatible land uses in these zones.
- Include a reference to Alpena CRTC in site plan review standards in local zoning ordinances.
- Consider establishing similar restrictions under known flight paths (see Strategy 1a.3), keeping in mind that flight paths may change to suit different types of military training in the future.
- Establish zoning overlays for airport runway clear zones that extend beyond the border of the installation. These should restrict all development so as to adhere to the applicable airfield criteria.

Figure 4.5 | Sample Military Overlay Zone



1/2 Alpena CRTC key issues noise/military operations

Issue 1a continued:

Training/aircraft operations are too low/fast

category: Noise | priority: M | timeframe: 0 1 2 3 4 5 +

strategy type: **Regulatory** | strategy lead: **City/county** | stakeholders: **Residents, Alpena CRTC**

ACTION PLAN: MILITARY OVERLAY ZONE NOISE STUDY

Strategy 1a.5: Update building codes to include better sound proofing for buildings built within the 65 ADNL noise area

Summary

Update local building codes so that the noise level within structures that exist within the 65 ADNL area can be reduced to optimal noise levels.

Recommendations

- Update building codes for applicable governing entities.
- Create incentives for existing buildings to update their soundproofing.
- Optimize available federal funding for sound abatement.

Challenges

- Creating increased soundproofing could cause an increase in price for new structures.
- Developers may be unwilling to build in areas where soundproofing is required as a response to the increase in regulations.
- Monetary aid for existing residents to upgrade their structures could be limited and may not be enough to cover the full costs.

category: Military | priority: H | timeframe: 0 1 2 3 4 5 +

strategy type: **Research** | strategy lead: **Alpena CRTC** | stakeholders: **NEMCOG, Residents**

ACTION PLAN: MILITARY OVERLAY ZONE NOISE STUDY

Strategy 1a.6: Conduct an AICUZ study

Summary

The noise analysis provided by Alpena CRTC in support of the JLUS is part of the Alpena CRTC 2016 IDP EA. "NoiseMap" is the name of the model within the Air Force that generated the noise contours. An AICUZ study will need to contain noise compatibility and CZ analysis. The assessment from the EA provides a basis for assessing noise and land use impacts from noise at the airport form the IDP projects. It is not an AICUZ but is a good starting point for a plan. The EA noise assessment could be combined with an APZ assessment as shown for Camp Grayling. That information along with land use parcel data can be used to develop an AICUZ plan since the data is, the time of publication of the final JLUS, less than 5 years old.

This data could be used to inform and direct guidance for changes to military and installation operations or to create zoning regulations to prevent encroachment.

Recommendations

- Contract the collection and analysis of providing ADNL contours for the entire region, specifically including areas that have been identified as bothersome to community members.
- Use that information when making zoning regulation changes to eliminate residential, commercial or service functions from being sited within the 65 ADNL contour.
- Work with the military to alter training activities so as to reduce the noise impact to existing sensitive areas where possible. Note: In many cases, existing ranges cannot be relocated or inactivated because of economic and logistical reasons.
- Provide residents already living within the 65 ADNL contour with information about how to mitigate noise (see Strategy 1a.2).
- GIS of the APZs will need to be obtained along with the GIS for the noise contours. A precise analysis of incompatible land use can be completed during the implementation phase of the JLUS when GIS data layers are made available

Issue 2a:

Live munition impacts to Lake Huron

category: Military | priority: H | timeframe: 0 1 2 3 4 5 +

strategy type: **Research** | strategy lead: **NEMCOG** | stakeholders: **Alpena CRTC, NEMCOG Community, NOAA**

ACTION PLAN: BATHYMETRIC SURVEY ENVIRONMENTAL IMPACT STUDY INTERAGENCY COORDINATION

Strategy 2a.1: Identify impacts to the environment

Summary

For many years, possibly as early as WWI or prior, live munitions have been hurled into Lake Huron. Through the establishment of the Lake Huron Marine Sanctuary and subsequent research and investigation, many shipwrecks and debris from military activities have been identified. This includes recent finds of unexploded munitions on the lake bed. The activity of firing munitions, albeit necessary for training, will result in changes to the environment.

Recommendations

- Work with the NOAA ONMS, Thunder Bay National Marine Sanctuary, the EPA, and the State of Michigan to contract a study of the environmental impact of military training activities over and within the R-4207 range on wildlife, historic and archaeological preservation, recreation, commercial uses of the lake, and military training requirements.
- The CRTC in conjunction with the US Navy and US Coast Guard should conduct a survey of the waters in and surrounding the range to determine if any UXO or dangerous conditions exist. These areas at the very least should be identified and protected from accidental or intentional intrusion with focus on the adjacent Marine Sanctuary, where a great deal of underwater activity occurs.

Issue 2b:
Northern Strike activity

ACTION PLAN: COMMUNITY OUTREACH

Strategy 2b.1: Organize and engage community members in advance

Summary

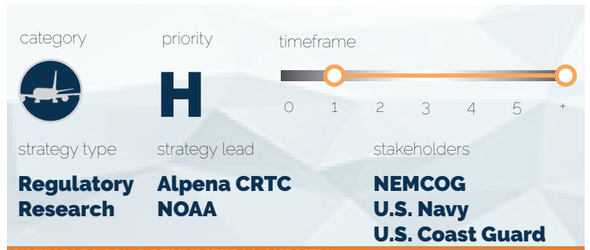
The annual Northern Strike military exercise, and others like it, bring large numbers of military and associated civilian personnel, equipment, aircraft, vehicles and activity to the region. These events bring a much-needed boost to the local economy and are embraced by the community.

However, the community should plan and prepare for the event as thoroughly as the military does. This should involve dissemination of information about events, shared activities, services offered and help wanted. They should prepare briefings and informational packages for military personnel to help them find what they are after and educate them on how to avoid areas that should be off-limits to military personnel. The community-military partnership is key to a successful event of this magnitude. Getting the community involved and engaged will help them reduce the negative impacts while more directly realizing the benefits.

Recommendations

- Organize and engage community members and leadership in preparing for these events well in advance. Invest in making the events more profitable to the community.
- Work with all the relative factions of the military to educate them on what is available, allowed, unwanted, etc. about these events. And likewise, get educated by them on what their needs are so as best to prepare for the event.
- Hold a townhall style meeting with members of the community and military well in advance of these events to provide information about the event so as to educate all and share ideas to make the events more successful for everyone involved.
- Add key community members to distribution list, including Alpena Chamber of Commerce.

Issue 2c:
Marine sanctuary



ACTION PLAN: BATHYMETRIC SURVEY
INTERAGENCY COOPERATION

Strategy 2c.1: Identify potential UXO on the lake bed

Summary

Because military training has been conducted over Lake Huron for decades, there is a potential for unexploded ordnance to exist outside the boundaries of the current training range. This possibility posses a risk to human exploration of the Marine Sanctuary and could impact its proposed expansion.

Recommendations

- Complete a baseline review or environmental analysis of the area and research historic operations in the area.
- Work with the military (Alpena CRTC, Navy and Coast Guard) to identify potential UXO on the lake-bed. This should be in conjunction with the study proposed in Issue 2a.1. If any evidence is found, mitigate findings as best as possible. If anything dangerous is found at a depth that could threaten safety, a DOD team can be brought in to mitigate the UXO.

ACTION PLAN: MILITARY OVERLAY ZONE
NOISE STUDY

Strategy 2c.2: Establish fixed boundaries so that encroachment into the military operations area is kept to a minimum

Summary

The Lake Huron Marine Sanctuary encompasses areas that are used by the military for bombing exercises, and the boundary was recently expanded.

Recommendations

- Create a bathymetric survey of the Marine Sanctuary and bombing areas.
- Identify areas in Lake Huron that will be used for bombing training and preservation.
- Update navigational/aeronautical maps of Lake Huron to reflect bombing areas and the Marine Sanctuary.
- Continue to fund economic analyses with a focus on the primary areas used for bombing. Seek alternate funding from other entities besides the National Guard Bureau.
- Codify SOPs regarding identifying sanctuary artifacts, both manmade and biological.
- Coordinate NGB/NOAA efforts and communication.

Challenges

- Surveys will be costly, time consuming, and hard to fund.

2/3 Alpena CRTC key issues
military operations/environmental

Issue 2c continued:
Marine sanctuary

ACTION PLAN: COMMUNITY OUTREACH
ENVIRONMENTAL IMPACT STUDY
INTERAGENCY COOPERATION

Strategy 2c.3: Author and promote cooperation story with Thunder Bay National Marine Sanctuary

Summary

The DOD Alpena CRTC practice bombing range lies just east of the 4,300 square mile NOAA – State of Michigan Thunder May National Marine Sanctuary. Interagency cooperation has developed since the 2014 Sanctuary expansion and includes sharing vessels for dive platforms and other cooperative activities. The Air Force/Air National Guard work in close cooperation with Sanctuary personnel to maintain the integrity of preserved sites and the ecology within the Sanctuary. The public has expressed concerns about the effects of UXO on both water quality/ecological health of Lake Huron and the effects of practice bombing on the archaeological sites in the Sanctuary.

Recommendations

- Create story content on interagency cooperation, including maps and anecdotes about actual activities such as sharing vessels for towing targets and as dive platforms. Also, explain safety and environmental health risks associated with munitions use in the lake to educate the public.
- Provide a base webpage link to MDEQ. Distribute story via web link on base home page and have available script for public meetings and outreach.
- Work with MIANG public affairs to further publicize work being doing at the sanctuary.

Challenges

- Requires personnel time to create narrative.

Additional Information

The Sanctuary works with community partners including the CRTC to improve public safety on and below the water. The Sanctuary has participated in diving and boating accident drills designed to test emergency responses from several agencies, including the U.S. Coast Guard, Alpena Combat Readiness Training Center, Alpena Central Dispatch, Alpena County Sheriff's Department, Michigan Department of Natural Resources, Mid-Michigan Medical Center-Alpena, and Alpena Fire Department. NOAA personnel who can help develop the cooperative story.

NOAA also produces joint education programs and other activities that could be promoted more widely.

Issue 3a:
PFOS and PFOA contamination of groundwater

ACTION PLAN: COMMUNITY OUTREACH
ENVIRONMENTAL IMPACT STUDY

Strategy 3a.1: Improve public outreach and access to information

Summary

Residents near the Alpena CRTC are concerned about the safety of their drinking water since the detection announcements in 2017. The health effects and extent of contamination are still being researched and are not completely understood, which contributes to citizen concern about health and economic impacts. Continuing and improving ongoing communications between Alpena CRTC and surrounding residents through public meetings, print and electronic media, and MDEQ call center assistance will help provide updated information, mitigate uncertainties, and ensure that those affected have access to exposure mitigation options while enhancing public relations.

Recommendations

- Maintain the links on the Alpena CRTC home page to Michigan.gov PFAs contamination information pages and EPA PFA/PFC information pages, and consider adding some summary status information associated with the link.
- Increase non web-based outreach to residents.
- Continue to hold frequent town hall public meetings during the monitoring project.
- Increase transparency about how wells are selected for testing.
- Consider staff increases at Alpena CRTC to help with outreach.
- Leverage existing water quality program and publicize its benefits.

Challenges

- Efforts may require dedicating additional personnel time to update the base website content, create information sheets, and coordinate print campaigns.

PFOS/PFOA Information

More information is available at https://www.michigan.gov/pfasresponse

If any resident has additional questions regarding this issue, the MDEQ Environmental Assistance Center can be contacted at 1-800-662-9278 or email deq-assist@michigan.gov. Representatives may be reached to assist with your questions Monday through Friday, 8:00 AM to 4:30 PM.

Issue 3b:
Surface water quality (lakes, rivers, streams, wetlands)

category: leaf | priority: H | timeframe: 0 1 2 3 4 5 +
strategy type: **Outreach** | strategy lead: **Alpena CRTC** | stakeholders: **MDEQ, Residents**

ACTION PLAN: ENVIRONMENTAL IMPACT STUDY
INTERAGENCY COOPERATION

Strategy 3b.1: Support water quality and aquatic ecology scientific communications

Summary

Public interest in water quality and aquatic ecological health is spurred by topics such as chemical contamination, fish advisories, nutrient pollution, sedimentation, climate change, habitat loss, and invasive species. There is a wide range of research and data available describing water quality, sediment quality, and the health of aquatic environments and species, but it can be challenging for citizens to identify and access appropriate and accurate information to satisfy questions and concerns. Sometimes there are public misperceptions about the location and sources of contamination, including incorrectly attributing causes to base operations.

Recommendations

- Develop an information link on the base home page that summarizes facts and organizes resource links concerning surface water quality and aquatic ecological health in Alpena CRTC watersheds.
- Include a narrative on overall water quality and aquatic ecological health as prepared response for public meetings concerned with PFOS groundwater contamination.
- Reconvene the 2004 Thunder Bay Watershed Initiative to develop a Thunder Bay Regional Water Master Plan.

category: leaf | priority: H | timeframe: 0 1 2 3 4 5 +
strategy type: **Regulatory, Research** | strategy lead: **Alpena CRTC** | stakeholders: **NOAA**

ACTION PLAN: ENVIRONMENTAL IMPACT STUDY
INTERAGENCY COOPERATION

Strategy 3b.2: Use biodegradable targets for lake training

Summary

Alpena CRTC operations have begun using biodegradable targets for munitions operations over Lake Huron. In 2017, they also began retrieving the targets that were not destroyed or sunk.

Recommendations

- Continue current practices and research ways to improve.
- Consult with NOAA for more ideas on how to increase sustainability.

Issue 3c:
Groundwater quality

category: leaf | priority: M | timeframe: 0 1 2 3 4 5 +
strategy type: **Outreach** | strategy lead: **Alpena CRTC** | stakeholders: **Residents, MDNR**

ACTION PLAN: COMMUNITY OUTREACH
ENVIRONMENTAL IMPACT STUDY

Strategy 3c.1: Provide information to the public on groundwater contamination in the Alpena CRTC area

Summary

Groundwater contamination in the Alpena CRTC area results from exposure to a wide range of toxic compounds, chemicals, metals, and petroleum byproducts that are introduced into soils and groundwater from industrial, manufacturing, and transportation activities. While the PFA contamination issue receives the most attention, public comments from town hall meetings have demonstrated concern with groundwater contamination from other sources, with specific concerns expressed about contamination from munitions. Munitions are expended at the small arms range facility at Alpena CRTC; however the primary training is done at the ranges at Camp Grayling JMTC and over Lake Huron.

Recommendations

- Provide a base webpage link to MDEQ information regarding groundwater contamination – this should include the link to DEQ Online Services, which includes their Environmental Mapper utility.
- Provide current bulletins on spills and plume status (as available) for any sites on base in a bulleted format via website and as a script for public inquiries.
- Create a chart of known sites for specific pollutants, potential pollution sites, and steps the base takes to mitigate hazards.

Challenges

- Requires personnel time to maintain bulletins and webpage.

4 Alpena CRTC key issues
transportation and infrastructure

Issue 4a:
Effects of growth on utilities

Strategy 4a.1: Address utilities issues at Alpena CRTC

Summary

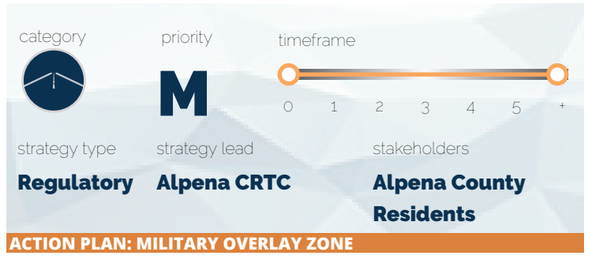
In accordance with the Alpena CRTC Installation Development Plan, projects to address aging and insufficient systems in order to accommodate current and possible future missions should be funded and executed.

Recommendations

- Upgrade the water distribution system and add a booster pump.
- Develop an agreement with Alpena Township to address maintenance issues.

Challenges

- Energy improvements and ensuring service may be dependent on private companies in some cases.
- Funding is inadequate to replace infrastructure.



Strategy 4a.2: Plan for possible mission expansion

Summary

The utility requirements of additions to or expansion of training missions should be investigated and integrated into existing installation plans.

Recommendations

- Update the existing energy assessment.
- Align growth with existing sustainability and net-zero plans, which may include implementation of new sources of renewable energy.
- Educate public on potential for mission expansion and share NGB vision for the future of Alpena CRTC.

Challenges

- Energy improvements and ensuring service may be dependent on private companies in some cases.
- Turnover at the installation can be problematic for long-term planning efforts.

Issue 4b: Airport joint ownership/land use access

Strategy 4b.1: Continue positive coordination

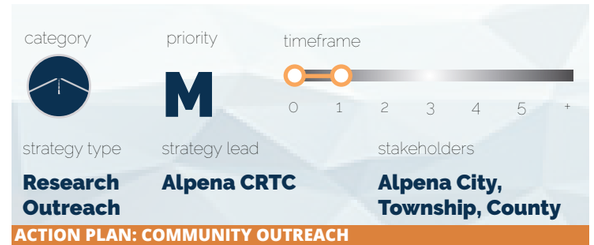
Summary

A long-term lease is in place for the National Guard use of the Alpena Regional Airport. Collaboration between the entities ensures strong relationships and coordinated planning efforts in the future.

Recommendations

- Continue Airport Committee monthly meetings.
- Coordinate regular updates with the military and public regarding the terminal construction.
- Continue to weigh effects on military operations when considering economic development opportunities related to the airport and nearby land uses.
- Consider updating the airport master plan.

Issue 4c:
Road funding



Strategy 4c.1: Continue discussion between county and military officials

Summary

Road condition in the surrounding community affects military residents traveling to and from Alpena CRTC on M-32. Funding solutions that support Alpena CRTC and the community should be studied. While the military is unlikely to be able to fund road improvements, Alpena CRTC could provide publicity for the issue and potentially speak to the governor's office about the issue.

Recommendations

- Investigate funding options for improvements.
- Develop materials for public outreach campaign.
- Set regular meetings with the governor's office and MIANG personnel to discuss such issues.
- Communicate military transportation projects with local officials.

Challenges

- Funding for road improvements and maintenance is a state-wide issue.

transportation/community partnerships

Issue 4d:
Road condition

category: Funding
priority: H
timeframe: 0 1 2 3 4 5 +
strategy type: Funding
strategy lead: County/City/Township
stakeholders: Residents

ACTION PLAN: TRANSPORTATION PLAN

Strategy 4d.1: Increase funding for road projects and maintenance

Summary

Road projects are costly, and aging roads and bridges pose significant maintenance problems throughout the area that cannot all be addressed through the current limited funding availability and streams.

Recommendations

- Align road and infrastructure projects and schedules to save costs.
- Update the Alpena Area-Wide Transportation Plan.
- Utilize PASER, traffic counts, and historical traffic accident data to prioritize projects.
- Pursue a public-private partnership (P3), particularly for areas of new development.
- Investigate funding agreements with the military for county roadway maintenance.

Challenges

- Grant proposals take time and money to develop and do not always yield funding.
- The military and private companies may not be interested in partnerships.

Issue 4e:
Recreational access

category: Research
priority: L
timeframe: 0 1 2 3 4 5 +
strategy type: Regulatory Research
strategy lead: Alpena CRTC/ Alpena Airport
stakeholders: Residents MDNR

ACTION PLAN: ENVIRONMENTAL IMPACT STUDY TRANSPORTATION PLAN

Strategy 4e.1: Determine whether allowing lake access is viable

Summary

Allowing public access to Lake Winyah's southern side would increase opportunities for local and tourist recreational activities such as kayaking and fishing.

Recommendations

- Determine whether there are any security or ATFP issues associated with allowing access near Alpena CRTC.
- Invite public participation in the process to ensure voices are heard and all issues are communicated.
- Publicize any future access to draw tourists and base personnel to increased recreational opportunities.

Challenges

- Any potential development must be coordinated with ATFP and security officials as well as airport officials.

Issue 5a:
Communications/education

category: Outreach
priority: H
timeframe: 0 1 2 3 4 5 +
strategy type: Outreach
strategy lead: Alpena CRTC MIANG
stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5a.1: Hire a dedicated community relations specialist for Alpena CRTC

Summary

Comprehensive and timely communication with community residents and other key stakeholders is a challenge without a dedicated community relations specialist for Alpena CRTC. Communicating controversial issues, such as concerns about groundwater contamination, magnifies this challenge. A dedicated community relations specialist will allow Alpena CRTC to create and implement a robust communications and public relations strategy.

Recommendations

- Review community relations and communication needs for Alpena CRTC. Discuss with community relations specialist at Camp Grayling JMTC for benchmarking and planning insight.
- Present communications and community relations needs to Michigan Air National Guard in Lansing for consideration.
- Once a specialist is in place, develop and implement a multifaceted communications strategy for Alpena CRTC.

Challenges

- Federal budget limitations to hire a community relations specialist to support more robust efforts.

category: Outreach
priority: M
timeframe: 0 1 2 3 4 5 +
strategy type: Outreach
strategy lead: Alpena CRTC MIANG
stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH

Strategy 5a.2: Improve the update process for Alpena CRTC website

Summary

Updates to the Alpena CRTC website are centralized through the Michigan Air National Guard website and involve a centralized process coordinated through Lansing. This process can hamper the ability to keep the webpage up to date. Alpena CRTC staff can work with the Michigan Air National Guard to explore ideas for expediting and streamlining the process for website updates.

Recommendations

- Engage in a discussion with Michigan Air National Guard Public Affairs staff in Lansing for ideas on how to keep the Alpena CRTC webpage relevant with new educational content and expedite the process for webpage updates.
- Ensure the Alpena CRTC website reflects a broader suite of informational and educational resources for a community audience, rather than just potential visiting units.

Challenges

- Limited Michigan Air National Guard Public Affairs staff in Lansing to implement changes in an expedited manner.
- Michigan Air National Guard social media and website requirements that preclude an expedited process to update the Alpena CRTC website.

5 Alpena CRTC key issues
community partnerships

Issue 5a continued:
Communications/education

category: Outreach | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: Alpena CRTC | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH
ECONOMIC IMPACT STUDY

Strategy 5a.3: Promote STARBASE as an asset connected to Alpena CRTC

Summary

Students attending classes at STARBASE have the opportunity to tour Alpena CRTC facilities. Educational materials about Alpena CRTC appropriate for students could be distributed through STARBASE to be shared with families. This would help educate more community residents about the operations and economic benefits of Alpena CRTC.

Recommendations

- Work with Michigan Air National Guard, Alpena CRTC staff, and community partners to create educational materials about Alpena CRTC that address unique functions and economic benefits, as well as career opportunities.
- Distribute materials to community partners, including local educators, for feedback.
- Revise as necessary.
- Distribute educational materials to STARBASE students and families.

Challenges

- Limited time and resources for Alpena CRTC to develop educational materials without dedicated community relations staff.

category: Outreach | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: Alpena CRTC | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH
ECONOMIC IMPACT STUDY

Strategy 5a.4: Strengthen existing partnership with Alpena Community College

Summary

Previous educational collaboration can serve as a foundation to reevaluate and strengthen the partnership between Alpena CRTC and Alpena Community College to provide more courses, training opportunities, and scholarships.

Recommendations

- Convene a working group between current Alpena CRTC leadership and Alpena Community College to discuss past educational collaboration successes and brainstorm potential new partnerships.
- Develop implementation strategy for working group recommendations, including activities, responsible parties, schedule, and resource needs.
- Implement priority educational collaborations.
- Announce new opportunities to the community, leveraging community partnerships to distribute information.
- Involve Alpena Community College in military affairs council via Chamber of Commerce.
- Look into job shadowing opportunities.

Challenges

- Limited time and resources for Alpena CRTC to provide on-site training, offer courses, provide equipment, or contribute to scholarship funds.

category: Outreach | priority: M | timeframe: 0 1 2 3 4 5 + | strategy type: Outreach | strategy lead: Alpena CRTC | stakeholders: Residents

ACTION PLAN: COMMUNITY OUTREACH
INTERAGENCY COOPERATION

Strategy 5a.5: Formalize communications with NOAA regarding operations over Thunder Bay National Marine Sanctuary

Summary

Alpena CRTC operations take place over Thunder Bay National Marine Sanctuary, requiring regular communication with NOAA to ensure continued protection of the sanctuary. Formalizing the communication mechanisms between Alpena CRTC and NOAA will promote better information exchange and identify coordinated educational opportunities.

Recommendations

- Schedule an initial discussion session between Alpena CRTC, NOAA, and other key community partners to identify communication needs related to Alpena CRTC operations and Thunder Bay National Marine Sanctuary protection and promotion.
- Develop communication strategy and schedule based on issues raised during discussion session.
- Implement and formalize a mechanism for regular communication between NOAA and Alpena CRTC.

Challenges

- Lack of community relations personnel at Alpena CRTC makes it hard for the base and NOAA to engage in communications strategy development and implementation.

category: Regulatory | priority: H | timeframe: 0 1 2 3 4 5 | strategy type: Regulatory | strategy lead: Alpena Townships NEMCOG | stakeholders: Developers Residents Local Governments

ACTION PLAN: MILITARY OVERLAY ZONE

Strategy 5a.6: Revise respective zoning ordinances for government entities within the APZ

Summary

Update local zoning codes to restrict height of new structures within the APZs. Any new structure must undergo a review to ensure compliance with new zoning codes. Require new facilities to match height limits mandated by the APZ and require site plan review for any new structure built on a property within the APZ.

Recommendations

- Update zoning codes in all applicable governmental entities.
- Zoning code update will also include a site review component for new structures in the APZ.
- Create a survey and registry of any current building that does not meet the new requirements.

Challenges

- Increase of regulatory requirements for residents and businesses.
- Restricts landowners' use of their property.
- May dissuade economic development in affected areas.

Issue 5b:
Public relations/community involvement

category: strategy type — **Outreach**
priority: **M**
timeframe: 0 1 2 3 4 5 +
strategy lead — **Alpena CRTC**
stakeholders — **Residents**

ACTION PLAN: INTERAGENCY COOPERATION
ECONOMIC IMPACT STUDY

Strategy 5b.1: Convene expanded Alpena CRTC Community Council with Alpena Area Chamber of Commerce

Summary

Using the organizational model suggested by the Alpena Area Chamber of Commerce (see Appendix A), Alpena CRTC can assist in convening the Alpena CRTC Community Council. This group would leverage community partnerships to support Alpena CRTC with public relations, economic valuation, visiting unit support services, and military family support services.

Recommendations

- Review Alpena Area Chamber of Commerce proposal to expand the Alpena CRTC Community Council with Alpena CRTC leadership.
- Convene a planning session to develop a formal strategy for the Alpena CRTC Community Council, including membership, goals, schedule, and priority activities.
- Evaluate council's effectiveness over time.
- Report on Alpena CRTC Community Council successes to Alpena CRTC leadership and key community partners.

Challenges

- Alpena CRTC resource limitations to participate, particularly without a dedicated community relations specialist.
- Potential requirements for MIANG to review communications materials prior to distribution.

category: strategy type — **Outreach**
priority: **M**
timeframe: 0 1 2 3 4 5 +
strategy lead — **Alpena CRTC**
stakeholders — **Residents**

ACTION PLAN: COMMUNITY OUTREACH
ECONOMIC IMPACT STUDY

Strategy 5b.2: Inform community on process to request tours and participation in community events

Summary

The process for requesting tours and involvement in events is not readily available to the public. Making the process and criteria available in several forms would help local partners.

Recommendations

- Develop a concise document on the availability of group tours, the tour timeframe and content, and the process for requesting, including lead time necessary to schedule a tour and the necessary request forms.
- Develop a document on the availability of Alpena CRTC to participate in community events. Include the criteria for events, options for participation (e.g., color guard, speaker, fly over), and provide the necessary forms.
- Provide overview of the process on Michigan Air National Guard website, Alpena CRTC Facebook page, and other tools possibly developed in near term (e.g., newsletter).
- Establish a process for responding to requests.
- Document in an overall SOP for future reference.

Challenges

- Limited time and resources for Alpena CRTC without dedicated community relations specialist.
- Possible need for review of processes by MIANG public affairs staff.

Issue 6a:
Significant contributor to local economy

category: **L** — priority
timeframe: 0 1 2 3 4 5 +
strategy type — **Outreach, Research**
strategy lead — **Alpena CRTC**
stakeholders — **Business owners, Target Alpena**

ACTION PLAN: ECONOMIC IMPACT STUDY

Strategy 6a.1: Local purchasing goal for Alpena CRTC

Summary

Commitment to spending Alpena CRTC funding at locally owned businesses is a priority by Alpena CRTC. Local purchasing goals for Alpena CRTC would help establish an operating norm that acknowledges the importance of Alpena CRTC on the surrounding local economies and would be less likely to change with changes in Alpena CRTC leadership over time.

MIANG has been consolidated and all but two contracting officers in the State are located at Selfridge ANGB. Contracting has set-aside goals for each year for HUBZone, 8a, and Small Business companies.

While Alpena CRTC personnel prefer to award work to NEMI contractors, the decisions are made at Selfridge ANGB and they consistently award Alpena CRTC work to SEMI contractors.

Recommendations

- Work with leadership in Michigan Air National Guard to identify and set local purchasing goals for Alpena CRTC for goods and services not subject to federal and state contracting laws to demonstrate commitment to economic development of surrounding communities.
- Track and report progress toward local purchasing goal for goods and services that are not subject to federal and state contracting laws to help quantify annual impact on local economy.
- As possible, inform chambers of commerce and local businesses when troops will be in the local area.
- Chamber of Commerce should work with Alpena CRTC Contracting Office to make sure our local contractors are aware and understand the set-aside goals of MIANG.
- Chamber of Commerce should contact the Alpena CRTC Contracting Office and formally protest that the recent set-aside contracts have consistently excluded NEMI contractors.

6 Alpena CRTC key issues
economic development

Issue 6b:
Airport viability

ACTION PLAN: INTERAGENCY COOPERATION

Strategy 6b1: Leverage relationships to replace customs agent

Summary

Loss of the part-time local customs agent has had a negative economic impact on the Alpena County Regional Airport, requiring aircraft emanating from foreign locations to route to other Northern Michigan locations. Stakeholders in Alpena have been actively seeking viable options to replace the customs agent, but have had no success.

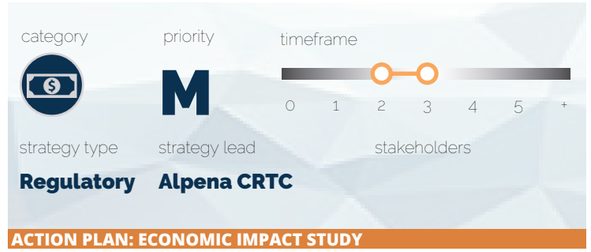
Recommendations

- Engage Alpena CRTC and Michigan Air National Guard in discussions on potentially helping to publicize the issue.
- Identify updated options that build on previous discussions with Congressional delegation.

Challenges

- Replacement of customs agent currently an issue raised by Congressional delegation without results to date.
- Alpena CRTC has a customs agent on an as-needed basis only and cannot provide resources.

Issue 6c:
Partnership with sheriff



ACTION PLAN: ECONOMIC IMPACT STUDY

Strategy 6c.1: Maintain relationship with CRTC and advocate for longer-term contract

Summary

Current contract extension will require Alpena County Sheriff's Department to compete for longer-term contract to provide services.

Recommendations

- Continue to provide excellent security services during contract extension period.

Challenges

- State of Michigan requires competitive bid for award of contract to provide services

Issue 6d:
Military tourism

ACTION PLAN: ECONOMIC IMPACT STUDY

Strategy 6d.1: Economic incentives to generate military tourism

Summary

Soldiers often bring family members into the area during training exercises. Local businesses will benefit if surrounding tourism bureaus work to create incentives for families to extend their stay in the area. Discounts or vacation packages could create incentives that expand military tourism associated with Alpena CRTC.

Recommendations

- Convene a working session among tourism bureaus, local business representatives, and government entities such as NOAA to identify possible incentives for Alpena CRTC trainees and their families to extend their visit and expand military tourism.
- Identify and develop most feasible incentives.
- Create marketing campaign to promote incentives in partnership with Alpena CRTC.
- Monitor incentive effectiveness.
- Report findings to working group.
- Adapt incentives based on findings.

Challenges

- Resource limitations to support working group efforts and campaign to market incentives.

Issue 6d: continued
Military tourism

ACTION PLAN: ECONOMIC IMPACT STUDY

Strategy 6d.2: Economic tracking and reporting mechanisms to quantify annual military tourism impact

Summary

Quantifiable economic data on how dollars flow from soldiers training at Alpena CRTC into surrounding communities would help communicate the contributions Alpena CRTC makes to the local economy. This type of information would assist in communicating the benefits of Alpena CRTC to current residents, prospective home buyers, and decision makers at the local, state, and federal levels.

Recommendations

- Conduct benchmarking research on other military training installations' efforts to track economic impact of operations on local communities.
- Convene a brainstorming session among key stakeholders to share benchmarking results and identify potential economic tracking mechanisms to monitor the spending flow from Alpena CRTC trainees in local communities. Mechanisms discussed during the JLUS process include a survey of Alpena CRTC soldiers during their stay with an incentive to participate or an Alpena CRTC discount card accepted at local businesses. Consider coordinating with Camp Grayling JMTC for this activity.
- Identify most feasible tracking mechanisms from brainstorming session and develop a monitoring plan and reporting schedule.
- Share information about the economic monitoring initiative with Alpena CRTC soldiers and families.
- Collect data and analyze findings.
- Report to key stakeholders participating in brainstorming session.
- Identify next steps to adapt monitoring approach based on findings.
- Prepare informational collateral to share findings with media, decision makers, and other key stakeholders.

Challenges

- Resource limitations to support economic monitoring mechanism development and implementation over time.
- Potential lack of widespread participation in tracking that will limit the ability to comprehensively quantify military tourism spending flow.

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a

references

2010 US Census data

Adaptatation Planning for Climate Resilience, MIARNG, 2016

Air Force Instruction 32-7063, Air Installations Compatible Use Zones Program

Air Force Instruction 90-2001, Encroachment Management

Air Installation Compatible Use Zone Program

Alpena CRTC Installation Development Plan, April 2015

Alpena CRTC Installation Development Plan Environmental Assessment

Alpena County Master Plan, NEMCOG, 2013

Anderson, B. (n.d.). DECOOK v. ROCHESTER INTERNATIONAL AIRPORT JOINT ZONING BOARD. Retrieved July 12, 2018, from https://caselaw.findlaw.com/mn-supreme-court/1597248.html

Army Regulation 405-10: Acquisition of Real Property and Interests Therein

City of Grayling Economic Development Strategy, Place and Main Advisors LLC, March 2017

Crawford County Land Act 172 of 1913

Department of the Army Pamphlet 385-63: Range Safety

Economic Development Study for the City of Grayling, Project Rising Tide, March 2017

Esri data

Federal Aviation Act

Grayling Area Transportation Study, 2008

Hogan, S. H., & LaVille, J. C. (2015, March 06). Zoning and the Fifth Amendment: When do Zoning Regulations "Go Too Far"? Retrieved July 12, 2018, from https://www.fosterswift.com/communications-Zoning-Fifth-Amendment-Regulations.html

Integrated Cultural Resources Management Plan for Alpena CRTC and Camp Grayling JMTC, 2012

Integrated Natural Resources Management Plan for Alpena CRTC, 2013

Letter from Kamperman Associates Inc. in reference to Installation Environmental Noise Management Plan for Camp Grayling JMTC; February 25, 2002

Long-term management agreement between the Department of Natural Resources and the Department of Military Affairs; November 26, 1984

Michigan Army National Guard Real Property Development Plan, May 2011

National Guard Regulation (NGR) 385-63: Army National Guard Range Safety Program, Policy, and Standards

NEMCOG-provided zoning data

NOAA Condition Report, 2013

"Northern Michigan Property Values: The Significance of Riverfront Properties," prepared by Public Sector Consultants Inc. for Anglers of the Au Sable; August 2013

"Penn Central Transportation Company v. New York City." Oyez, 13 Jul. 2018, www.oyez.org/cases/1977/77-444.

Property Topics and Concepts. (2018). Retrieved July 12, 2018, from https://www.planning.org/divisions/planningandlaw/propertytopics.htm

Public Act 288 of 2016

Public Hearing Record, Bernard J. Fowler to Camp Grayling Management Advisory Committee; August 30, 1988, and additional information provided September 21, 1988

Sierra Club and Anglers of the Au Sable on NPDES permit No. MI0059209, Exhibit 242, Assessment of Economic Effects of Increased Production at the Grayling Trout Hatchery; November 23, 2015

Unified Facilities Criteria 3-260-01, Airfield and Heliport Planning and Design

http://grayling.minationalguard.com/

http://ns.minationalguard.com/exercise-northern-strike-2017-is-closing-in/

http://www.alpenacrtc.ang.af.mil/

http://www.discovernortheastmichigan.org

http://www.loc.gov/pictures/resource/pan.6a30457/

http://www.michigandnr.com

https://www.michigan.gov/pfasresponse

A.1 Alpena CRTC Community Council Background Information

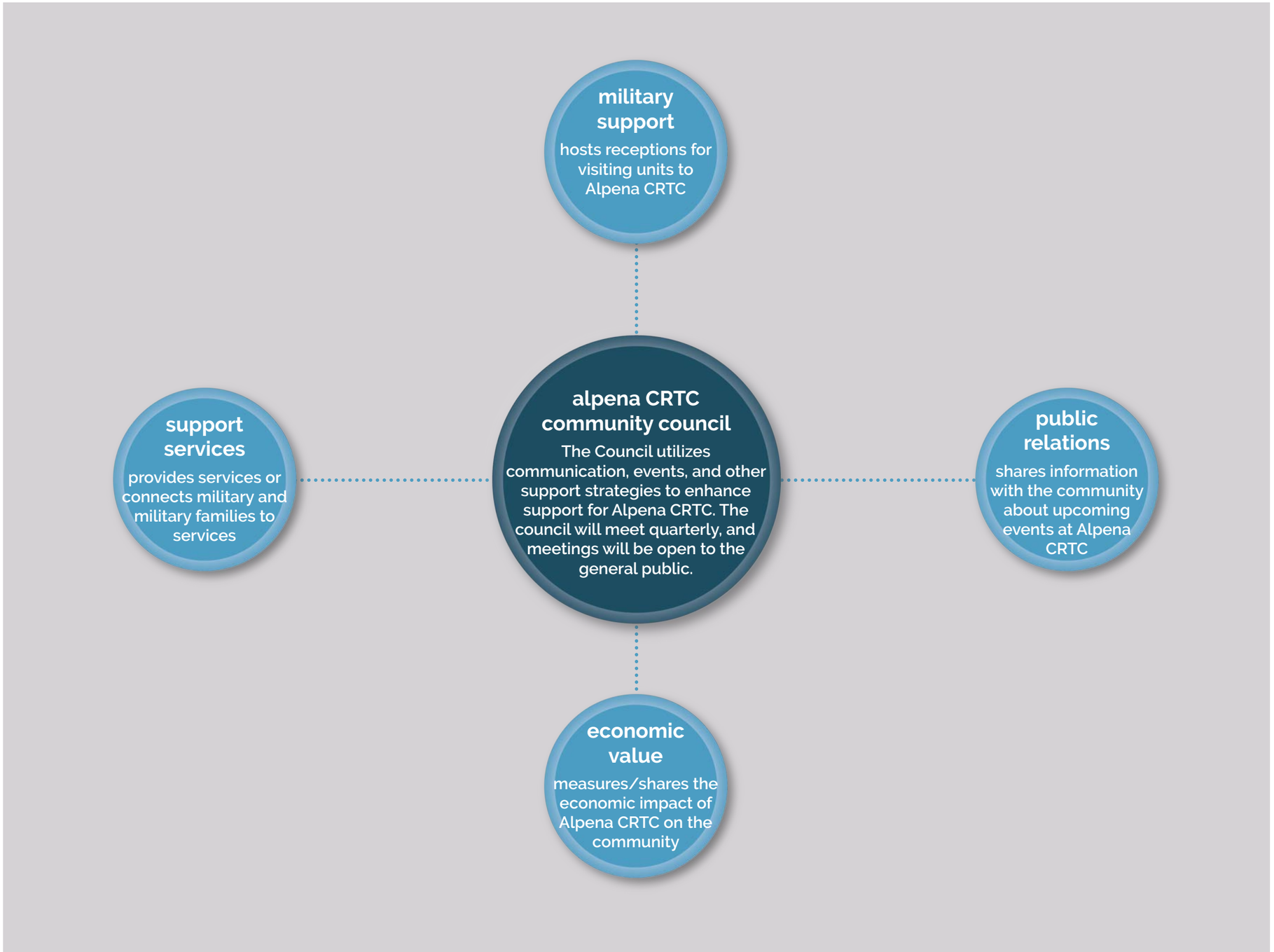
Representatives from the Alpena Chamber of Commerce first met with representatives from Alpena CRTC in 2013 in the interest of convening a council that would focus and help foster civilian interaction with the installation. The relationship between the base and the community was recognized as positive, but all parties wanted to ensure things continued in that vein into the future.

Other areas in the state with a heavy military presence (e.g., Battle Creek and Selfridge) already had similar programs in place, and they had reported positive effects.

At right, the graphic shows some details for the proposed council, as well as the areas it would focus on. The council would be part of the Chamber of Commerce if approved by the chamber's board.

This JLUS recommends that the council be convened as described in Strategy 5b.1 for Alpena CRTC, presented on page 4-35 of this document.

Figure A.1 | Alpena CRTC Community Council



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public participation plan

Please see the following pages.

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camp grayling joint maneuver training center | alpena combat readiness training center

joint land use study

public participation plan

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joint land use study

public participation plan | final | april 2018

acknowledgments and key partners

Northeast Michigan Council of Governments
Michigan DNR (Gaylord)
Michigan Dept of Transportation (Gaylord)
US Forest Service
Michigan Dept of Environmental Quality (Gaylord)
US Fish & Wildlife Service (Alpena)
Headwaters Land Conservancy
USDA Natural Resource Conservation Service (Gaylord)
Huron Pines (conservation) (Gaylord)
Crawford County
City of Grayling (Crawford Co)
Grayling Twp (Crawford Co)
Lovells Twp (Crawford Co)
Maple Forest Twp (Crawford Co)
Frederic Twp (Crawford Co)
Beaver Creek Twp (Crawford Co)
South Branch Twp (Crawford Co)
Crawford County Road Commission
Otsego County
Chester Twp (Otsego Co)
Otsego Lake Twp (Otsego Co)
Bagley Twp (Otsego Co)
Hayes Twp (Otsego Co)
Otsego County Economic Alliance
Bear Lake Twp (Kalkaska Co)
Garfield Twp (Kalkaska Co)
Au Sable River Property Owner's Association
Anglers of the Au Sable
Mason-Griffith Founders Chapter of Trout Unlimited
Upper Manistee River Association
Michigan Association of Timbermen
Weyerhaeuser
Arauco
AJD Forest Products
Jays Sporting Goods
Alpena Regional Airport
Alpena County
City of Alpena (Alpena Co)
Alpena Twp (Alpena Co)
Maple Ridge Twp (Alpena Co)
Wilson Twp (Alpena Co)
Green Twp (Alpena Co)
Ossineke Twp (Alpena Co)
Sanborn Twp (Alpena Co)
Long Rapids Twp (Alpena Co)
Village of Hillman
Target Alpena
Alpena Chamber of Commerce
Michigan Sea Grant/MSU Extension
Northern MI Unmanned Aerial Systems Consortium
Thunder Bay National Marine Sanctuary
US Coast Guard
Thunder Bay Audubon Society
NOAA
Michigan United Conservation Club – Region 4
Camp Grayling and Alpena CRTC
Michigan Economic Development Corporation
Grayling Chamber of Commerce
Michigan Works!
Briley Twp (Montmorency Co)
Roscommon County
Lyon Twp (Roscommon Co)
Posen Twp (Presque Isle Co)
Krakow Twp (Presque Isle Co)
Metz Twp (Presque Isle Co)
Higgins Twp (Roscommon Co)
Antrim County

This study was prepared under contract with the Northeast Michigan Council of Governments, with financial support from the Office of Economic Adjustment, Department of Defense. The content reflects the views of the Northeast Michigan Council of Governments and all of the JLUS project stakeholders and does not necessarily reflect the views of the Office of Economic Adjustment.

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1

JLUS public participation plan background and goals

1.1 Introduction

The Joint Land Use Study (JLUS) is a community driven, collaborative, strategic planning process among Camp Grayling Joint Maneuver Training Center (JMTC) and Alpena Combat Readiness Training Center (CRTC), surrounding local governments, jurisdictions, and other key stakeholders within an approximately 20 mile radius to:

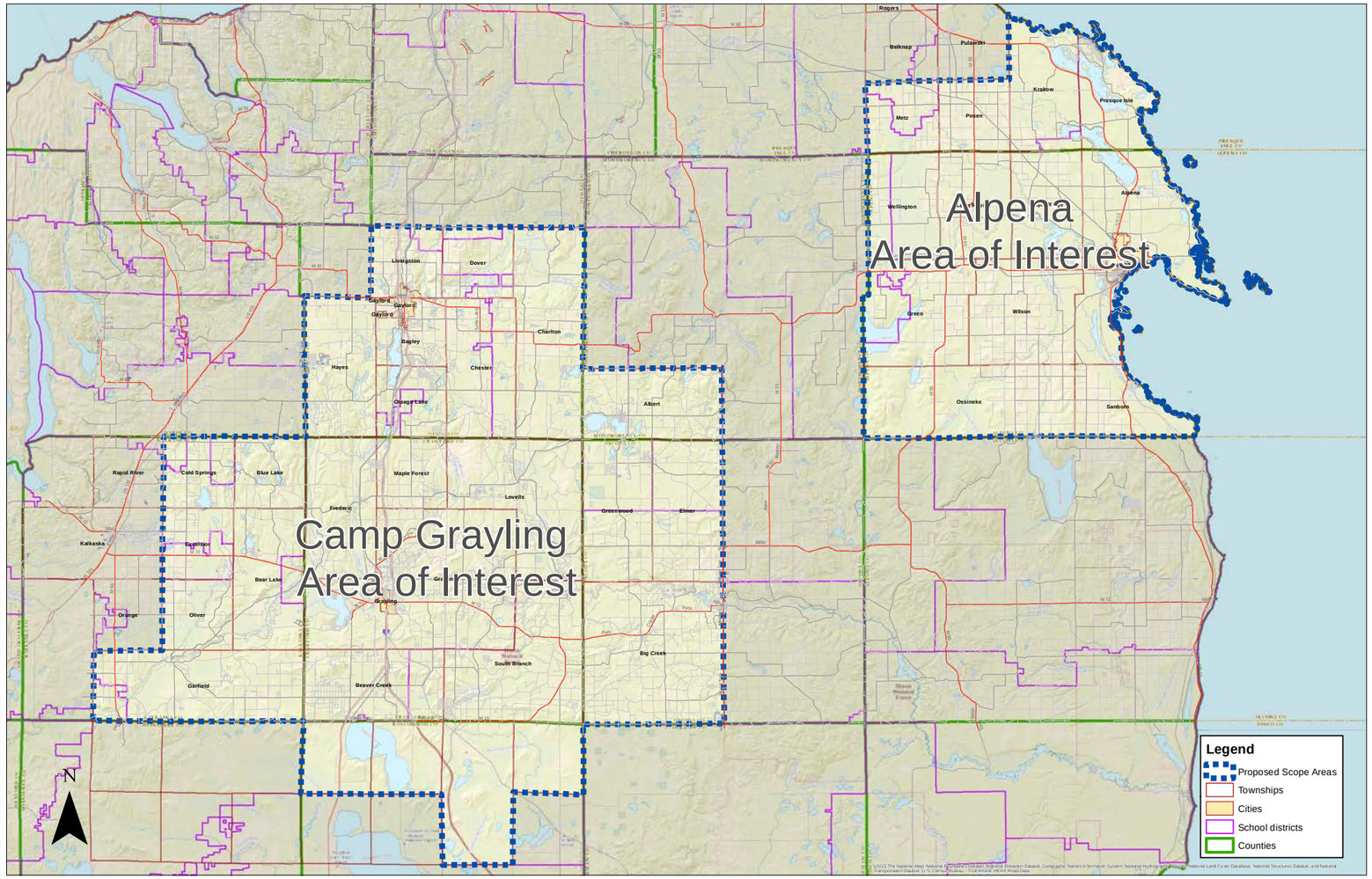
1. Promote community development that is compatible with military training, testing, and operational missions;
2. Seek ways to manage operational impacts on adjacent lands; and
3. Optimize the use of private and community involvement and support.

The Northeast Michigan Council of Governments (NEMCOG) received a grant from the U.S. Department of Defense (DOD) Office of Economic Adjustment (OEA) and is the sponsoring agency coordinating the development of this JLUS.

See Figure 1.1 on the following page for a map of the JLUS areas of interest

Above, stakeholders participate in Camp Grayling JMTC and Alpena CRTC public meetings.

Figure ES.1 | JLUS Areas of Interest



1.2 Goals

The JLUS project goals are to:

- Promote land use compatibility between the installations and surrounding communities;
- Seek ways to manage development that is compatible with military training, testing, and operational missions;
- Encourage cooperative action among military personnel, local community officials, and citizens;
- Maintain and strengthen regional economic engines;
- Convene both a technical advisory and policy committee comprised of people drawn from the surrounding areas affected by the two training centers;
- Engage the public (which includes the technical and policy committees) to identify current and future land use incompatibility issues;
- Map the identified compatibility issues and communicate them to the public;
- Solicit input from stakeholders about potential solutions to the identified incompatibilities;
- Gain agreement from the various stakeholders on the recommended future management actions;
- Educate the surrounding municipalities on the process and report to promote adoption and implementation of recommendations identified in the final report.

Achieving the JLUS project goals requires developing and implementing a Public Participation Plan (PPP) that will effectively engage stakeholders in the JLUS project area. The core JLUS Project Team, NEMCOG and Tetra Tech, has developed, implemented, and will continue to implement the stakeholder engagement activities described in this PPP throughout the duration of the JLUS project.

2

public participation plan components

The five components of the PPP include:

1. Identifying and characterizing key stakeholders;
2. Creating effective messages;
3. Identifying and creating effective stakeholder involvement opportunities and educational resources;
4. Identifying effective distribution channels and mechanisms; and
5. Assessing effectiveness.

Each of these PPP components will be discussed in detail on the following pages.

2.1 PPP Component 1: Identifying and Characterizing Key Stakeholders

Stakeholders include individuals, groups, organizations, and governmental entities interested in, affected by, or affecting the outcome of the JLUS project. The foundational component of the PPP activities is identifying and characterizing stakeholders, with emphasis on the characterization. The goals of the JLUS project include engaging, educating, obtaining input, and seeking agreement from stakeholders. Therefore, it is imperative to tailor the engagement and education messages, formats, and distribution channels based on the stakeholders' perceptions, interests, and communication preferences. In addition to creating a comprehensive list of stakeholders for the JLUS project, it is important for the JLUS Project Team to document characterization information to inform the other PPP components and future JLUS actions.

2.1.1 Key Stakeholder List

Stakeholders identified for the JLUS project include individuals, groups, organizations, and governmental entities located within the JLUS project area.

The Camp Grayling JMTC area of influence includes the whole of Crawford County and portions of Crawford County's border counties: to the east, Oscoda County; to the south, Roscommon County; to the west, Kalkaska County and to the north, Otsego County. Also included in the study areas are the southeast portions of Antrim County and the southwest portion of Montmorency County for a total of 7 counties and 33 municipalities.

Camp Grayling Policy Committee Meeting

The Alpena CRTC area of influence includes Alpena County and a small portion of Presque Isle County, as well as 13 municipalities.

Key stakeholders within the two primary JLUS project areas will represent the following:

- Camp Grayling JMTC staff
- Alpena CRTC staff
- Federal agency staff
  - Thunder Bay National Marine Sanctuary, National Oceanic and Atmospheric Administration
  - U.S. Forest Service
  - U.S. Fish and Wildlife Service
  - U.S. Department of Agriculture Natural Resources Conservation Service
  - U.S. Coast Guard
- State agency staff
  - Michigan Department of Environmental Quality
  - Michigan Department of Natural Resources
  - Michigan Department of Transportation
  - Michigan Economic Development Corporation
- Michigan Sea Grant/Michigan State University Extension
- Elected officials and municipal staff
- Community residents within the project area
- Local organizations
  - **HOMEOWNERS ASSOCIATIONS:** the AuSable River Property Owners' Association, Lake Margrethe Property Owners' Association, Enchanted Forest Property Owners' Association
  - **ECONOMIC DEVELOPMENT GROUPS:** Grayling Regional Chamber of Commerce and the Alpena Area Chamber of Commerce
  - **LOCAL EMPLOYERS:** Weyerhaeuser, AJD Forest Products, Jays Sporting Goods
  - **RECREATION ORGANIZATIONS:** Anglers of the AuSable and Trout Unlimited
  - **ENVIRONMENTAL ORGANIZATIONS:** Headwaters Land Conservancy, Upper Manistee River Association, Thunder Bay Audubon Society, Michigan United Conservation Club
  - **ACADEMIA:** Kirtland Community College and Alpena Community College
- Media
  - The Alpena News
  - Crawford County Avalanche
  - WQON-FM 100.3
  - WATZ-FM 99.3

Many of the key stakeholders within the JLUS Project Area have been asked to serve on the project's policy committee (PC) and technical committee (TC). The PC is primarily com-

posed of city, township, and county officials; military installation leadership; state officials; and private sector leaders. The PC meets on a quarterly basis and is charged with:

- providing overall project leadership to include policy direction and oversight, budget approval, project monitoring, and report adoption; and
- participating in public outreach events.

The TC comprises local and installation community planners, community staff, business representatives, and residents. The TC meets on a monthly basis and is responsible for:

- data collection
- identifying and studying technical issues
- recommending working groups (if needed) for specific issues
- evaluating alternatives
- developing recommendations for the PC

2.1.2 Committee Membership

Table 2.1, JLUS Policy and Technical Committee Members and Organizations, contains a list of JLUS TC and PC members. These individuals will play a key role in both developing and implementing the PPP by serving as the core group of stakeholders that help disseminate information and promote engagement in the JLUS process among their key stakeholder groups.

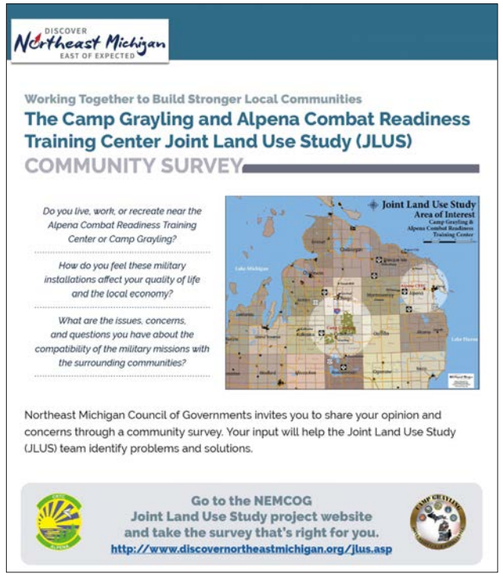
Table 2.1 | JLUS Policy and Technical Committee Members and Organizations

JLUS POLICY COMMITTEE	
Name	*Representing/Title*
Ken Glasser (JLUS Chairman)	Otsego County Board
Greg Sundin (JLUS Vice Chairman)	City of Alpena
Matt Waligora (JLUS Vice Chairman Alternate)	City of Alpena Mayor
Marc Dedenbach (JLUS Secretary)	Grayling Township
SGM Kent Smith	Camp Grayling JMTC
SFC Jeremie Mead	Camp Grayling JMTC
LTC Brian Burrell	Camp Grayling JMTC
Lt Col Matthew Trumble	Alpena CRTC
Lt Col Michael Leski	Alpena CRTC
Capt Brian Blumline	Alpena CRTC
Jonathan Edgerly	Michigan Army National Guard – Environmental
Kim VanNuck	Beaver Creek Township Supervisor
Brandon Schroeder	Michigan State University Extension/Michigan Sea Grant
Susan Thiel	MDNR
Jeff Gray	Thunder Bay National Marine Sanctuary, NOAA
Rob Pallarito	Otsego County Board
Mark Ignash	MEDC
Jim Klarich	Target Alpena
Scott Thayer	MDOT
Dave Stephenson	Crawford County Board Chair
Doug Baum	Grayling City Manager
Steve Smigelski	Alpena Airport Manager
David Persons	Garfield Township Supervisor
Cody Werth	Wilson Township Board/Planning Commission
Julie Lowe	MDEQ
Lisa McComb	Otsego County Economic Alliance
Bill Johnson	Frederic Township Supervisor
Shelly Pinkelman, alternate	Frederic Township Zoning
Ken Lobert	Ossineke Township Supervisor
Nathan Skibbe	Alpena Township Supervisor
Dave Post	Village of Hillman
Myron McIntire, alternate	Hillman Village President
Cam Habermehl	Alpena County
Brian Goebel	Bagley Township
Ken Arndt, alternate	Bagley Township
Jodi Valentino	Roscommon County Controller
Bruno Wojick	Briley Township
Howard Lumsden	Long Rapids Township Supervisor
Sharcy Ray	USDA Natural Resource Conservation Service

JLUS POLICY COMMITTEE, CONTINUED	
Name	*Representing/Title*
George F. Banker	Bear Lake Township Supervisor
Chris Peterson	US Forest Service
Scott R. Koproski	US Fish & Wildlife Service
Edward A. Nellist	Lyon Township Supervisor
James Zakshesky	Posen Township Supervisor
Michael Grohowski	Krakow Township Supervisor
Nyle Wickersham	Metz Township Supervisor
William E. Curnalia	Higgins Township Supervisor
Gary Neumann	Lovells Township Supervisor
Denise Matteini	Otsego Lake Township
Margaret Black, alternate	Otsego Lake Township Clerk
Bonny Miller	Chester Township Supervisor
Scott Kruger	Antrim County Commissioner
Brenda Fournier	Alpena County Commissioner

JLUS TECHNICAL COMMITTEE	
Name	*Representing/Title*
Adam Poll	City of Alpena Planning & Development Director
Erich Podjaske	City of Grayling Zoning/Economic Development
Lisa Kruse	Alpena CRTC Environmental Specialist
Susan Thiel	MDNR
Julie Lowe	MDEQ
Alayne Hansen	Michigan Works!
Patty O'Donnell	MDOT
Doug Baum	City of Grayling
Denise Mattieni	Otsego Lake Township
John Bailey	Huron Pines
SMSgt Jerome Torres	Alpena CRTC
SMSgt Damian Pappas, alternate	Alpena CRTC

Alpena CRTC community land use strengths identified during June 2017 discussion and public meetings.



JLUS June 2017 Community Survey Announcement

2.1.3 Stakeholder Characterization

Understanding stakeholders' existing awareness, perceptions, concerns, values, and priorities related to Camp Grayling JMTC and Alpena CRTC will help the JLUS Project Team develop and implement involvement opportunities and educational resources. Characterization information can influence the level of detail in educational materials and highlight where issues might serve as potential roadblocks to participation or agreement on strategies.

Compiling characterization information for each stakeholder group is an iterative process that starts with a core group of key stakeholders and, over the course of the project, becomes more specific. Stakeholder characterization information evolves over time and could augment approaches for initiating and sustaining stakeholder involvement and educating stakeholders on the JLUS project. The JLUS survey process, as well as public meetings, aided in characterizing stakeholders' perspectives of Camp Grayling JMTC and Alpena CRTC.

The June 2017 PC and TC discussion sessions and the public meetings offered early insights into stakeholders' perspectives of and concerns about Camp Grayling and the Alpena CRTC. Stakeholders in the project area have a broad array of challenges, including noise, water quality, wildfire, traffic, property value, military operations, and public safety concerns, that are more prevalent and will promote increased levels of stakeholder participation.

Another key aspect of stakeholder characterization is understanding communication channel preferences. Based on discussions with NEMCOG and the Camp Grayling community relations specialist, as well as other members of the PC and TC, the community residents rely on traditional sources of information, such as newspaper, radio, and word-of-mouth, to obtain information. Social media is more limited in use, particularly for the older demographic in the study area.

2.2 PPP Component 2: Creating Effective Messages

Raising stakeholder awareness and motivating participation in the JLUS process are key to achieving project goals. Doing so successfully requires effective messaging for educational materials and announcements for public involvement opportunities. Stakeholder characterization information on perceptions, concerns, and interests related to Camp Grayling JMTC and Alpena CRTC installation complexes and mission footprints aid in crafting effective messages for education and engagement collateral. The messages change with each phase of the project and as stakeholder characterization is further refined. Messages for each phase of the project are presented below.

- **DISCOVERY PHASE (APRIL 2017 – JULY 2017):** Initial messages for the discovery phase focus on raising awareness and promoting engagement. Messages raise stakeholder awareness about the JLUS project and their proximity to the JLUS project area, addressing their potential curiosity and concerns about the activities taking place at Camp Grayling and Alpena CRTC, and promoting the unique opportunity to share their concerns through the JLUS process. Message: Your input on issues and concerns is important to identifying solutions that will benefit your community.
- **STRATEGY AND PLANNING PHASE (AUGUST 2017 – MARCH 2018):** Messages for the strategy and planning phase focus on reporting out the interim findings for the identified issues/conflicts uncovered in the discovery stage. Messages focus on validating issues identified in the discovery phase and providing input on potential solutions. Message: Please tell the JLUS Project Team if we accurately captured your issues and concerns and contribute to developing possible solutions.
- **IMPLEMENTATION PHASE (APRIL 2018 – ONGOING):** Messages for the implementation phase focus on presenting the final report findings and recommendations in both the Grayling and Alpena areas. This phase focuses on initiating the process of local municipal adoption of the JLUS report in effected communities. Message: The JLUS Project Team heard and incorporated your input throughout the JLUS process, and your views are reflected in the final recommendations. It is now time to implement these recommendations, which require continuous support to help execute the necessary actions to benefit the community.

A subset of the PC and TC members with experience in local communications will have the opportunity to review and comment on project-related messaging. This subset of PC and TC members will include the JLUS project officers, the Camp Grayling community relations specialist, NEMCOG staff, and local economic directors, as well as other PC and TC members that have an interest in providing constructive feedback on messaging.

2.3 PPP Component 3: Identifying and Creating Effective Stakeholder Involvement Opportunities and Educational Resources

This component of the PPP focuses on identifying and creating effective stakeholder involvement opportunities and educational resources.

2.3.1 Meetings, Tours, and Surveys

Stakeholder involvement opportunities include meetings, tours, interviews, and surveys. The JLUS Project Team selected this suite of stakeholder involvement opportunities to allow stakeholders a variety of options based on schedule constraints, communication preferences, and project needs. Each opportunity is described below in greater detail.

- **TC AND PC MEETINGS:** These meetings are coordinated and facilitated by NEMCOG staff throughout the JLUS project. They serve as working forums for these key stakeholders to provide input on JLUS project information and developing recommendations to address issues and concerns. The project website will include a project schedule and calendar of events for the TC and PC meetings.
- **CAMP GRAYLING JMTC AND ALPENA CRTC PC AND TC MEMBER TOURS AND ISSUE IDENTIFICATION SESSIONS:** The tours provide an opportunity for PC and TC members to better understand the mission and operations of Camp Grayling JMTC and Alpena CRTC during

JLUS Policy and Technical Committee Members touring Camp Grayling JMTC and Alpena CRTC

the discovery phase of the JLUS project. The tours also provide PC and TC members with an additional opportunity to discuss the JLUS project, goals, and objectives. An added benefit is promoting PC and TC team building, communication, and cooperation to benefit the overall JLUS process. The tours for Camp Grayling JMTC and Alpena CRTC took place on June 1 and June 5, 2017.

- **COMMUNITY MEETINGS AND INPUT SESSIONS:** The JLUS process provides broader stakeholder involvement opportunities using a series of community meetings and input sessions at each phase.
  - **ISSUE IDENTIFICATION COMMUNITY MEETINGS (DISCOVERY PHASE):** The purpose of these meetings is to raise stakeholder awareness of the JLUS project and identify issues and concerns related to Camp Grayling JMTC and Alpena CRTC from local stakeholders. The initial community meetings and input sessions took place on June 1, 2017, for Alpena CRTC and June 6, 2017, for Camp Grayling. Appendix A contains agendas and a list of participants for these meetings.
  - **ISSUE REPORT OUT COMMUNITY MEETINGS (STRATEGY AND PLANNING PHASE):** During these meetings, the JLUS Project Team will report out the issues and conflicts identified during the discovery phase of the JLUS process. These meetings will give local stakeholders the opportunity to validate the interim findings of the discovery phase, clarify any issues, and identify additional issues that were not adequately captured during the discovery phase. The PC meeting is ideally held on the same day as the community meeting and also open to the public.
  - **PRELIMINARY RECOMMENDATIONS COMMUNITY MEETINGS (STRATEGY AND PLANNING PHASE):** These community meetings will provide stakeholders with the opportunity to voice their opinions and ideas on preliminary recommendations crafted to address issues and concerns. The JLUS Project Team documents stakeholder feedback on the preliminary recommendations and finalizes the recommendations, considering that feedback. The PC meeting is ideally held on the same day as the community meeting and also open to the public.
  - **FINAL RECOMMENDATIONS AND IMPLEMENTATION COMMUNITY MEETINGS (IMPLEMENTATION PHASE):** The purpose of these final community meetings is to present the final report findings and recommendations to stakeholders, as well as initiate the early stages of the implementation process. This could include identifying steps needed for local municipal adoption of the JLUS report in affected communities.
- **STAKEHOLDER INTERVIEWS:** This stakeholder involvement strategy involves conducting one-on-one interviews with key stakeholders in the JLUS project area. Stakeholder interviews are critical to gaining an understanding of existing issues or situations that will contribute to the conflict/compatibility analysis of the JLUS project. Interviews also provide an opportunity to gain a deeper understanding pf stakeholder perceptions and opinions about compatibility and conflicts, as well as details on sensitive topics that stakeholders may feel uncomfortable discussing in a group setting. This information will not only feed into development of management strategies, but will also assist in refining stakeholder characterization for the PPP and future stakeholder involvement and education activities in the latter stages of the JLUS process. Appendix B contains the survey questions developed for the JLUS project administered both in-person and via telephone.
- **COMMUNITY SURVEYS:** The community surveys are another stakeholder involvement mechanism to allow a wider range of stakeholders in the JLUS project area to share their opinions. The community survey questions are the same as those found in Appendix B, but the responses are self-entered without assistance from JLUS Project Team members. Ensuring widespread participation in the community survey is a potential challenge that will likely require an iterative approach to make stakeholders aware of the survey, educate stakeholders on the benefits of participating in the survey, and motivate participation. As such, a multi-pronged approach that capitalizes on opportunities as they arise to communicate the survey with the public.

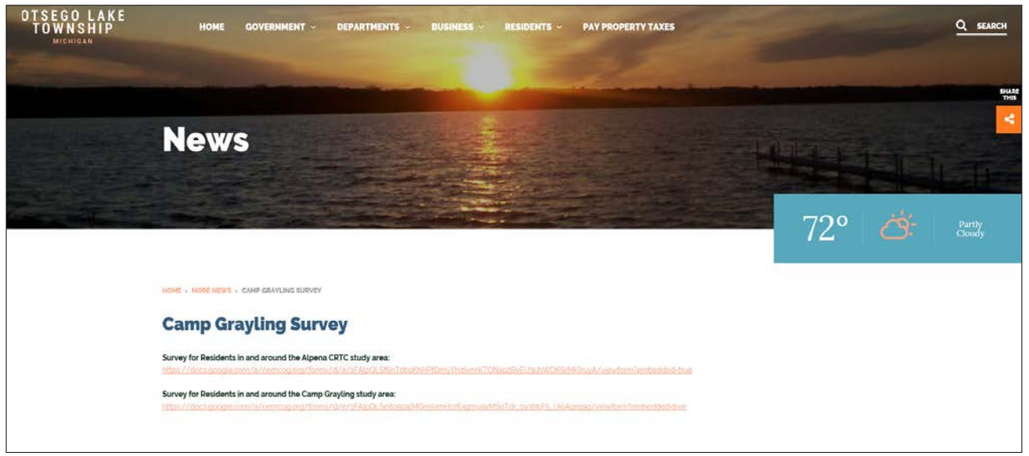
2.3.2 JLUS Educational Resources

Stakeholder educational resources include meeting announcements, fact sheets, presentations, project website, and press releases. The JLUS Project Team selected this suite of stakeholder educational resources to provide stakeholders with a variety of formats based on communication preferences and project needs. Each educational resource is described below in greater detail.

- **JLUS PROJECT WEBSITE:** NEMCOG staff created a JLUS project web page within the current NEMCOG website that provides comprehensive project information. The project website is available at http://www.discovernortheastmichigan.org/jlus.asp. The JLUS Project Team will update the project web pages throughout the JLUS process. It is the primary source of educational information on the JLUS project. All stakeholder involvement opportunities and educational resources will be available to stakeholders, including the link to the community surveys.
- **JLUS PROJECT FACT SHEETS/MEETING ANNOUNCEMENTS:** This educational resource provides an easy-to-read summary of the JLUS project, including an overview of the project purpose, expected outcomes, involvement opportunities during the process, and where to obtain additional information. For each of the community meetings described above, the JLUS Project Team uses the project fact sheet as a meeting announcement. The project fact sheet will be updated with new project information (e.g., identified issues) and updated meeting information. Appendix C provides examples of the project fact sheet/initial meeting announcements.
- **JLUS PROJECT SURVEY ANNOUNCEMENT:** This resource announces the availability of the community survey to stakeholders in the JLUS project area and provide a link to the survey on the JLUS Project web page hosted by NEMCOG. Appendix D contains the project survey announcement.
- **JLUS PRESENTATIONS:** For each community meeting, the JLUS Project Team develops a presentation that provides context for the JLUS project, a review of the process and the current process status, as well as information related to the current phase of the project. The presentations are made available on the project website after each meeting.
- **JLUS PRESS RELEASES:** The JLUS Project Team develops press releases announcing stakeholder involvement activities related to the JLUS project. This is done in coordination with the community relations staff at Camp Grayling JMTC and Alpena CRTC to ensure a consistent JLUS project message. The press releases target print media and offer educational background on the JLUS project goals and process, including the link to the JLUS project web pages, to promote comprehensive news stories on the process.

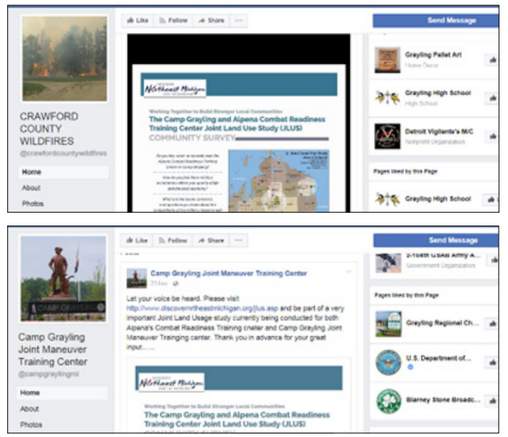
2.4 PPP Component 4: Identifying Effective Distribution Channels and Mechanisms

This component of the PPP focuses on effective distribution channels and mechanisms in the JLUS project area. Ensuring meaningful participation in stakeholder involvement opportunities and effective delivery of educational resources requires that information successfully reaches targeted stakeholders. For purposes of the JLUS project, the JLUS Project Team employs both a targeted and ripple approach to distribute information. Both of these approaches are described below.



Otsego Lake Township website promoting the JLUS community survey.

JLUS survey news story on WATZ website.



JLUS Survey postings on Camp Grayling and Crawford County Wildfire Facebook pages.

TARGETED APPROACH: This approach ensures delivery of information directly to the intended targeted stakeholders. Members of the PC and the TC are key stakeholders in the JLUS Project. When the JLUS Project Team distributes stakeholder involvement opportunity information and project educational resources to the PC and TC members, key stakeholders directly receive that information. The targeted approach involves email as the primary distribution channel to PC and TC members, as well as PC and TC meetings.

RIPPLE APPROACH: This approach focuses on enlisting the help of NEMCOG and the JLUS PC and TC members to use their existing distribution mechanisms, such as newsletters, websites, email distribution lists, social media sites, meetings, and community bulletin boards to further disseminate information on JLUS project stakeholder involvement opportunities and educational resources to their organizational members and constituents. For example, the Camp Grayling JMTC community relations specialist distributes notification of range activities on a regular basis to local property owners' associations and maintains a Camp Grayling JMTC Facebook page. The JLUS Project Team requested that the Camp Grayling JMTC community relations specialist post information about the community survey on the Camp Grayling JMTC Facebook page where this information has been shared. In addition, the JLUS Project Team will email information about stakeholder involvement opportunities to individuals who attend community meetings with a request to help share the information with neighbors. Given the size of the JLUS project area, as well as resource constraints, the ripple approach leverages existing stakeholder contacts for minimal project investment. Another advantage of this approach is the familiarity local stakeholders have with these local organizations and elected officials; trust and familiarity with the messenger can help to increase participation.

Each approach described above rely on specific distribution mechanisms. Each distribution mechanism will reach different stakeholder subgroups. The suite of distribution mechanisms will expand over time as the JLUS Project Team develops a more refined understanding of stakeholder communication preferences and most effective distribution channels. Key distribution mechanisms are described in more detail below.

- **EMAIL DISTRIBUTION LISTS:** NEMCOG and the JLUS PC and TC email distribution lists are the primary distribution mechanisms to engage these stakeholders in committee activities. The JLUS Project Team asks members on this email distribution list to forward community information to relevant stakeholders using their email distribution lists.
- **NEWSLETTERS:** NEMCOG and many of the JLUS PC and TC members, as well as other stakeholder organizations, develop and distribute regular newsletters for both mail and electronic distribution. For example, the Grayling Regional Chamber of Commerce develops and posts a weekly newsletter and included information about the JLUS survey in the June 29 newsletter.
- **WEBSITES:** As discussed, the primary project information distribution channel is the JLUS project web pages hosted on the NEMCOG website. Using the ripple approach, the JLUS Project Team is encouraging PC and TC members to post links to the JLUS Project web pages on their own organizational websites and encourage other stakeholders to do the same. For example, the Enchanted Forest Property Owners' Association posted JLUS survey information and a link to the JLUS web page on the association's main website, as well as Alpena Township and Otsego Lake Township, as shown above. The JLUS Project Team will encourage PC and TC members to continually post information on their websites to help disseminate information throughout the JLUS project.
- **LOCAL MEDIA:** Both newspaper and radio are key distribution mechanisms in the JLUS project area. Experience shared by NEMCOG staff and the Camp Grayling JMTC community relations specialist indicate that local residents rely heavily on local newspapers (Crawford County Avalanche and the Alpena News). Stakeholders attending the initial community meeting for Camp Grayling on June 6 indicated that the primary source of meeting information was the Crawford County Avalanche. The Houghton Lake Resorter also included information on their website about the JLUS community survey. Radio is another popular distribution mechanism in the JLUS project area; in addition to airing news stories, radio stations often have websites that also post news. For example, WATZ aired a story about the JLUS community survey and posted a story on their website. The Camp Grayling Community Relations Specialist has an existing relationship with local newspapers and radio; therefore, promotion of the JLUS related events and surveys can come from Camp Grayling, particularly in conjunction with media coverage related to key activities, such as Northern Strike, scheduled for July 29 through August 12, 2017.
- **SOCIAL MEDIA:** This distribution mechanism reaches a younger demographic within the JLUS project area, but is assumed to be less effective than newspaper and radio. Grayling Visitors Bureau posted information on the initial community meetings on the bureau's Facebook page, resulting in 31 shares. The Camp Grayling community relations specialist updates the Camp Grayling Facebook page on a regular basis and included information on the JLUS community survey, which was then further shared. It is possible search Facebook to identify groups discussing Alpena CRTC and Camp Grayling issues and then request that they post JLUS project information. The JLUS Project Team found a Crawford County Wildfire group that has over 1,000 members that posts information on Camp Grayling's controlled burns. A simple message request led to the posting of the survey information on the group's Facebook page.
- **FLIER DROPS AND POSTING:** Through the ripple approach, PC/TC members are encouraged to print and drop JLUS project fliers that announce community meetings and survey availability at local businesses, chambers of commerce, libraries, and other locations frequented by local stakeholders. The Camp Grayling community relations specialist uses this approach to post range activities at a local bakery, barbershop, restaurants, and grocery stores. NEMCOG staff members have dropped fliers at visitor centers.
- **DIRECT MAILINGS:** This is a distribution mechanism

that would reach local residents in a very direct manner. However, this distribution mechanism is both time-consuming and more expensive than other distribution mechanisms. It could, however, be useful in targeted areas within the JLUS project area where the JLUS Project Team feels more engagement from stakeholders is necessary. It could be beneficial to consider if online survey numbers remain low as the project moves out of the Discovery Phase and more data are needed to characterize issues and concerns.

2.5 PPP Component 5: Assessing Effectiveness

This PPP component focuses on assessing the effectiveness of stakeholder involvement activities and educational efforts. Feedback from stakeholders on involvement activities helps the JLUS Project Team determine if there are changes necessary for subsequent activities to improve effectiveness. This information can help to sustain stakeholder participation in the process over time. Mechanisms include workshop evaluation forms, interview questions, and tracking participation rates over the course of the project.

2.5.1 PPP Activities and Schedule

Table 2.2, JLUS Project Public Participation Plan Activities and Effectiveness Metrics, presents the PPP schedule. This schedule is likely to evolve over time, depending on the overall JLUS project schedule, as well as factors such as stakeholder availability, facility availability, and other planned activities scheduled at Camp Grayling JMTC and Alpena CRTC. Table 2.2 also identifies PPP roles and responsibilities for PPP activities under each component.

Table 2.2 | JLUS Project Public Participation Plan Activities and Effectiveness Metrics

INVOLVEMENT AND OUTREACH FORMAT	TARGET AUDIENCES	DISTRIBUTION CHANNELS AND DATES	JLUS PROJECT TEAM LEAD	EFFECTIVENESS METRICS
Discovery Phase: Objectives: Increase awareness of JLUS process and motivate participation in meetings and survey. Messaging: Your input on issues and concerns is important to identifying solutions that will benefit your community.				
JLUS Website (Status: Complete)	All stakeholders in project area	Link provided on all communications; updates occur throughout project	NEMCOG (web page update) Tetra Tech (content)	# of views and page visits
PC/TC Tour and Issue Identification Session invitation in electronic one-page PDF or hard copy flier (Status: Complete)	PC and TC members	Emailed to all PC/TC members; two weeks prior to meeting	JLUS Project Team	# of RSVPs
PC/TC Tour and Issue Identification Session (Status: Complete)	PC and TC members	Alpena CRTC and Camp Grayling facilities	JLUS Project Team Camp Grayling staff Alpena CRTC staff	# of participants
Initial project fact sheet/community meeting announcement electronic one-page PDF or hard copy as flier (Status: Complete)	All stakeholders in project area	PC/TC targeted email PC/TC ripple (email, social media, websites); two weeks prior to meeting	JLUS Project Team PC/TC members	# of postings; # of meeting participants
Initial community meetings (Status: Complete)	All stakeholders in project area	NOAA Maritime Heritage Center (Alpena CRTC) Kirtland Health Sciences Center (Camp Grayling)	JLUS Project Team	# of meeting participants; meeting evaluation responses
Community survey announcement electronic one-page PDF or hard copy flier (Status: Complete)	All stakeholders in project area	PC/TC targeted email PC/TC ripple (email, social media, websites)	JLUS Project Team PC/TC members	# of postings; # of survey participants
Community survey (Status: Ongoing)	All stakeholders in project area	PC/TC targeted email PC/TC ripple (email, social media, websites) Specific help requested from Camp Grayling Community Relations Specialist to include in Northern Strike related press releases and open houses (prior to July 29)	JLUS Project Team PC/TC members	# of online search results for survey mentions; # of completed surveys
Stakeholder interviews (Status: Ongoing)	Key stakeholders identified by JLUS Project Team	JLUS Project Team one-on-one discussions coordinated during initial meetings; follow-up phone calls	JLUS Project Team	# of completed interviews
JLUS project fact sheet with opportunities for participation (Status: In development once new PC/TC dates established)	All stakeholders	JLUS website for easy downloading and printing	JLUS Project Team	# of fact sheets distributed; # of meeting participants
Strategy and Planning Phase: Objective: Increase and sustain participation in the JLUS process and verify the issues and concerns compiled during the Discovery Phase, while seeking input on possible solutions and recommendations to generate early buy-in for implementation. ***Messaging: Please tell the JLUS Project Team if we accurately captured your issues and concerns and contribute to developing possible solutions.***				
JLUS Website	All stakeholders in project area	Link provided on all communications; updates occur throughout project	NEMCOG (web page update) Tetra Tech (content)	# of views and page visits
Issue report out community meeting announcements (electronic one-page PDF or hard copy as flier)	All stakeholders in project area	PC/TC targeted email PC/TC ripple (email, social media, websites); two weeks prior to meeting Follow up with targeted outreach to property owners' associations, local businesses	JLUS Project Team PC/TC members	# of meeting participants

Table 2.2 Continued | JLUS Project Public Participation Plan Activities, Audiences, Distribution Channels, Roles, and Effectiveness Metrics

INVOLVEMENT AND OUTREACH FORMAT	TARGET AUDIENCES	DISTRIBUTION CHANNELS AND DATES	JLUS PROJECT TEAM LEAD	EFFECTIVENESS METRICS
Issue report out community meetings	All stakeholders in project area	Select facilities in project area; possibly varied from initial community meeting locations based on stakeholder feedback	JLUS Project Team	# of meeting participants; meeting evaluation responses
Preliminary recommendation community meeting announcements (electronic one-page PDF or hard copy as flier)	All stakeholders in project area	PC/TC targeted email PC/TC ripple (email, social media, websites); two weeks prior to meeting Follow up with targeted outreach to property owners' associations, local businesses	JLUS Project Team PC/TC members	# of participants
Preliminary recommendation community meeting	All stakeholders in project area	Select facilities in project area; possibly varied from initial community meeting locations based on stakeholder feedback	JLUS Project Team	# of meeting participants; meeting evaluation responses
Implementation Phase: Objective: Solidify support for final JLUS recommendations and transform sustained participation into meaningful implementation. Messaging: The JLUS Project Team heard and incorporated your input throughout the JLUS process into the final recommendations that now require your support and action to benefit the community.				
JLUS Website	All stakeholders in project area	Link provided on all communications; updates occur throughout project	NEMCOG (web page update) Tetra Tech (content)	# of views and page visits
Final recommendations and implementation community meetings announcements (electronic one-page PDF or hard copy as flier)	All stakeholders in project area	PC/TC targeted email PC/TC ripple (email, social media, websites); two weeks prior to meeting Follow up with targeted outreach to property owners' associations, local businesses	JLUS Project Team PC/TC members	# of meeting participants
Final recommendations and implementation community meetings	All stakeholders in project area	Select facilities in project area; possibly varied from initial community meeting locations based on stakeholder feedback	JLUS Project Team	# of meeting participants; meeting evaluation responses

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a

meeting participants

Please see the following pages.

TETRA TECH, INC.

JOB Alpena PC + TC SHEET NO. _____

SUBJECT _____ FILE NO. _____

COMPUTED BY _____ DATE _____ CHK. BY _____ DATE _____

Name	Org
Mike Grohowski	Krakow Township
Myron McIntire	U.P.H.
Julianne Heinlein	GLEC
Scott Koproski	USFWS
Julie Lowe	MDEQ
SGM James Ryba	Camp Grayling
Scott Thayer	MDOT
Cody Werth	Wilson Twp.
Dave Post	Village of Hillman
Rob Pallarito	Otsego County
Denise Pallarito	State Rep. Tristan Cole
Ken Glasser	Otsego County
Lisa Kruse	Alpena CRTC
Brian Blumline	Alpena CRTC
Ken Lobert	Ossineke Twp
Steve Smigelski	Alpena Airport
Jim Klarich	Alpena Chamber EDC
Nathan W. Skibba	Alpena Township
Shelly Pinkelman	Crawford County.
Diane [illegible]	NEMCOG
Adam Poll	City of Alpena
Howard Lumsden	Long Rapids Twp

RSVP for Tours

Alpena JTC - June 1

1. Adam Poll, Planning & Development Director, City of Alpena
2. Steve Smigelski, Alpena County Airport Manager
3. LTC Theresa Brown, Camp Grayling
4. SGM Ryba, Camp Grayling
5. SFC Jeremie Mead, Camp Grayling
6. Ken Lobert, Ossineke Township Supervisor
7. Matt Waligora, Mayor, City of Alpena
8. Scott Thayer, Michigan Department of Transportation
9. Brian Blumline, Capt, PE, MIANG
10. ~~Susan Thiel~~, MDNR
11. James Booth, Big Creek Township Supervisor
12. ~~Ken Glasser~~, Otsego County Board of Commissioners
13. Shelley Pinkelman, Frederic Township
14. Michael Grohowski, Krakow Twp Supervisor
15. Scott Koproski, US Fish & Wildlife Service
16. Matt McCauley, Networks Northwest
17. Nathan Skibee, Alpena Township Supervisor
18. Mark Ignash, MEDC
19. Dave Post, Hillman Village Manager
20. Myron McIntire, Hillman Village President
21. Julie Lowe, MDEQ
22. Rob Pallarito, Otsego County Commissioner
23. Denise Pallarito, Legislative Director for Representative Tristan Cole
24. ~~James Zakshesky, Posen Township Supervisor~~
25. Lisa Kruse, State Env. Quality Analyst, MI ANG – Alpena CRTC
26. Cody Werth, Wilson Township
27. ? ~~Jeff Gray, Thunder Bay National Marine Sanctuary~~
28. ~~Howard Lumsden, Long Rapids Township~~
29. ~~Denise Cline, NEMCOG~~
30. Diane Rekowski, NEMCOG
31. ~~Ethan Cline, NEMCOG Intern~~
32. Julianne Neinlein

Alpena Issues Identification Session only (afternoon)

1. Jim Klarich, Target Alpena

TETRA TECH, INC.

JOB Public SHEET NO.
SUBJECT FILE NO.
COMPUTED BY DATE CHK. BY DATE

Name	organization	email
Geo Bunker	Bear Lake Twp	gfbunker@gmail
MARK JURKOVICH	—	mark.jurkovich @KIRTLAND.edu
Rob Pallarito	Otsego County	rpallarito@gmail.co
DENISE MATTEINI	Comm. OTSEGO LKTWP	djm290djm@gmail.co
Margaret Black	Otsego Lake Twp	mejblack@gmail.co
Susan LaVanway	Otsego Lake Twp	SLAVANWAY@ittouch.n
Connie Kalonick	Grayling	Ckalonick@charter.n
Anne Stephenson	Citizen	KIRTLAND GEAR @GMAIL.com
DAVE STEPHENSON	Crawford Co. Brd	dave@
Shelley Brinker	Crawford	sbrinker@charter.net
David Smith	Anglers of the Au Sable	DMSmith321@ gmail.c
Leonard Lobsinger	c/o Dam Rd	
Jeri Selthaffer	Grayling Twp	lmaverage@ charter net
Terry & Carol Wakeley	Grayling	carolwakeley@ charter.net
Lisa Oliver	resident	lisa.oliver.mi@ gmail.co
JAY SWART	DOD-OEA	
Rosalie Myers	RCEDC	myers@roscommon county.net
Rick Calkins	Grayling	
Jim Kitch	Grayling	
VIRGINIA WATSON	GRAYLING	
Ed/Marge Martella	Grayling	e.martella@ yahoo.com
Rose Rakoczy	Resident	rakoczyrd yahoo.com

Name	organization	email
Sandy Rosa	resident	smrosa1@gmail.com
C Rosa	"	"
ROGER WILCOX	"	rwilcoxfl@earthlink net
Dave Gillahan	DMVA	david.m.gillahan.mil @mail.mil
Susan	DNR	

Grayling PC + TC

Name	Organization
DENISE MATTEINI	OTSEGO LK TWP
GARY NEUMANN	Supervisor - Lovells Twp.
Dave Gillahan	DMVA
Dave Stephenson	Crawford County Bd
Geo. Banker	Bear Lake Twp
Joan Charlebois	DNR
Brian Blumline	Alpena CRTC
JAY SWEAT	DOD-OEA
Shelly Pinkelman	Crawford County / Frederic Township
Earl Nellist	Lyon Twp.
SCOTT THAYER	MDOT
MARC T. DEDENBACH	GRAYLING TOWNSHIP
William Johnson	FREDERIC TWP.
Theran Brown	Dep Camp Grayling
JAMES RYBA	OPNS SGM Grayling
Mike Rawesi	CG Environmental
KEN GLASSER	OTSEGO COUNTY COMM.
SFC Jeremie A Mead	Camp Grayling Community Relations
Patty O'Donnell	MDOT North Region
Abigail Ertel	Huron Pines
Kim VanNuk	Beaver Creek
Julie LOWE	MDEQ

Camp Grayling JMTC – June 5

1. Rob Pallarito, Otsego County Commissioner
2. Denise Pallarito, Legislative Director for Representative Tristan Cole
3. Kim VanNuck, Beaver Creek Township Supervisor
4. Ken Lobert, Ossineke Township Supervisor
5. Jay Sweat, Office of Economic Adjustment, US Department of Defense
6. Scott Thayer, Michigan Department of Transportation
7. George Banker, Bear Lake Township Supervisor
8. Marc Dedenbach, Grayling Township Planning Commission
9. Scott Kruger, Antrim County Commissioner
10. Denise Matteini, Otsego Lake Township
11. Margaret Black, Otsego Lake Township
12. Dave Stephenson, Crawford County Board Chair — Interested
13. ~~Susan Thiel, MDNR~~
14. James Booth, Big Creek Township Supervisor
15. Ken Glasser, Otsego County Board of Commissioners
16. Shelley Pinkelman, Frederic Township
17. William Johnson, Frederic Township
18. William Curnalia, Higgins Township
19. ~~Erich Podjaske, City of Grayling~~ > CBG
20. ~~Doug Baum, City of Grayling~~
21. Alayne Hansen, Michigan Works!
22. ~~Matt McCauley, Networks Northwest~~
23. ~~Nathan Skibbee, Alpena Township Supervisor~~
24. ~~Dave Post, Hillman Village Manager~~
25. ~~Myron McIntire, Hillman Village President~~
26. ~~Julie Lowe, MDEQ~~
27. ~~Mary Sanders, Hayes Township Supervisor~~
28. Cody Werth, Wilson Township
29. Abigail Ertel, Huron Pines
30. Edward Nellist, Supervisor
31. Howard Lumsden, Long Rapids Township
32. ~~Denise Cline, NEMCOG~~
33. Diane Rekowski, NEMCOG
34. ~~Ethan Cline, NEMCOG Intern~~
35. Patty O'Donnell, MDOT North Region Planner

Julianna Neustein
Mike Rawesi – Camp Grayling Env. Office
Scott
Capt Blumline

b

surveys

Please see the following pages.

Resident Survey for Areas Surrounding Alpena Combat Readiness Training Center (CRTC)

1. In what City, Village, or Township do you reside? _____

2. Are you (Please check one):

☐ On the Planning Commission for your area
☐ A Municipal staff member
☐ An Elected official
☐ A Resident

3. What is you gender? Male Female

4. What range does your age fall into?

☐ 18 an under
☐ 19 - 30
☐ 31 - 50
☐ 51 - 64
☐ 65 plus

Questions relating to your perceptions of Alpena CRTC.

5. How familiar are you with Alpena CRTC and the military operations that take place there?

Unfamiliar Somewhat Familiar Familiar Very familiar

6. Are you comfortable with military operations at Alpena CRTC?

Not Comfortable Somewhat Comfortable Comfortable

Comments: _____
_____
_____

Joint Land Use Study
Camp Grayling Joint Military Training Center (JMTC) and Alpena Combat Readiness Training Center (CRTC)

7. Do you have any concerns about military installation operations with regard to noise, traffic, or other issues around Alpena CRTC? Please select all that apply?

☐ Noise
☐ Traffic
☐ Recreational Access
☐ Other

Comments: _____
_____
_____

8. Do you have concerns about military installation operations with regard to public health, safety, housing, or general welfare around Alpena CRTC? Please select all that apply.

☐ Public health
☐ Safety, housing
☐ General welfare
☐ All of the above
☐ None of the above

Comments: _____
_____
_____

9. Do you believe that current or future missions of Alpena CRTC effect your property value?

☐ Increases the value (>10% than if the Base wasn't there)
☐ Decreases the value (>10% than if the Base wasn't there)
☐ Has no effect on the value

Comments: _____
_____
_____

10. Have you ever participated in a military sponsored community event? Circle one

Yes - Which one(s)? No

Comments:_____
_____

Questions relating to the local economy.

11. Do you believe that Alpena CRTC has a positive impact on the surrounding communities' quality of life?

☐ Yes
☐ No
☐ Unsure

Comments: _____

_____

_____

12. How would you rate your agreement with this statement:

Alpena CRTC is a significant contributor to the local economy?

Strongly Disagree Disagree Agree Strongly Agree

If you answered Strongly Disagree or Disagree, then please describe what is:

_____

_____

13. Alpena CRTC's significant economic contributions have been (check up to 2)

☐ Jobs
☐ Local Attraction
☐ Construction
☐ Other _____
☐ Unsure

14. What is your impression of Alpena CRTC's relationship with surrounding property and business owners?

Negative Somewhat positive Positive Very positive Unsure

Comments: _____

_____

_____

15. How would you rate your agreement with this statement:

Our local businesses find it easy to conduct business with Alpena CRTC?

Strongly Disagree Disagree Agree Strongly Agree Unsure

Joint Land Use Study
Camp Grayling Joint Military Training Center (JMTC) and Alpena Combat Readiness Training Center (CRTC)

Questions relating to local planning.

16. Are you familiar with NEMCOG? Yes No

17. Are you familiar with any of the comprehensive plans for your area?

☐ Yes
☐ No
☐ Unsure

18. Our Comprehensive Plan recognizes Alpena CRTC as a significant local resource?

Strongly Disagree Disagree Agree Strongly Agree Unsure

19. Do you believe that future missions and potential growth of Alpena CRTC will have a significant effect on the following infrastructure capacity? Please check all that apply.

☐ Water
☐ Sewer
☐ Electricity
☐ All of the above
☐ None of the above

Comments: _____

_____

_____

20. Do you believe renewable resources such as wind and solar energy are vital to the area?

☐ Yes
☐ No
☐ Unsure

21. Do you see current and/or future land use conflicts occurring around Alpena CRTC?

Comments: _____

_____

_____

22. There is sufficient control over development in my community.

Strongly Disagree Disagree Agree Strongly Agree Unsure

23. The local zoning ordinances, currently in place, protect residents from adverse impacts from military training initiatives at the local installation.

Strongly Disagree Disagree Agree Strongly Agree Unsure

24. I feel it would be more helpful to have more zoning in effect.

Strongly Disagree Disagree Agree Strongly Agree Unsure

25. I am in support of development controls.

Strongly Disagree Disagree Agree Strongly Agree Unsure

Questions relating to transportation planning.

26. Municipal transportation plans for Alpena CRTC are reasonable? (i.e. the transportation system can adequately accommodate the current volume of traffic, the quality of the roads support the volume)

Strongly Disagree Disagree Agree Strongly Agree Unsure

Comments: _____

_____

_____

27. How would you rate your agreement with this statement:

Coordination/communication between Alpena CRTC and local communities facilitates an efficient flow of traffic.

Strongly Disagree Disagree Agree Strongly Agree Unsure

Other

Would you like to receive updates on the JLUS process? If so please leave us your name, email or address.

_____

_____

_____

Joint Land Use Study
Camp Grayling Joint Military Training Center (JMTC) and Alpena Combat Readiness Training Center (CRTC)

Resident Survey for Areas Surrounding Camp Grayling Joint Military Training Center (JMTC)

1. In what City, Village, or Township do you reside? _____

2. Are you (Please check one):

☐ On the Planning Commission for your area
☐ A Municipal staff member
☐ An Elected official
☐ A Resident

3. What is you gender? Male Female

4. What range does your age fall into?

☐ 18 an under
☐ 19 - 30
☐ 31 - 50
☐ 51 - 64
☐ 65 plus

Questions relating to your perceptions of Camp Grayling.

5. How familiar are you with Camp Grayling and the military operations that take place there?

Unfamiliar Somewhat Familiar Familiar Very familiar

6. Are you comfortable with military operations at Camp Grayling?

Not Comfortable Somewhat Comfortable Comfortable

Comments: _____

_____

_____

7. Do you have any concerns about military installation operations with regard to noise, traffic, or other issues around Camp Grayling? Please select all that apply?

☐ Noise
☐ Traffic
☐ Recreational Access
☐ Other

Comments: _____

_____

_____

8. Do you have concerns about military installation operations with regard to public health, safety, housing, or general welfare around Camp Grayling? Please select all that apply.

☐ Public health
☐ Safety, housing
☐ General welfare
☐ All of the above
☐ None of the above

Comments: _____

_____

_____

9. Do you believe that current or future missions of Camp Grayling effect your property value?

☐ Increases the value (>10% than if the Base wasn't there)
☐ Decreases the value (>10% than if the Base wasn't there)
☐ Has no effect on the value

Comments: _____

_____

_____

10. Have you ever participated in a military sponsored community event? Circle one

Yes - Which one(s)? No

Comments:_____

_____

Questions relating to the local economy.

11. Do you believe that Camp Grayling has a positive impact on the surrounding communities' quality of life?

☐ Yes
☐ No
☐ Unsure

Comments: _____

_____

_____

12. How would you rate your agreement with this statement:

Camp Grayling is a significant contributor to the local economy?

Strongly Disagree Disagree Agree Strongly Agree

If you answered Strongly Disagree or Disagree, then please describe what is:

_____

_____

13. Camp Grayling's significant economic contributions have been (check up to 2)

☐ Jobs
☐ Local Attraction
☐ Construction
☐ Other _____
☐ Unsure

14. What is your impression of Camp Grayling's relationship with surrounding property and business owners?

Negative Somewhat positive Positive Very positive Unsure

Comments: _____

_____

_____

15. How would you rate your agreement with this statement:

Our local businesses find it easy to conduct business with Camp Grayling?

Strongly Disagree Disagree Agree Strongly Agree Unsure

Questions relating to local planning.

16. Are you familiar with NEMCOG? Yes No

17. Are you familiar with any of the comprehensive plans for your area?

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☐ No
☐ Unsure

18. Our Comprehensive Plan recognizes Camp Grayling as a significant local resource?

Strongly Disagree Disagree Agree Strongly Agree Unsure

19. Do you believe that future missions and potential growth of Camp Grayling will have a significant effect on the following infrastructure capacity? Please check all that apply.

☐ Water
☐ Sewer
☐ Electricity
☐ All of the above
☐ None of the above

Comments: _____
_____
_____

20. Do you believe renewable resources such as wind and solar energy are vital to the area?

☐ Yes
☐ No
☐ Unsure

21. Do you see current and/or future land use conflicts occurring around Camp Grayling?

Comments: _____
_____
_____

Joint Land Use Study
Camp Grayling Joint Military Training Center (JMTC) and Alpena Combat Readiness Training Center (CRTC)

22. There is sufficient control over development in my community.

Strongly Disagree Disagree Agree Strongly Agree Unsure

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24. I feel it would be more helpful to have more zoning in effect.

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25. I am in support of development controls.

Strongly Disagree Disagree Agree Strongly Agree Unsure

Questions relating to transportation planning.

26. Municipal transportation plans for Camp Grayling are reasonable? (i.e. the transportation system can adequately accommodate the current volume of traffic, the quality of the roads support the volume)

Strongly Disagree Disagree Agree Strongly Agree Unsure

Comments: _____
_____
_____

27. How would you rate your agreement with this statement:

Coordination/communication between Camp Grayling and local communities facilitates an efficient flow of traffic.

Strongly Disagree Disagree Agree Strongly Agree Unsure

Other

Would you like to receive updates on the JLUS process? If so please leave us your name, email or address.

_____
_____
_____

C

project fact sheet/ announcements

Please see the following pages.

DISCOVER Northeast Michigan EAST OF EXPECTED

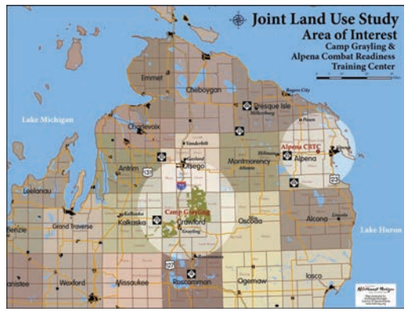
Working Together to Build Stronger Local Communities

The Camp Grayling and Alpena Combat Readiness Training Center Joint Land Use Study (JLUS) Community Meetings

Do you live, work, or recreate near the Alpena Combat Readiness Training Center or Camp Grayling?

Have you wondered about the military installations and how they contribute to our economy?

What are the issues, concerns, and questions you have about the compatibility of the military missions with the surrounding communities?



Northeast Michigan Council of Governments invites you to participate in upcoming public meetings for the JLUS project that will address the issues related to military installations in our communities. Join staff from Camp Grayling and the Alpena Combat Readiness Training Center, local community officials, and other interested residents and business owners to hear a presentation about the military installations, learn about the JLUS project, and share your issues, concerns, and questions. Light snacks will be provided.

Alpena Combat Readiness Training Center Public Meeting

Thursday, June 1, 2017 | 7:00 pm – 9:00 pm
Maritime Heritage Center (NOAA) Sanctuary Theater, 500 W. Fletcher Street, Alpena, MI

Camp Grayling Public Meeting

Tuesday, June 6, 2017 | 7:00 pm – 9:00 pm
Kirtland Health Sciences Center, Community Room B, 4800 W. 4 Mile Road, Grayling, MI

Read more about the JLUS project at NEMCOG's website *http://www.discovernortheastmichigan.org/jlus.asp*

DISCOVER Northeast Michigan EAST OF EXPECTED

The Northeast Michigan Council of Governments invites Joint Land Use Study (JLUS) Policy and Technical Committee members to participate in the

Camp Grayling and the Alpena Combat Readiness Training Center JLUS Installation Tours and Issues Identification Discussion

Alpena Joint Training Center Installation Tour and Issues Identification Discussion

Thursday, June 1, 2017

9:00 am – 12:00 pm Installation Tour and Lunch (details provided upon receiving RSVP)

1:30 pm – 4:00 pm Issues Identification Discussion
at the Maritime Heritage Center (NOAA) Education Room,
500 W. Fletcher Street, Alpena, MI

(Please consider staying for the JLUS Public Meeting from 7:00 pm – 9:00 pm in the Maritime Heritage Center Sanctuary Theater)

Camp Grayling Joint Maneuver Training Center Installation Tour and Issues Identification Discussion

Monday June 5, 2017

9:00 am – 4:00 pm Installation Tour and Lunch (details provided upon receiving RSVP)

Tuesday, June 6, 2017

9:00 am – 11:30 am Issues Identification Discussion
at the Grayling Township Hall, 2090 Viking Way, Grayling, MI

(Please consider attending the JLUS Public Meeting from 7:00 pm – 9:00 pm Kirtland Health Sciences Center, Community Room B, 4800 W. 4 Mile Road, Grayling, MI)

RSVPs are required to participate in the installation tours.

All Policy Committee and Technical Committee members should RSVP for the installation tours to **Denise Cline**, Deputy Director/Chief Planner, Northeast Michigan Council of Governments (734) 648-9295 (direct phone line), (989) 705-3730 (main office), (989) 705-3729 (fax) or dmcline@nemcog.org. **RSVPs due no later than 12:00 pm Friday, May 26.** Anyone who has not provided an RSVP will not appear on the installation security list and will not be able to participate in the tour. You will receive additional details about the tour logistics upon submitting your RSVP.

d

surveys announcement

DISCOVER Northeast Michigan EAST OF EXPECTED

Working Together to Build Stronger Local Communities

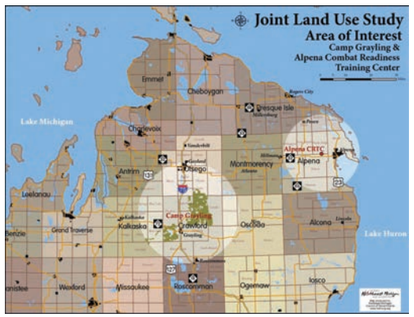
The Camp Grayling and Alpena Combat Readiness Training Center Joint Land Use Study (JLUS)

COMMUNITY SURVEY

Do you live, work, or recreate near the Alpena Combat Readiness Training Center or Camp Grayling?

How do you feel these military installations affect your quality of life and the local economy?

What are the issues, concerns, and questions you have about the compatibility of the military missions with the surrounding communities?



Northeast Michigan Council of Governments invites you to share your opinion and concerns through a community survey. Your input will help the Joint Land Use Study (JLUS) team identify problems and solutions.

Go to the NEMCOG Joint Land Use Study project website and take the survey that's right for you.
http://www.discovernortheastmichigan.org/jlus.asp

If you would like a paper copy of the survey, please call NEMCOG at 989-705-3730 or email dmcline@nemcog.org

Read more about the JLUS project at NEMCOG's website *http://www.discovernortheastmichigan.org/jlus.asp*

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C

SWOT results

During the June 2017 public meetings for the Camp Grayling JMTC and Alpena CRTC JLUS, the JLUS project team conducted a SWOT analysis with project stakeholders. Stakeholders included members of the TC and PC as well as the public.

A SWOT analysis is a consensus-building exercise to sort previously identified issues into the categories of strengths, weaknesses, opportunities, and threats so that individuals can vote to share their preferences.

This voting it turn leads to the creation of a weighted matrix, which reveals the issues that stakeholders consider most important to their daily lives.

Some questions to consider while placing issues in the various categories include:

- **STRENGTH:**
  - What is working or has worked?
  - What are the technologies, programs, policies, or resources to build on?
- **WEAKNESS:**
  - What is not working and requires modification or abandonment?
  - What has been unsuccessful in the past and why?
- **OPPORTUNITY:**
  - What could work?
  - Are there untapped resources available?
  - Are there assets, like geographic location, that are not being maximized?
- **THREAT:**
  - What will work against the program if there is no charge?
  - What needs to be planned for now to prevent failure?

Results of the analysis performed at the NEMCOG public meetings is provided in the following tables and graphics. These weighted issues were used to develop the refined list of issues that was later presented to the public in October 2017.

Above: The SWOT exercise facilitator collects issues, which can be positive or negative, on sticky notes. Then, the facilitator encourages participants to answer "in one voice" as they sort the issues into the four categories.

Once all the issues have been categorized, participants in Alpena (top left) and Grayling (below left) are given a number of stickers and instructions about how to use them. They can place their stickers as they see fit, selecting the issues that matter the most to them and their communities.

Table C.1 | Camp Grayling JMTC SWOT Results – TC and PC Members

STRENGTHS		WEAKNESSES		OPPORTUNITIES		THREATS	
Issue	*Votes*	*Issue*	*Votes*	*Issue*	*Votes*	*Issue*	*Votes*
Economic Impact	9	Camp Grayling Operations: Noise	11	Airport: Sound and View Buffer	6	PFCs	19
Sustainability and Recycling	5	Tax Burden	7	MATES	6	Road Conditions	16
Community Cooperation	3	Internet Access	7	Communication with Area Surrounding Camp Grayling	5	Wildfires	12
Sounds and Sights of Freedom	3	Noise: Aircraft	7	Emergency Response Notification	4	Runway Expansion: Trees	8
Positive Community Interaction	3	Noise: Impact on Communities	6	Communication about Operations	3	ASP Protection	3
Simulated Training	2	DNR Tree Cutting	6	Camp Grayling 5 Year Expansion Plan	3	Unexploded Ordinance	2
Positive Members of the Community	2	Poor Cell Phone Reception	6	Future of Joint Recycling	1	Fuel Point Protection	2
Historic Reputation	2	Flight Path	5	Lake Recreation Effects	1	Anti-Terrorism/Force Protection	0
No Land Growth	1	Night Operations Impact on Communities	4	Summer Peak	1		
Continuing Improvement with Public Relations	1	Camp Grayling Operations: Low Flying	4	Increase Tanks	1		
Camp Grayling Operations: Noise Improvement	1	Displaced Wildlife	3	Tank Trails	0		
Threatened and Endangered Species Habitat	1	Clear Cutting	3	Double Northern Strike	0		
Wide Name Recognition	1	Emergency Response: Summer Peak	2	In Grants	0		
Best Group EVER	1	New Gates	1	Out Grant Disposal	0		
Multi-County Collaboration	0	Infrastructure Disrepair	0				

Table C.2 | Camp Grayling JMTC SWOT Results – Public

STRENGTHS		WEAKNESSES		OPPORTUNITIES		THREATS	
Issue	*Votes*	*Issue*	*Votes*	*Issue*	*Votes*	*Issue*	*Votes*
Wildlife: Contiguous Habitat	4	PA288 Enforce Resources	6	Public Relations	9	Fire Control	7
Community Support	3	Camp Grayling Operations: Noise	5	Economic Monitoring	7	Ground Water Contamination	6
Economic Impact	3	Problem Intersections	4	PA 288	5	Airfield Water Contamination	3
Wildlife: Partnerships	3	Cell Coverage	4	Education	5	Fire Impact to Local Training	2
Emergency Responders	2	Road Conditions	4	Social Media	2	Vertical Hazards	2
147,000 Acre Facility	2	North Down River I-75 Road	3	Silent Sports	2	PFCs	2
Maintaining Protected Habitat	1	Disaster Communications	3	Forest Health	2	Public Safety	1
Air Space	1	Water Quality	3	Energy Efficiency	1	In Grants and Out Grants	1
Wildfires Required Burns	1	Four Mile/I-75	2	Stormwater Management	1	PA288 ORV Trail Posting	1
UASs	1	Siltation	2	Interoperability	1	Property Damage due to Wildfires	0
Grayling Army Airfield	1	Infrastructure	2	Facilities as a Community Resource	1	UXOs	0
Wildlife: T&E Species	1	Shortage of Emergency Responders	1	Airfield Expansion Opportunities	1		
State Partnerships	1	Swimmers Itch	1	Virtual Pipe Line	1		
Research and Development	1	Soil Erosion	1	Population Surge (Carrying Capacity)	1		
Wildlife: T&E Research	1	BAPs	1	COA 4 UAS to Restricted Airspace	0		
Positive Deterrent	0	Fire Fighting Costs	1	Public Recreation	0		
Alpena-Grayling Partnership	0	Visitors Tail	1	Public Access	0		
Restricted Air Space	0	High Season Problem Intersections	1				
CG MATES Partnership	0	Traffic Congestion	1				
Increased Throughput	0	Social Media Perception	0				
Rising Tide	0	Removal of Vegetation	0				
DSCA	0	Logistical Trail	0				
Varieties of Land Ownership	0	Freeway Interchanges (choke points)	0				
Designated Natural Rivers	0						
NWTF Cooperative WL Management	0						
Facilities	0						
Hanson Hills Rec Area	0						
Boundary Management	0						
Frequency Capacity	0						

Table C.3 | Alpena CRTC SWOT Results – TC, PC, and Public

STRENGTHS		WEAKNESSES		OPPORTUNITIES		THREATS	
Issue	*Votes*	*Issue*	*Votes*	*Issue*	*Votes*	*Issue*	*Votes*
Northern Strike Activity	9	Noise: Training/Aircraft Operations (Too low and fast)	5	Base Community Council	9	Closing Alpena CRTC	10
Commercial Partnership with Sheriff's Department	7	Delayed Budget/ Congressional Approval	3	Northern Strike	7	Live Munition Impacts to Lake Huron	7
Draws New People/ Tourist to Community	6	Flight Path	2	Increase Local Awareness of Alpena CRTC Economic Impact	6	PFCs	5
Base Population Economic Impact	6	Training Accidents	2	Increase Community Involvement	6	Impact of Munitions on Groundwater Quality	4
Airport Viability	5	Infrastructure Issue – Roads and Matching SRM	2	Sustainability	5	Unexploded (UXO)/ Dummy Ordinance in Lake Huron	1
Joint Response Emergency Services	5	FAA Oversight	1	Attract DOD Prime Contractors	5	Impact on the Marine Sanctuary	1
Star Base	5	PT SES Trigger Northern Strike	0	Identify the Carrying Capacity of Alpena	3	Security Breach	0
Members of the Community	4	Sling Load Training	0	PSA	2	Civilian Intrusion	0
New Hangar	3	Drop Zone Accidents	0	Parade	1		
Construction is a positive Economic Impact	3			Public Air Show	0		
Expansion Potential	3						
Northern Strike and Economic Assess	2						
Current Sonar Scan	2						
Surge Capacity - Rental Vehicle	0						

Figure C.1 | Camp Grayling JMTC SWOT Results

Figure C.2 | Alpena CRTC SWOT Results

(Items in the smallest font size got less than 5 votes.)

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d

strategy index

Please see the following pages.

Table D.1 | Camp Grayling JMTC Strategies

JLUS IMPLEMENTATION TEAM ACTION PLAN ITEMS	ID	ISSUE/STRATEGY	PRIORITY	TIME	TYPE	STRATEGY LEAD	STAKEHOLDERS
Category 1: Noise							
	Issue 1a	*Impact of Aircraft Noise on Communities*					
Noise Study	1a.1	Conduct a noise study	H	0-3	Research	Camp Grayling JMTC/Alpena CRTC	NEMCOG, Residents
Noise Study	1a.2	Educate the public on residential sound attenuation	M	0-1	Outreach	NEMCOG, Camp Grayling JMTC/Alpena CRTC	NEMCOG, Residents
Noise Study	1a.3	Establish no-fly zones over sensitive areas	M	0-4	Regulatory	NEMCOG, Camp Grayling JMTC/Alpena CRTC	NEMCOG, Residents
Military Overlay Zone	1a.4	Conduct an analysis of property ownership under the restricted airspace and near the airfield	M	0-5+	Regulatory	Camp Grayling JMTC/Alpena CRTC	NEMCOG, Residents
Military Overlay Zone	1a.5	Noise reduction for buildings within 65 ADNL noise area	H	0-1	Regulatory	Grayling, Alpena, Crawford County	NEMCOG, Residents
	Issue 1b	*Tree Cutting Reduces Noise Buffer*					
Landscape Plan	1b.1	Plant trees in areas where it is appropriate and allowed	H	2-5+	Regulatory	Camp Grayling JMTC, MDNR	NEMCOG, Residents, U.S. Forest Service
Landscape Plan	1b.2	Assess timber harvest effects on noise attenuation	M	2-3	Outreach	Camp Grayling JMTC	Residents, MDNR
Landscape Plan	1b.3	Enhance public awareness of forestry management plans, operations, and impacts	M	2-3	Outreach	MDNR	Camp Grayling JMTC, Residents
Category 2: Military Operations							
	Issue 2a	*Flight Paths over Homes*					
Military Overlay Zone	2a.1	Create sensible military overlay zones around Camp Grayling JMTC	H	0-4	Regulatory	NEMCOG Planners	NEMCOG, Residents
Noise Study Military Overlay Zone	2a.2	Educate the public on existing established flight paths	M	0-5+	Outreach	Camp Grayling JMTC/Alpena CRTC, NEMCOG	NEMCOG, Residents
	Issue 2b	*Noise and Vehicular Disruption from MATES*					
Community Relations Staff	2b.1	Educate the public on traffic routes and needs	M	0-2	Outreach	Camp Grayling JMTC Public Affairs, NEMCOG	NEMCOG, Residents
	Issue 2c	*Noise and Vibration from Night Training*					
Noise Study Community Relations Staff	2c.1	Educate and inform the public on night training	M	3-5	Regulatory	DOD, NGB, Camp Grayling JMTC/Alpena CRTC	NEMCOG, Residents
Noise Study Installation Master Plan	2c.2	Identify specific locations where night training is particularly disruptive and identify alternatives	M	0-2	Regulatory	DOD, NGB	NEMCOG, Camp Grayling JMTC/Alpena CRTC
Noise Study Installation Master Plan	2c.3	Confine military arms testing and range use to areas adjacent to state-owned lands	M	0-2	Regulatory	DOD, NGB, Camp Grayling JMTC/Alpena CRTC	NEMCOG, Residents
	Issue 2d	*Population Growth may Encroach on the Mission*					
Military Overlay Zone Installation Master Plan	2d.1	Establish zoning regulations that prevent encroachment, particularly near potentially dangerous and noise-generating activities	H	1-2	Regulatory	NEMCOG	NEMCOG, Residents, Camp Grayling JMTC
Military Overlay Zone Installation Master Plan	2d.2	Purchase land around installations to control growth	L	2-5+	Regulatory	NEMCOG, Camp Grayling JMTC	Landowners
Category 3: Environmental							
	Issue 3a	*PFOS and PFOA Contamination of Groundwater*					
Community Relations Staff Water Master Plan	3a.1	Improve public outreach and access to information	M	1-5+	Outreach	Camp Grayling JMTC, NGB	NEMCOG, Residents, MDNR
	Issue 3b	*Impacts/Effects on Groundwater and Drinking Water*					
Community Relations Staff Water Master Plan	3b.1	Provide information to the public on groundwater contamination in the Camp Grayling area	M	2-3	Research	Camp Grayling JMTC, MDEQ	NEMCOG, Residents, MDNR

JLUS IMPLEMENTATION TEAM ACTION PLAN ITEMS	ID	ISSUE/STRATEGY	PRIORITY	TIME	TYPE	STRATEGY LEAD	STAKEHOLDERS
	Issue 3c	*Impacts/Effects on Surface Water Systems*					
Community Relations Staff Water Master Plan	3c.1	Control runoff and support bioassessment surveys to monitor ecological and aquatic community health	H	2-3	Regulatory	NEMCOG, MDEQ	Residents
Community Relations Staff Water Master Plan	3c.2	Support water quality and aquatic ecology communications	L	2-3	Outreach	NEMCOG	Residents, MDNR
	Issue 3d	*Effects on Health of Wildlife Populations*					
Installation Master Plan Community Relations Staff	3d.1	Ongoing ecological assessment and community outreach and engagement	M	3-5+	Research/ Outreach	Camp Grayling JMTC, MDNR	Residents
	Issue 3e	*Wildfire Management*					
Community Relations Staff Fire Study	3e.1	Increase public awareness of ongoing wildfire management efforts and gather public input	M	0-5+	Outreach	Camp Grayling JMTC, MDNR	Residents, MDNR
	Issue 3f	*Resource Use and Sustainability*					
Community Relations Staff Water Master Plan	3f.1	Public outreach to increase awareness of sustainability measures at Camp Grayling JMTC	L	0-5+	Outreach	Camp Grayling JMTC Public Affairs	Residents
Installation Master Plan	3f.2	Consider the creation of joint recycling/sorting station	L	2-3	Regulatory	Camp Grayling JMTC, NEMCOG	Residents
Category 4: Transportation and Infrastructure							
	Issue 4a	*Effects of Growth on Utilities*					
Installation Master Plan	4a.1	Continue to monitor capacity and community growth	L	0-5+	Regulatory	Grayling Township	Residents, MDNR
Installation Master Plan	4a.2	Plan for possible mission expansion	M	0-5+	Planning	Camp Grayling JMTC	City of Grayling, Residents
	Issue 4b	*Improve Internet Access*					
	4b.1	Encourage the growth and use of high-speed internet services	L	0-3	Regulatory	City of Grayling	Residents, County, Military
	Issue 4c	*Poor Cellular Reception*					
	4c.1	Grow cellular services	L	2-3	Regulatory	Camp Grayling JMTC, Local Communities	Residents, MDNR
	Issue 4d	*Traffic*					
Installation Master Plan Transportation Study	4d.1	Streamline Camp Grayling JMTC traffic	M	2-3	Regulatory	Camp Grayling JMTC, Local Communities	Residents
Installation Master Plan Transportation Study	4d.2	Improve traffic flow and safety throughout the Grayling area	H	2-3	Regulatory	NEMCOG/City of Grayling	Residents, County, Military
Transportation Study	4d.3	Improve the I-75/North Down River Road interchange	H	2-3	Development	Crawford County Road Commission	NEMCOG, Camp Grayling JMTC, City of Grayling
Transportation Study	4d.4	Create a landmark and symbolic entrance to Camp Grayling JMTC	L	3-5	Regulatory	Grayling Township, City of Grayling	Camp Grayling JMTC, Grayling Township
	Issue 4e	*Recreational Access*					
Community Relations Staff Transportation Study Installation Master Plan Landscape Plan	4e.1	Ensure appropriate recreational access and increase public outreach	M	2-3	Regulatory	Camp Grayling JMTC, Local Communities, MDNR	Residents, MDNR
	Issue 4f	*Poor Road Condition*					
Transportation Study	4f.1	Improve road network	M	0-5+	Regulatory	Multiple	Residents, Camp Grayling JMTC
Transportation Study	4f.2	Increase funding for road projects and maintenance	H	0-5+	Funding	Multiple	Residents, Camp Grayling JMTC

JLUS IMPLEMENTATION TEAM ACTION PLAN ITEMS	ID	ISSUE/STRATEGY	PRIORITY	TIME	TYPE	STRATEGY LEAD	STAKEHOLDERS
Category 5: Community Partnerships							
	Issue 5a	*Communications/Education*					
Community Relations Staff	5a.1	Document a comprehensive SOP for communications and community relations at Camp Grayling JMTC	M	1-2	Outreach	Camp Grayling JMTC	Residents
Community Relations Staff	5a.2	Use relationship with Blarney Broadcasting as a model for expanding media reach	L	1-3	Outreach	Camp Grayling JMTC	Residents, Local Media
Community Relations Staff	5a.3	Develop a public education program on UXO	M	1-2	Outreach	Camp Grayling JMTC	Residents
Community Relations Staff	5a.4	Ensure web resources include access to Camp Grayling contact information and resources	L	0-1	Outreach	Camp Grayling JMTC	Residents
	Issue 5b	*Public Relations/Community Involvement*					
Community Relations Staff	5b.1	Inform community partners on process to request Camp Grayling JMTC tours and participation in community events	M	0-1	Outreach	Camp Grayling JMTC	Residents
Community Relations Staff	5b.2	Expand Camp Grayling JMTC community relations staff	H	3-5	Staffing	Camp Grayling JMTC	Residents
Community Relations Staff	5b.3	Develop an interpretive visitors' center/history center at Camp Grayling JMTC	L	3-5	Outreach	Camp Grayling JMTC	Residents, Chambers of Commerce
Military Overlay Zone Community Relations Staff	5b.4	Revise respective zoning ordinances for governmental entities within the APZ	H	1-2	Regulatory	Grayling Township, City of Grayling	Developers, Residents, Local Governments
Community Relations Staff Installation Master Plan Transportation Study	5b.5	Collaborate on joint-use conference/community center	M	4-5	Partnership	Camp Grayling JMTC, City of Grayling	Residents, Local Governments
Community Relations Staff	5b.6	Convene a Camp Grayling JMTC Community Council	M	2-3	Outreach	Project Rising Tide, Camp Grayling JMTC	Residents, NEMCOG
Category 6: Economic Development							
	Issue 6a	*Effect on Property Value Mostly Perceived as Neutral or Positive*					
Military Overlay Zone Community Relations Staff Economic Impact Study	6a.1	Develop communication materials that highlight the potential impacts from Camp Grayling JMTC for future homebuyers	M	0-1	Outreach	JLUS Implementation Committee, Rising Tide Initiative	Camp Grayling, County Economic Development Leads, Local Real Estate Agents
	Issue 6b	*Significant Contributor to Local Economy*					
Fire Study Economic Impact Study	6b.1	Fire protection services needs study	H	0-1	Research	Camp Grayling JMTC	Residents, Grayling Fire Department, County Economic Development Leads
Economic Impact Study	6b.2	Local purchasing goal for Camp Grayling JMTC	M	2-3	Outreach	Camp Grayling JMTC	Grayling Business Owners, County Economic Development Leads
Transportation Study Economic Impact Study	6b.3	Expanded public transportation from Camp Grayling JMTC to surrounding communities to support military tourism	M	0-1	Outreach	City of Grayling	Grayling Business Owners, County Economic Development Leads, Gaylord, Michigan Works!
Installation Master Plan Economic Impact Study	6b.4	Increase public use of Grayling Airfield	L	4-5	Development	Camp Grayling JMTC	Grayling Township, Camp Grayling, FAA, MDOT, County Economic Development Leads
	Issue 6c	*Economic Incentivizing and Monitoring*					
Economic Impact Study	6c.1	Economic tracking and reporting mechanisms to quantify annual military tourism	M	0-1	Outreach	City of Grayling	Camp Grayling JMTC, County Economic Development Leads, Michigan Works!
Economic Impact Study	6c.2	Economic incentives to generate military tourism	M	2-3	Regulatory	Camp Grayling JMTC, City of Grayling, Grayling Township	Chambers of Commerce, County Economic Development Leads

Table D.2 | Alpena CRTC Strategies

JLUS IMPLEMENTATION TEAM ACTION PLAN ITEMS	ID	ISSUE/STRATEGY	PRIORITY	TIME	TYPE	STRATEGY LEAD	STAKEHOLDERS
Category 1: Noise							
	Issue 1a	*Training/Aircraft Operations are Too Low/Fast*					
	1a.1	Educate the public on the flight paths used for military aircraft	M	0-2	Outreach	Alpena CRTC, NEMCOG	NEMCOG, Residents
	1a.2	Discourage residential uses via zoning	M	2-4	Regulatory	NEMCOG	NEMCOG, Alpena Regional Airport
	1a.3	Work with FAA and Alpena Regional Airport to control aircraft flight paths	M	0-2	Outreach	NEMCOG	Alpena Regional Airport, Alpena CRTC
Military Overlay Zone	1a.4	Create a Military Overlay Zone	H	0-4	Regulatory	NEMCOG Planners	Residents
Military Overlay Zone Noise Study	1a.5	Update building codes Alpena CRTC to include better sound proofing for buildings built within the 65 ADNL noise area	M	1-3	Regulatory	City of Alpena, Alpena County	Residents, Alpena CRTC
Military Overlay Zone Noise Study	1a.6	Conduct a noise study	H	0-3	Research	Camp Grayling JMTC/Alpena CRTC	NEMCOG, Residents
Category 2: Military Operations							
	Issue 2a	*Live munition impacts to Lake Huron*					
Bathymetric Survey Water Master Plan Interagency Cooperation	2a.1	Identify impacts to the environment	H	2-5+	Research	NEMCOG, MDNR, MDEQ	NEMCOG, Residents, NOAA, Alpena CRTC
	Issue 2b	*Northern Strike Activity*					
Community Relations Staff	2b.1	Organize and engage community members in advance	M	2-3	Outreach	NEMCOG	Alpena CRTC, Camp Grayling JMTC, Community Leaders
	Issue 2c	*Marine Sanctuary*					
Bathymetric Survey Interagency Cooperation	2c.1	Identify potential UXO on the lake bed	H	1-5+	Regulatory/ Research	Alpena CRTC, NOAA	NEMCOG, U.S. Navy, U.S. Coast Guard
Military Overlay Zone Noise Study	2c.2	Establish fixed boundaries so that encroachment into the military operations area is kept to a minimum	H	2-3	Regulatory/ Research	Thunder Bay National Marine Sanctuary	Alpena CRTC
Community Relations Staff Interagency Cooperation Water Master Plan	2c.3	Author and promote cooperation story with Thunder Bay National Marine Sanctuary	M	2-3	Research/ Outreach	NEMCOG, NOAA	Thunder Bay National Marine Sanctuary, MDEQ
Category 3: Environmental							
	Issue 3a	*PFOS and PFOA Contamination of Groundwater*					
Community Relations Staff Water Master Plan	3a.1	Improve public outreach and access to information	H	1-3	Outreach	Alpena CRTC	MDEQ, Residents
	Issue 3b	*Surface Water Quality (Lakes, Rivers, Streams, Wetlands)*					
Water Master Plan Interagency Cooperation	3b.1	Support water quality and aquatic ecology scientific communications	M	2-3	Outreach	Alpena CRTC	MDEQ, Residents
Water Master Plan Interagency Cooperation	3b.2	Use biodegradable targets for lake training	H	2-3	Regulatory	Alpena CRTC	NOAA
	Issue 3c	*Groundwater Quality*					
Community Relations Staff Water Master Plan	3c.1	Provide information to the public on groundwater contamination in the Alpena CRTC area	M	2-3	Outreach	Alpena CRTC	Residents, MDNR

JLUS IMPLEMENTATION TEAM ACTION PLAN ITEMS	ID	ISSUE/STRATEGY	PRIORITY	TIME	TYPE	STRATEGY LEAD	STAKEHOLDERS
Category 4: Transportation and Infrastructure							
	Issue 4a	*Effects of Growth on Utilities*					
	4a.1	Address utilities issues at Alpena CRTC	L	1-4	Regulatory	Alpena CRTC	City of Alpena, Alpena County Townships, Alpena County
	4a.2	Plan for possible mission expansion	M	0-5+	Regulatory	Alpena CRTC	Alpena County, Residents
	Issue 4b	*Airport Joint Ownership/Land Use Access*					
Interagency Cooperation Community Relations Staff	4b.1	Continue positive coordination	H	0-5+	Outreach	Alpena CRTC, Alpena Regional Airport	
	Issue 4c	*Road Funding*					
Transportation Plan Community Relations Staff	4c.1	Continue discussion between county and military officials	M	0-1	Research/ Outreach	Alpena CRTC	City of Alpena, Alpena County Townships, Alpena County
	Issue 4d	*Road Condition*					
	4d.1	Increase funding for road projects and maintenance	H	0-5+	Funding	City of Alpena, Alpena County Townships, Alpena County	Residents
	Issue 4e	*Recreational Access*					
	4e.1	Determine whether allowing lake access is viable	L	0-1	Regulatory/ Research	Alpena CRTC, Alpena Regional Airport	Residents, MDNR
Category 5: Community Partnerships							
	Issue 5a	*Communications/Education*					
Community Relations Staff	5a.1	Hire a dedicated community relations specialist for Alpena CRTC	H	2-3	Regulatory	Alpena CRTC, MIANG	Residents
Community Relations Staff	5a.2	Improve update process to Alpena CRTC website	M	2-3	Outreach	Alpena CRTC, MIANG	Residents
Community Relations Staff Economic Impact Study	5a.3	Promote STARBASE as an asset connected to Alpena CRTC	M	2-3	Outreach	Alpena CRTC	Residents
Community Relations Staff Economic Impact Study	5a.4	Strengthen existing partnership with Alpena Community College	M	2-3	Partnership	Alpena CRTC	Residents
Interagency Cooperation Community Relations Staff	5a.5	Formalize communications with NOAA regarding operations over Thunder Bay National Marine Sanctuary	M	0-3	Outreach	Alpena CRTC	Residents
Military Overlay Zone	5a.6	Revise respective zoning ordinances for governmental entities within the APZ	H	1-2	Regulatory	Alpena County Townships, NEMCOG	Developers, Residents, Local Governments
	Issue 5b	*Public Relations/Community Involvement*					
Interagency Cooperation Economic Impact Study	5b.1	Convene expanded Alpena CRTC Community Council with Alpena Area Chamber of Commerce	M	2-3	Outreach	Alpena CRTC, JLUS Implementation Committee	Residents
Community Relations Staff Economic Impact Study	5b.2	Inform community on process to request tours and participation in community events	M	2-3	Outreach	Alpena CRTC	Residents
Category 6: Economic Development							
	Issue 6a	*Significant Contributor to Local Economy*					
Economic Impact Study	6a.1	Local purchasing goal for Alpena CRTC	M	2-3	Outreach/ Research	Alpena CRTC	Business Owners, Target Alpena
	Issue 6b	*Airport Viability*					
Interagency Cooperation	6b.1	Leverage relationships to replace customs agent	M	2-3	Regulatory	Alpena Regional Airport	Residents

JLUS IMPLEMENTATION TEAM ACTION PLAN ITEMS	ID	ISSUE/STRATEGY	PRIORITY	TIME	TYPE	STRATEGY LEAD	STAKEHOLDERS
	Issue 6c	*Partnership with Sheriff*					
Economic Impact Study	6c.1	Maintain relationship between sheriff and Alpena CRTC and advocate for longer-term contract	M	2-3	Regulatory	Alpena CRTC/Alpena County Sheriff	
	Issue 6d	*Military Tourism*					
Economic Impact Study	6d.1	Economic incentives to generate military tourism	M	2-3	Outreach/ Research	Alpena County	Local Businesses, Tourism Bureaus, Target Alpena
Economic Impact Study	6d.2	Economic tracking and reporting mechanisms	M	2-3	Outreach/ Research	Chamber of Commerce	Alpena CRTC, Local Businesses, Target Alpena

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e

report comments and resources

E.1 Official Stakeholder Comments

See the following pages for comments received from key stakeholders on the draft and check final submittals.

Camp Grayling JMTC and Alpena CRTC JLUS Comment Matrix
Draft Submittal, May 2018

Comment Number	Reviewer	Page Number	Heading Number	Comment	Contractor Response	Contractor Resolution
1	Denise Cline	2-6	2.1.8	Missaukee County is unzoned (text says zoning information was unavailable)	Concur	Text corrected
2	Denise Cline	2-7	2.1.9	Could we include a description of what APZ I and II mean? How are they different?	Concur	Text adjusted
3	Denise Cline	2-13	2.3.2	Text says that small portions of the RA may be privately owned if they have a conditional use lease agreement between the land owner and the US Government. Does this exist at Guthrie Lakes? I'm assuming not since the text also says it is unclear how they came to be in such close proximity. Issue 1b talks about trees needing to hug the structure to be effective, but this is in conflict with wildfire prevention strategies.	Concur	Additional research is needed to better understand what agreements were in place when the Guthrie Lakes development was approved. Tetra Tech will resolve this comment before the Final Submittal. Regarding wildfire, the narrative has been adjusted.
4	Denise Cline	2-16	2.3.2	Issue 2.d - add "township" to zoning recommendations. "Cities, counties, and townships….". Also - report recommends preventing future development to limit future encroachment, etc. However, it's already been stated that this large amount of private property and development was allowed to exist/develop (without reallly knowing why). Questions that the communities will likely ask when the implementation committee starts working on this are: How do you limit someone's ability to use their property without it being considered a taking? Or maybe a taking is justified in these cases due to safety concerns? Could the property owner demand just compensation?	Concur	Added "townships." See updated language on page 4-9, 4-27, and Appendix F.
5	Denise Cline	2-16	2.3.3	Change the "More Information" box to include the new consolidated website: https://www.michigan.gov/pfasresponse	Concur	Text adjusted
6	Denise Cline	3-3	3.1.5	Typo - Top paragraph on right-hand column. "The installation employees 88 military personnel…"	Concur	Text corrected
7	Denise Cline	3-13	3.3.3	Change the "More Information" box to include the new consolidated website: https://www.michigan.gov/pfasresponse	Concur	Text adjusted
8	Denise Cline	3-14	3.3.4	3rd column - 2nd paragraph - reference for the wastewater treatment numbers were probably from the City of Alpena Comprehensive Plan, not the Alpena County Master Plan.	Concur	Text corrected
9	Denise Cline	4-12	2.d.2	No real comment here - I just wanted to say that this is a very interesting strategy. I'm very interested in learning more about the RPX program mentioned.	Concur	Thanks! No action
10	Denise Cline	4-22	5.b.4	I'm thinking that communities should be coordinating with Camp Grayling/Alpena CRTC for their site plan reviews - especially if there isn't a military overlay zone in place. Camp Grayling/Alpena CRTC should at least be on the list of potential entities that site plans are distributed to in order to obtain feedback. This comment would apply to all strategies concerning the military overlay zone. Should add reference to Camp Grayling/Alpena CRTC in site plan review standards in local zoning ordinances.	Concur	Text adjusted - pages 4-9, 4-22, 4-27
11	Denise Cline	b-9	2.1.1	Add Michigan Sea Grant/Michigan State University Extension to list of stakeholders	Concur	Text adjusted
12	Denise Cline	b-10	2.1.2	Update list of committee members (attached) - delete Mary Sanders, add Brenda Fournier. Check for other changes (changes within Camp Grayling as well).	Concur	Text adjusted per Word document

Comment Number	Reviewer	Page Number	Heading Number	Comment	Contractor Response	Contractor Resolution
13	Denise Cline			General Comment - NEMCOG should continue developing the JLUS web presence. Each issue could have a separate page with the recommended strategies and also other resources which address that strategy. Then, as new developments occur, this additional information could be added.	Concur	This is a great idea!
14	Steven P. Smigelski, Airport Manager	3-3	3.1.5	Drones can now be flown in the Class D airspace when the tower is open.	Concur	Text adjusted
15	G. Sundin, Alpena City Manager	Pg. before 1-1	Surround Area	CRTC located west of Alpena, not northwest	Concur	Corrected
16	G. Sundin, Alpena City Manager	Same as Above	Top Issues	2nd arrow - I do not believe that events like Northern Strike are a burden to the community. Where does this come from?	Concur - We heard from some that the activity is a burden while others see it as a boon.	Changed to "impact the community"
17	G. Sundin, Alpena City Manager	Pg. 1-2	1.3	2nd column, 2nd paragraph, 4th line - "bound" should be "bounded". Later in paragraph, does not say what it is bounded by to the east.	Concur	Changed to "bounded." No major constraints/boundaries to the east except wetlands.
18	G. Sundin, Alpena City Manager	Pg. 3-4	3.1.6	Population projection for Alpena County is unrealistically high. Where did you get your data?	Discuss	Our source is Esri community analyst, which pulls Census data. The population graph is for the city of Alpena, not the study area.
19	G. Sundin, Alpena City Manager	Pg. 3-10	3.3.2	Issue 2b - I have never heard that Northern Strike and other events are a burden to the community.	Concur - We heard from some that the activity is a burden while others see it as a boon.	Changed "burden" to "impact" like in comment above.
20	G. Sundin, Alpena City Manager	Pg. 3-17	3.3.5	3rd column, 2nd paragraph, 3rd line from bottom - Add the word "been" after "regularly".	Concur	Changed
21	G. Sundin, Alpena City Manager	Pg. 3-17	3.3.5	4th column, last paragraph - need an explanationas to why visits through STARBASE are not providing information that can be shared with family members. This is a generic statement as currently written.	Concur	Removed sentence
22	G. Sundin, Alpena City Manager	Pg. 3-18	3.3.6	Issue 6.a, 2nd column, 2nd paragraph - Statement that summer tourism adds more than 4,000 people to the area seems outdated. Number seems low. Check with CVB.	Concur	Figure revised
23	G. Sundin, Alpena City Manager	Pg. 3-18	3.3.6	Issue 6.b., 3rd column, 15th line - change "Airfield" to "Airport".	Concur	Corrected
24	G. Sundin, Alpena City Manager	Pg. 4-2		1st column, ICRMP Heading - paragraph states that last ICRMP expired in 2017. Has a new one been completed or is it at least planned for?	Concur	Added language about the ICRMP update process
25	G. Sundin, Alpena City Manager	Pg. 4-30	Issue 2c	1st column, 3rd arrow - need a period after MDEQ. Change "has" to "have".	Concur	Corrected
26	G. Sundin, Alpena City Manager	Pg. 4-30	Issue 2c	2nd column under "Additional Information" - Change "Alpena Regional Medical Center" to "Mid-Michigan Medical Center - Alpena".	Concur	Corrected
27	G. Sundin, Alpena City Manager	Pg. 4-32	Issue 4b	3rd column, last arrow under Recommendations - Wasn't the airport master plan recently updated as part of the terminal project? I could be wrong.	Concur	Design plans for the new terminal were released, but that's different from the master plan.

Comment Number	Reviewer	Page Number	Heading Number	Comment	Contractor Response	Contractor Resolution
28	G. Sundin, Alpena City Manager	Pg. 4-33	Issue 4d	1st column under Recommendations - I strongly disagree with using trolley fares or possible future downtown paid parking to subsidize road repairs. These funds help pay trolley expenses and any future paid parking would offset equipment and maintenance costs.	Concur	Removed recommendation
29	G. Sundin, Alpena City Manager	Pg. 4-35	Issue 5b	1st column under "Summary" - a Copy of the Chamber's organizational model should be included in the Appendix. If not to be included, it should not be mentioned.	Concur	Will include graphic in references appendix (A).
30	G. Sundin, Alpena City Manager	Pg. 4-35	Issue 6a	3rd column,last recommendation - Eliminate the word "know" in the 2nd line	Concur	Corrected
32	G. Sundin, Alpena City Manager	Throughout		When recommendations are made, such as improving direct lines of communication between the CRTC and the community; need for a dedicated community relations specialist; improving the CRTC's webpage; and other digital outreach, etc., the challenges listed seem to be ready made excuses for nothing actually being done (the unlikelihood of the base getting a dedicated community relations specialist, even though Camp Grayling has one; problems with having to have any changes to the base's website or other digital communications needing ANG headquarters review and approval, etc.). The report needs to be more forceful in saying certain recommendations need to be taken seriously and every effort made to make them happen. This is especially true of the community relations specialist position, which is at the center of many of the needs and recommendations. Otherwise this is nothing more than an academic exercise.	Unfortunately, this is not a regulatory document. The most forceful we can get is to recommend actions.	Narrative updated in section 4.1.1.
33	Julie Lowe, MDEQ	Throughout		Incorporate metion of new PFAS website: https://www.michigan.gov/pfasresponse	Concur	References adjusted - pages 2-16, 3-13
34	Rob Pallarito, Otsego County Commissioner	Throughout		I like the study as presented. I do wish it included a recommendation to correct for zoning/planning mistakes from the past.... possibly an avenue to acquire land now occupied and creating a "buffer area".	Concur	Zoning recommendations have been revised in Section 4
35	Ken Glasser	Pg. 2-14	Issue 1b	Trees hugging a home is a fire, roof damage issue. An insurer may cancel a policy due to the increased hazard!	Concur	Text ajusted
36	Ken Glasser	Pg. 2-16	Issue 2d	A 5-mile setback is economically devastating to the townships and counties which rely on property taxes to operate. Private individuals are also detrimetnally affected.	Concur	Recommendation for a 5-mile buffer revised.
37	Ken Glasser	Pg. 4-7		Same comment as above	Concur	Recommendation for a 5-mile buffer revised.
38	Ken Glasser	Pg. 4-9		Building code changes create consequences of higher building cost and potential out-of-pocket expense in an isurance claim due to costs to retrofit home.	Concur	Recommendation rephrased to only include new construction
39	Patty O'Donnell	Entire		The Study should be in a format that is practical to read and to print such as 8.5x11	Do not concur	The format was chosen to better represent the maps.
40	Patty O'Donnell	Page 4-17	4d.2	Challenges: What does this bullet point mean: "Local efforts to retain posted speed limits on M-72 may be unsuccessful" I think I know what this means but where on M-72 or would they like it throughout the County?	Discuss	Text adjusted to say within Crawford county
41	Patty O'Donnell	Page 4-18	4d.3	Recommentations: first arrow: combine the two sub-bullits to - Develop a full interchanges by adding southbound ramps to I-75. Challenges: first bullet, last sentence - This is not a State or federal priority	Concur	Text adjusted
42	Patty O'Donnell	Page 4-18	4f	Make Issue 4f Poor road condition that includes 4f.1 Improve Road network and 4f.2: Increase funding for road projects and maintenance, to 4e for better flow instead of after Recreational Access. Recreational access would be 4f.	Discuss	This adjustment would affect the layout in multiple locations.

Comment Number	Reviewer	Page Number	Heading Number	Comment	Contractor Response	Contractor Resolution
43	Patty O'Donnell	Page 4-19	4f (4e)	(Please note that the State, County Road Commission, and the City of Grayling have started to receive increased funding from the increased gas tax and registration fees that begain January 2017) 4e.2 Recommendations: add at the end of the last bullet: and wood products industry.	Concur	Text adjusted
44						
45						
46						
47						

Camp Grayling JMTC and Alpena CRTC JLUS Comment Matrix

Ck Final Submittal, October 2018

Comment Number	Reviewer	Page Number	Heading Number	Comment	Contractor Response	Contractor Resolution
1	Kruse L	3 dash 6	Incompatible Use	Noise study completed in IDP EA in 2016. **Noise study is attached in email with this comment matrix please update language to reflect.**	Language has been updated.	Narrative updated: Noise contours were provided at the time of the finalization of this JLUS. GIS of the APZs will need to be obtained along with the GIS for the noise contours. A precise analysis of incompatible land use can be completed during the implementation phase of the JLUS when GIS data layers are made available.
2	Kruse L	3 dash 9	Issue 1a:	"It is recommended that cities and counties restrict development of residential neighborhoods within 5 miles of all airports, ranges, or installations." who (agency) is recommending that?	It is a general planning recommendation to help limit encroachment and/or incompatible uses around air bases.	No change
3	Kruse L	3 dash 9	Issue 2a:	"Sheboygan" please change to "Cheboygan"	Concur	Changed to Cheboygan
4	Kruse L	3 dash 12	Issue 3a:	Instead of listing the results (As of January 1, 2018, 80 private wells had been tested for PFOSPFOA with 17...) I would refer to the MDEQ website Michigan.gov/AlpenaPFASresponse	Concur	Deleted the reference to January 2018 results.
5	Kruse L	3 dash 14	Issue 3b:	...remove "on or" the base, as it is public property.	Concur	Language removed from the JLUS
6	Kruse L	3 dash 14	Issue 4a:	IDP date should be 2016 not 2013 (noted several times throughout section and document)	Concur	updated to 2015
7	Kruse L	3 dash 14	Issue 4a:	There is a more recent energy audit than 2009 (2017). **Please get with Capt Blumline to obtain report.**	See Capt Blumline comment 1	No change
8	Kruse L	3 dash 17	Issue 5a:	"With less than 200 followers...". Currently the FB pages has 1,000 followers.	Concur	Narrative updated: At the inception of the JLUS, the number of followers on facebook was less than 200. Upon completion of the JLUS, there are 1.000, which indicates that the Alpena is an optimal communication mechanism to reach community members.
9	Kruse L	3 dash 17	Issue 5a:	"Alpena CRTC is located near STARBASE Alpena..." consider reversing "STAREBASE Alpena is located on Alpena CRTC..."	Concur	Narrative updated
10	Kruse L	4 dash 2	Alpence CRTC IDP	IDP was finalized in 2016 not 2015	See Capt Blumline comment 2	NC
11	Kruse L	4 dash 2	INRMP	Define INRMP in title similar to ICRMP in the following section	Concur	Defined
12	Kruse L	4 dash2	ICRMP	In the note it states that the Grayling Range obtained a wavier for ICRMP. That is not true, they fall within the Alpena CRTC ICRMP jurisdiction where is explains lack of cultural resources and therefore not extensively discussed in the plan.	Concur	Narrative updated: Note: A cultural resources survey was performed at the Camp Grayling range, and no items of note were identified. The buildings under ANG jurisdiction fall within the Alpena CRTC ICRMP. There is a lack of cultural resources and therefore not extensively discussed in the ICRMP.

Camp Grayling JMTC and Alpena CRTC JLUS Comment Matrix

Ck Final Submittal, October 2018

Comment Number	Reviewer	Page Number	Heading Number	Comment	Contractor Response	Contractor Resolution
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2	Kruse L	3 dash 9	Issue 1a:	"It is recommended that cities and counties restrict development of residential neighborhoods within 5 miles of all airports, ranges, or installations." who (agency) is recommending that?	It is a general planning recommendation to help limit encroachment and/or incompatible uses around air bases.	No change
3	Kruse L	3 dash 9	Issue 2a:	"Sheboygan" please change to "Cheboygan"	Concur	Changed to Cheboygan
4	Kruse L	3 dash 12	Issue 3a:	Instead of listing the results (As of January 1, 2018, 80 private wells had been tested for PFOSPFOA with 17...) I would refer to the MDEQ website Michigan.gov/AlpenaPFASresponse	Concur	Deleted the reference to January 2018 results.
5	Kruse L	3 dash 14	Issue 3b:	...remove "on or" the base, as it is public property.	Concur	Language removed from the JLUS
6	Kruse L	3 dash 14	Issue 4a:	IDP date should be 2016 not 2013 (noted several times throughout section and document)	Concur	updated to 2015
7	Kruse L	3 dash 14	Issue 4a:	There is a more recent energy audit than 2009 (2017). **Please get with Capt Blumline to obtain report.**	See Capt Blumline comment 1	No change
8	Kruse L	3 dash 17	Issue 5a:	"With less than 200 followers…". Currently the FB pages has 1,000 followers.	Concur	Narrative updated: At the inception of the JLUS, the number of followers on facebook was less than 200. Upon completion of the JLUS, there are 1.000, which indicates that the Alpena is an optimal communication mechanism to reach community members.
9	Kruse L	3 dash 17	Issue 5a:	"Alpena CRTC is located near STARBASE Alpena…" consider reversing "STAREBASE Alpena is located on Alpena CRTC…"	Concur	Narrative updated
10	Kruse L	4 dash 2	Alpence CRTC IDP	IDP was finalized in 2016 not 2015	See Capt Blumline comment 2	NC
11	Kruse L	4 dash 2	INRMP	Define INRMP in title similar to ICRMP in the following section	Concur	Defined
12	Kruse L	4 dash2	ICRMP	In the note it states that the Grayling Range obtained a wavier for ICRMP. That is not true, they fall within the Alpena CRTC ICRMP jurisdiction where is explains lack of cultural resources and therefore not extensively discussed in the plan.	Concur	Narrative updated: Note: A cultural resources survey was performed at the Camp Grayling range, and no items of note were identified. The buildings under ANG jurisdiction fall within the Alpena CRTC ICRMP. There is a lack of cultural resources and therefore not extensively discussed in the ICRMP.

Camp Grayling JMTC and Alpena CRTC JLUS Comment Matrix

Ck Final Submittal, October 2018

Comment Number	Reviewer	Page Number	Heading Number	Comment	Contractor Response	Contractor Resolution
1	Blumline	NA	NA	To Lisa's comment #7, I'm not aware of the last official energy audit on base. We have a Regional Energy Manager that keeps tabs on our energy usage and equipment continuously. He is not from our base, but he contacts us periodically to perform small studies.	Thank you.	NA
2	Blumline	NA	NA	Regarding Lisa's comment #10, use 2015 for the last IDP.	Concur	Updated to 2015
3	Blumline	3-6	3.1.9	You mention (or it appears you mention) that there is no APZ? The APZ is defined by the FAA in Part 107 or 109 (the number slips my memory). I don't have this on a digital map, but we do have defined APZs. This also conflicts with statements on 3-17.	Concur	Narrative updated as follows: Noise contours were provided at the time of the finalization of this JLUS and the FAA defines the accident potential zones (APZs). GIS of the APZs will need to be obtained along with the GIS for the noise contours. A precise analysis of incompatible land use can be completed during the implementation phase of the JLUS when GIS data layers are made available.
4	Blumline	3-12	3.3.2	In terms of the NMS, the sanctuary was created to protect the shipwrecks. Unlike many other marine sanctuaries, the law for Thunder Bay NMS doesn't directly protect marine life.	Concur	Added the following sentence: The sanctuary was created to protect the shipwrecks and unlike many other marine sanctuaries, the law for Thunder Bay National Marine Sanctuary (NMS) doesn't directly protect marine life.
5	Blumline	3-15	3.3.4, 4c	The amount of passes of military vehicles on public roads for this base is not significant. I would make an educated guess that there are only hundreds to thousands of passes each year. Since roads are designed to have hundreds of thousands to hundreds of millions of passes, i don't think it is significant. Also, we primarily use regular passenger vehicles. Grayling is a completly differnt animal becuase of convoys and the weight of their vehicles, but we primarily transport heavy things through the air. I would suggest that the JLUS report suggests a study before any actions are taken.	Concur; because this was public comment, we will need to keep it as an issue, however we will clarify that Alpena CRTC has minimal impact on roads. We also have a suggestion to update the Alpena Area-wide Comprehensive Transportation Plan	added the following to 3.3.4, Issue 4c: Members of Alpena CRTC primarily use regular passenger vehicles and use of military vehicles is minimum.
6	Blumline	3-16	3.3.4, 4d	Can you please be specific as to what is out of compliance with the 32-1084? If it is a possible security vulnerability, we should not make that public.	Concur	Statement removed
7	Blumline	3-18 and 4-35	3.3.6, 6a	Something I believe could have a MUCH greater impact involves procurement of Construction (which is the lionshare of the base's budget). Contracting in Michigan has been consolidated, and all but two Contracting Officers in the State are located at Selfridge ANGB. Contracting has set-aside goals for each year (HUBZone, 8a, Small Biz, etc). I believe that Alpena has GREAT contractors and subcontractors. They are much better than the contractors from Southeast Michigan. However, because the State contracting office is located in Southeast Michigan, the majority of our contracts are given direct awards to 8a/Small Biz/HUBZone contractors from Southeast Michigan. Remedying this would would have to be a multi-directional approach. First, the Chamber of Commerce should work with our Contracting Office to make sure our local contractors qualify for these set asides. Second, whoever does HUBZone district lines recently split the City of Alpena into two. I'm not sure why one half of Alpena would be a HUBZone and the other would not. I would suggest we get with whoever defines a HUBZone to include all of Alpena County in the HUBZone. This may require work with lawmakers?	Concur	Numerous changes made to page 4-39, strategy 6a.1

E.2 Public Comments

See the following pages for comments received from the public during the JLUS process.

1. Al Miller CMSGT USAF RET

I've read the Joint Land Use Study and I see no where where past practices polluting ground water will be corrected. Before planning for the future let's clean up the past. Recommend all future plans and modification to this lad be put on hold until the water contamination is fully identified and cleaned up.

2. Don and Tammy Mullett

Im not sure where to begin. We bought in Gutherie Lakes/Enchanted Forest Sub a year ago. Yes we knew there was military practice here and the box was checked off on the house purchase papers. But until we lived it..we had no idea. Guess we should've wondered why the house was on the market for 4 years. We understand they need to practice and this is where its done but there needs to be balance with the people that live here. We are full timers. My husband drives a semi and is home every night. The nights that the house is shaking and you can't sleep during the night is dangerous for his job. He shouldn't have to call in to work because he can't sleep in his own home for a week. Maybe bombing with duds or a restricted time..just before or after dawn...for the dark practice...or fly to the U.P. At times its ridiculous. We spent hundreds of dollars on our pet too..to comfort him...crate, thunder coat, meds...before having to put him down. Broke my heart. Again I had no idea when I moved here what this new life would be. He was a family member. These troups come and go and here we..going to work tired...crying over my doggie, Carl! We probably wouldn't of bought here, had we really known.

3. Jim and Lorrie Johnson

We have just seen the Gaylord Herald-Times article on Facebook. We have not been made aware of any study regarding the impact of Camp Grayling and National Guard maneuvers, except the meetings about water quality. All notices about those public meetings were about water quality only; many other facets of their maneuvers are affecting our family, our property value, and nature around us. We have seen nothing in the Avalanche about a study regarding impact of noise and other concerns. We are residents and property owners and would very much like to voice our concern over the major impact on our AuSable River area and on our family's well-being. If there is a survey available, may we ask to be included? We would appreciate notification of activities, surveys, and meetings so that we may participate. Thank you.

4. Barb Herman

I live in Guthrie Lakes and was reading the Gaylord Herald Times where I noticed you want feedback on the survey results from last year. As soon as I finish writing you this message I will look at the results you have posted on your website, but first, I want to tell you how TERRIBLE the noise was from Range 40 the past couple of weeks during Northern Strike. This was the worst noise level I have EVER experienced ...and I thought 2017 was bad!!! My first time visiting Guthrie Lakes located in southern Otsego County was when I was 28 years old. It was 1976 and my parents were building a house just off the lake. The EFPOA (Enchanted Forest Property Owners Association) was just being formed, and the earlier residents were already forming a committee to band with neighboring communities to open communication with the military. We had a good relationship with the top brass at Camp Grayling and had rules we could

live by. The military agreed to NOT fly over our lakes. They limited nighttime strafing and bombing to 2 hours after dark. They did NOT allow planes to shoot rockets from right over our lakes/houses and required pilots to stay at least 1500 feet from the ground. They did not allow helicopters to hover over our homes just above the treetops. And certainly, helicopters did not have nets filled with machinery/weapons dangling above our houses. Today, there are no rules. Ten days ago, I saw planes criss-crossing over Guthrie Lake, I saw a rocket shot off about 3/4 of the way down the lengthwise part of our lake from an A-10. I was awakened at all hours of the night to the sound of heavy artillery. Even if the sound didn't wake me, the concussions shook my bed causing me to startle awake at 2 or 4 AM. Calls to the Tower or to the main Camp Grayling line resulted in some sergeants asking me to repeat my message because of the noise in the background. In fact, one guy asked my husband what that loud noise was while my husband was trying to complain about the A-10 planes right overhead. When my husband said the noise was one of his planes, the sergeant asked him to repeat himself. Some people think the residents of Guthrie Lakes are crazy for living here because the military was here first. However, in the years since 1976 the military has gotten closer and closer by leasing more land, has more sophisticated weaponry and planes, has invited other states and countries to train here, and has forgotten we are here. There has been a resort here on this lake since the 1930s. After spending a year or two researching the history of this lake I wrote a short book in 2008 on what was here before Guthrie Lakes Enchanted Forests was established in 1969. I donated a copy to the Otsego County Library and one to the historical society in Gaylord. The information goes back to the late 1800s when logging ruled the area. I'm sorry I missed all the meetings you held on the JLUS this past year. Most meetings were in Grayling in the evening and often during the winter/snowy months. I would have liked giving my 2-cents at those meetings, but I'm not inclined to drive at night, especially in cold weather. As soon as I read the results of the survey, I will let you know my thoughts. Many people here at Guthrie Lakes do not use/have the internet so lots of people who would agree with me that the noise from the military is becoming unbearable just haven't/won't be heard.

5. Denise Matteini

I do have a comment about Northern Strike, this year has been exceptionally Bad. Why do we have to put up with this. Major disregard for the community when with a little common courtesy can help us all get though these maneuvers. I thought Camp Grayling was willing to work with us? Dropping 500lb bombs or larger at 4 am is unexceptionable, people have to go to work in the morning. Children are woken up frightened and crying not to mention pets in a panic. This needs to be addressed, this is affecting our quality of life.

6. Glen A. Eberly

Hello Denise,

I recently learned a bout the subject study. I am a resident of Bloomfield Hills,MI and have a cottage on Shupac Lake in Lovells, just north east of Grayling. I will not be able to read the entire study as will be traveling soon. I wanted to get my comments to you before the Sept.16th deadline.

We are not against the military and support training operations including small arms fire. We have a grandson who is an officer in the Guard and are proud of him!

1. BUT, we are very much opposed to having our cottage shaken by heavy ordnance which lasts late into the wee hours of the morning. In discussions with MI National Guard representatives regarding noise complaints in the early 2000s, they stated that the Guard agreed to suspend shelling 2 hours after sunset. What happened to that agreement?

2. During that meeting I asked if the heavy artillery shelling was to evaluate destruction value of the shells or was for accuracy training. They stated it was solely for accuracy training. I asked if they could use shells with low powder charges as the shell landings could be readily seen from the observation posts. (They could probably use flour and still check accuracy!!) This would save money and resolve the heavy ordnance disturbance which upsets many residents. Obviously nothing happened to my suggestion. The firing of heavy ordnance shells is not too bad, it is the concussion waves and noise at impact that shakes the house, knocks pictures off the walls, and scares grandkids and pets.

3. There is no need of shelling after dark! The army should be fully capable of simulating dark conditions in which the artillery teams

could carry out their training during daylight hours. If the Air Force can simulate jets, you certainly should be able to simulate darkness!!!

4. The National Guard is cutting "Firing Positions" all through our north woods. Enough! You don't need more firing positions. These woods are multipurpose forests and more firing positions are simply destruction of our forests. I see firing positions numbered 125! Does that mean there are at least another 124 firing positions?

5. One last item. Loons nest on our lake and during the nesting period we have mitary jets flying very low over Shupac Lake. The loons go crazy with panic calls and alert calls. It is a federal offense to harass loons and they sure are harassed by the low flying jets. How do we get our lake on the "no fly zone list" from mid April until late June?

We love our north woods and built up here because of the beauty of the forests, streams and lakes and to enjoy the peace and quiet of northern Michigan. The National Guard can change its ways to let us enjoy what we have when you are not shaking our house.

Regards,

Glen A. Eberly

ANGLERS OF THE AU SABLE

Founded 1987

An affiliated member of the Federation of Fly Fishers

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September 16, 2018

Ms. Denise Cline (via email)
80 Livingston Blvd, Suite U-108
PO Box 457
Gaylord, MI 49734

Re: Comments on Camp Grayling Joint Land Use Study

Dear Ms. Cline:

These are the comments on the draft Joint Land Use Study for Camp Grayling submitted by the Anglers of the Au Sable. We are a nonprofit organization of over 1,000 members whose goal is to preserve, protect and enhance the Au Sable River System for future generations of fly fishers. We have interacted with the National Guard in Grayling on several occasions. The comments below are colored by this experience as well as our review of the JLUS.

The JLUS clearly anticipates substantial expansion of Camp Grayling, both geographically and in terms of training levels. We believe that the facility has already reached its limits. Thus, we oppose further expansion of Camp Grayling and any recommendations in the study that would accomplish such an expansion.

Basic Assumptions

A basic flaw in the study is a bias toward military interests, including inflated and poorly supported assertions regarding the economic contribution of Camp Grayling to the region, failure to recognize its costs, and a tendency to ignore the contributions of other competing interests. There is an unstated assumption that expanded military training is superior to other uses, and must simply be tolerated by residents and visitors to the area.

For example, the JLUS calls for economic "tracking and reporting" of "military tourism" to "assist in communicating the benefits of Camp Grayling." There is no recommendation, however, for a real economic study, which would assess the true costs and benefits of the facility.

We refer your attention to two economic studies prepared for the Anglers of the Au Sable. The first is Northern Michigan Property Values: the Significance of Riverfront Property (Public Sector Consultants, August 2013). It shows that riverfront property in Crawford County, including cottages and fishing cabins, contributes much more in

property values and taxes than other properties, far out of proportion to their relative land area. The second is Assessment of Economic Effects of Increased Production at the Grayling Trout Hatchery (Lupi, November 2015). It assesses the adverse economic effects of reduced fishing visits to the Au Sable River. Recreation is a significant economic driver in the region. Reduced fishing tourism – which will result from expanded activities at Camp Grayling – will have a significant negative effect on revenue from tourism and the jobs it creates. Copies of these studies are attached.

Any study of the economic benefits of Camp Grayling should also include an assessment of its direct and indirect costs to other interests in the area.

Expansion of Camp Grayling's Boundaries

Once again, proposals for expansion of the geographic scope of Camp Grayling are emerging. These include suggestions for the lease of additional lands and the purchase of contiguous properties.

We dealt with a similar proposal in 2014. The Department of Military and Veteran's Affairs and the Department of Natural of Natural Resources had been engaged in secret discussions for the purpose of leasing 54,000 additional acres of state land to Camp Grayling. This included more than 30,000 acres along both sides of the Manistee River from M-72 to CCC Bridge, large tracts on both sides of the Manistee River in Frederick Township near the Deward area, and a large tract near the Kellogg's Bridge area of the North Branch of the Au Sable River. When this was leaked the outcry was tremendous, and these parcels were "taken off the table" by the administration.

We submit that it is time to recognize that Camp Grayling has reached the limits of its growth, and that efforts must be made to tailor activities at the Camp to these limits.

Military Overlay Zones

The most "creative" proposal for expansion of the facility is for a "military overlay zone." Local municipalities are asked to voluntarily "downzone" in areas near Camp Grayling, limiting otherwise permissible use, growth and development "in order to protect the boundaries of the installation from encroachment." In essence, local zoning authorities are being asked to voluntarily limit their citizen's lawful use of their land to serve the military's interests. This will reduce property values and related taxes. Local governments will take the brunt of the criticism. And the military will achieve a de facto expansion of the base free of charge.

We recognize the need to train our military. But the interest in training does not outweigh the interests of local residents, businesses and industry. A balance must be reached. It bears repeating: Camp Grayling has reached its limits of growth.

A History of Concerns, Broken Promises and Ongoing Problems

Complaints involving the military's activities at Camp Grayling go back for decades. In the 1950's it was agreed that all activity would be kept ½ mile north of North Down River Road. Less than two years later that agreement was violated. Other early complaints included noise, low flying aircraft, fires, land closures, road damage, trespass and uncontrolled expansion.

In the 1980's, things came to a head again. This was the result of numerous factors, including those mentioned above plus troop maneuvers on public roads and bridges, extreme bombing and canon fire (including at night), lease violations and numerous environmental concerns. This led to litigation and resulted in agreements that the Guard would improve. Among other things, heavy weapons fire was curtailed, aircraft were supposedly rerouted to higher altitudes, excess propellant was no longer to be burned, white phosphorus was banned, and an environmental office was created.

The 2014 secret expansion proposal was discussed above. For obvious reasons, this was viewed as a major breach of faith.

In the meantime, in 2012 the Michigan Department of Environmental Quality, and presumably the Department of Military and Veterans Affairs and the US Department of Defense, were made aware of PFAS pollution on military bases due to the use of certain fire suppressants and related public health threats. For six years the public was kept in the dark. Now that the situation has been exposed, the military – including those handling the situation at Camp Grayling – have failed to exhibit the transparency necessary to fully inform those affected. The EPA blocked release of a health study for months because it would be a "public relations nightmare." The state continues to use outdated water standards which do not adequately protect human health.

This series of events has not enhanced trust, nor has it improved relations with the public, which have been rocky for decades. Rather than propose additional expansions, Camp Grayling should resolve these lingering problems and adhere to the promises it made in the past.

Conclusion

The JLUS states: "as military training requirements . . . increase it should be an accepted fact that all the land area within the boundary could be used for training activities." We disagree.

Camp Grayling has reached its limits. Increased training levels, physical expansion of activities within the camp, further land acquisitions, reduced buffer zones, and "military overlay zones" are incompatible with use of the region by others. The military's efforts should be guided by this knowledge, and efforts made to live within current limits.

We understand the need to train our nation's military forces. And we agree there is some economic benefit to having Camp Grayling in Crawford County, but there are also costs associated with its presence. Simply saying that we need to train does not justify continued expansion of Camp Grayling. There is simply no further room to grow without significant adverse effects on other legitimate interests in the region.

Thank you for considering our comments.

Sincerely,

Thomas A Baird, Chair
Anglers of the Au Sable
Legal and Government Affairs Committees

c/ via email: Jeremie Mead
Leatha Mendenhall

October 25, 2018

The comments listed in this document were provided by Grayling Township, Rick Harland, Lacey Stephan, and Marc Dedenbach, October 7, 2018. Reponses to comments are in ***purple*** text. A conference call to review comments and responses was held October 19, 2018.

1a.1

(ADVERSE ENVIRONMENTAL IMPACT OF NOISE HAS TO BE INVESTIGATED. THIS SHOULD BE A TOP PRIORITY OF THE IMPLEMENTATION COMMITTEE.)

We will add this statement to the overall recommendation, 4.5.3 and in 1a.1

1a.4

Military owns majority of land in our township. Any buffering from military training should involve range land and not township land. 82%+- is federal, military and state land so even small portion of private property in the township absorbed by the military make no sense.

We will add a comment to 1a.4 about the percentage of land that is currently owned by the military

1a.5

Passing on costs to upgrade residential building codes vs increasing buffer at no cost to military is unacceptable as 82% +- is already state or military controlled land. Military can and should be able to add mile for buffering if not more and still have enough land for training our nation's finest.

It should be noted that this recommendation and all recommendations of the JLUS are an option to consider, but not a requirement. This recommendation was a suggestion by members of the community, so I think we should leave as is knowing that it is an optional strategy and not required.

(SOME STATS ABOUT THE INCOME LEVELS OF THE COUNTY OR TOWNSHIP COULD BE HELPFUL AND ARE READILY AVAILABLE. WE ARE IN AN ECONOMICALLY DEPRESSED AREA IN WHICH MORE EXPENSIVE BUILDING CODES WOULD BE AN UNFAIR BURDEN TO OUR CITIZENS.

Page 2-4, section 2.16 does have this information for the study area.

2a.1

We already have airport zoning approval requirements you must turn in with building permit application. Cranes used 5 miles from airfield have to apply and pass airport zoning. Any towers erected must have airport zoning approval.

2a.2

Issue with flight paths in Grayling Township is mostly from helicopters flying from Camp to Airfield. Low flying over residential neighborhoods for no reason other than to straighten out flight path. Flying higher and over state land with no private property is easy and adds very little to know burden on equipment and pilots. Safety in case of mechanical malfunctions while flying over unoccupied areas should be the main reason for not flying over residential property not the disturbance to residents.

Please see figure 2.31. The restricted airspace is monitored by Camp Grayling, however all other surrounding air space is under FAA jurisdiction. The different classes of airspace have different flying heights regulations.

(ESTABLISH NO FLY ZONES OVER SENSITIVE AREAS SUCH AS RESIDENTIAL, TOURIST, AND ENVIRONMENTALLY SENSITIVE AREAS. SURELY THERE HAS TO BE AIR TRAFFIC CONTROL REGULATING BOTH GRAYLING AND ALPENA AIRFIELDS. RATHER THAN HAVE CITIZENS CALL IN A COMPLAINT – WHETHER WE CAN SEE A NUMBER ON THE AIRCRAFT OR NOT – THE MILITARY SHOULD TAKE RESPONSIBILITY FOR POLICING THEIR OWN AND ENFORCING ALL FAA REQUIREMENTS. THEY SHOULD DO THIS ON THEIR OWN RATHER THAN INSISTING THAT THE PUBLIC POLICE THE MILITARY.
CREATE A JOINT MILITARY/CITIZENS COMMITTEE TO STUDY SOUND ATTENUATION TECHNIQUES. EDUCATE THE GENERAL PUBLIC ON RESIDENTIAL AND TOURIST AREA SOUND ATTENUATION STRATEGIES. SET UP A MILITARY/CITIZENS COMMITTEE TO STUDY AND IMPLEMENT SOUND ATTENUATION MEASURES.)

Establishing No Fly Zones/Restricted Airspace is a process that can take many years. An important first step in this process is completing the AICUZ/Noise Study. However, the JLUS does include a recommendation to establish no fly zones over sensitive areas, 1a.3)

A noise study to examine sound attenuation is a recommendation of the JLUS. Educating the public is also a recommendation of the JLUS and can be added as a standard topic for the Camp Grayling JMTC Community Council (5b.6)

2b.1
Sheriff and city police would be willing to coordinate traffic control with little advance notice at traffic lights on M72 and stop signs on North Down River road to let convoys pass without stopping and waiting for traffic. This would help our residents and the military cut down on congestion affecting timing arriving for work and military prepare schedule and saving stop and go wear and tear on their vehicles.

This is great discussion that should be brought up as part of the Camp Grayling Community Council.

(The use of existing tank trails and roads on military land could eliminate most of the military traffic through on paved local roads. This would save wear and tear on our roads and eliminate much of the traffic congestion.)

The JLUS recommends a Transportation Plan to document all traffic and make recommendations to lessen traffic congestion and wear and tear on roads.

(AVOIDING MAJOR TRAINING CAMPAIGNS DURING MAJOR HOLIDAYS, INCLUDING THE CANOE MARATHON, IS A MUST.)

Per TC/PC meeting on Oct 10, 2018: Training activities are publicized by Public Service Announcements; however they are looking to increase their staff and communication channels. The CGCC will help with coordination of training activities and important community events.

2c.1
Use of social media, municipal, school websites would get the word out and create word of mouth from local citizens to accomplish times of excessive night noise and disturbance from training. Social media would require 7 to 10 days' notice to be affective. PFAS contamination by the military has already taught your environmental office where and what social media sites are viable.

Camp Grayling Public Relations is planning on expanding their use of Social Media. This recommendation is included in JLUS strategies in 5, Community Partnerships.

2d.1
Grayling Township has Airport zoning requirements that must be met before any new construction permits can be issued. Trading land in areas of concern for safe areas of development for both residential and commercial building would be advantageous to both the township and the military. Municipal leaders and generational resident's input on where land could be affected would be helpful in deciding what land would be feasible for trade and or development. Consideration should lean towards the township as military already owns super majority of land in our township.
(ANY FURTHER AIRPORT OR CAMP EXPANSION SHOULD BE DONE ONLY AFTER PUBLIC NOTICE AND PUBLIC HEARING WHICH MUST TAKE INTO CONSIDERATION ALL PUBLIC COMMENTS.)

The strategy doesn't discuss land exchanges, trade, or expansion. Any zoning or land use changes are expected to go through the standard, required public notification process.

3e.1
Crawford County has been very active in fire wise program and is well ahead of the curve notifying our public. Military fire protection has historically been undertrained and unable to protect our land from fires. Local funding for full time fire department would increase level of safety significantly. Military has decided recently funding for local fire protection is not justified in there budget. Historical wildfire data shows during times of municipal funding for fire safety vs military providing fire protection. ***(Studies done by the military, support contracting fire protection vs building their own fire department. One of few benefits the City of Grayling and Grayling Township received was better fire service due to full time paid fire service.)***
(MILITARY NEEDS TO PAY SOME "ON CALL"COSTS FOR OUR FOLKS TO BE AVAILABLE TO FIGHT THEIR FIRES. THEY SHOULD ALSO PAY FOR TIME AND MATERIALS USED IN FIGHTING THEIR FIRES.)

This was an issue identified by the public as a concern. We do have an Implementation Team Action to put the Fire Protection Services Agreement back in place.

The JLUS recommends that the Fire Services agreement. That process should include discussion to make sure that the City and Township of Grayling and Camp Grayling agree on all costs and services.

Regarding Military Payments, this should be part of the discussion of an updated Fire Services Protection Agreement.

4f.2
Some of our county roads class rating cannot carry overweight military vehicles use. Class of road is causing asphalt failure quicker than normal lifetime for these roads creating safety issues for both military and civilians. Example: Jones Lake Road is not designed to handle weight of vehicles regularly used by military. ***(Again the use of existing tank trails and roads on military land could eliminate most of the military traffic through on paved local roads. This would save wear and tear on our roads and eliminate much of the traffic congestion.)*** Further MDOT does not have funding available for most of our residential areas. Citizens would agree to SAD district with some form of Military participation (40% military 40% residents 20% municipal) to fund road replacement with upgrade to higher class road. Where overweight of military vehicles use primarily residential roads. Fire, police and ambulance service time is unnecessarily extended do to road degradation from overweight military vehicles.

The JLUS recommends that Camp Grayling complete an Installation Master Plan (IMP). The IMP should evaluate existing and future circulation on the Camp.

The completion of a transportation study should provide the necessary information to include in the SAD/SID definition. An Impact Analysis of all traffic would be needed. They study should also evaluate road weight class are allowed.

It is my understanding that the DOD does not pay taxes on the land. I am researching this; however it may take congressional approval to fund/have the military participate. As that the SID would span years, it may take ongoing congressional approval. Perhaps a discussion of Impact Funds based on the results of the Transportation study is a scenario more likely to bear fruit.

5b.4
Military and state control 82% of land in Grayling Township. Consideration for buffering should be encroaching on state and military land not private. Increasing the cost of construction is not the responsibility of our citizens when state and military controlled land is such a large %.

My understanding is that the City of Grayling is already updating the zoning code for height restrictions.

Building within APZs and the Clear Zone is a safety issue.

5b.6
Grayling Township would welcome monthly joint meeting with camp assistant commander.
(THERE SHOULD BE AN ONGOING COMMUNITY COUNCIL COMPRISED OF MILITARY, LOCAL GOVERNMENT, AND CITIZENS GROUPS TO MONITOR PROGRESS, ENFORCE AGREEMENTS AND DEVELOP FUTURE STRATEGIES TO BE STUDIED AND IMPLEMENTED.)

Agreed. That is a recommendation of the JLUS: Camp Grayling JMTC Community Council

6a;
Military support for quality of life in our community would be welcome change. Until recently military was involved in many areas of our community. Recently military for whatever reason has isolated themselves from our community.
6b.4
Nowhere in this study does it talk about the financial burden all local government has because of the excessive amount of state and federal land, much of it used by the military. We would like to task Camp Grayling with researching a way to properly compensate our community for the use of this land. Many of the issues with infrastructure, fire protection and quality of life are due to over use and lack of any kind of compensation from the military. The Military should expect to provide financial support in the way of payment for use of the vast majority of property in Crawford and surrounding Counties.)

We do recommend an Economic Impact Study that should look at Camp Graylings direct and indirect costs to other interests in the area.

(OTHER ISSUES TO CONSIDER:
GET A WRITTEN AGREEMENT THAT CAN BE ENFORCED,
HAVE A CENTRAL DEPOSITORY FOR ALL DOCUMENTS (NEMCOG?),
HAVE AN ONGOING ORGANIZATION TO MONITOR COMPLIANCE OF ALL PARTIES,
MILITARY MUST MONITOR AND ENFORCE THEIR OWN OBLIGATIONS, IE. NOISE, FLIGHT ALTITUDES, FLIGHT PATHS, ETC.,
DEVELOP A 5 YEAR PLAN.)

These are good suggestions and can be included as Camp Grayling Community Council is formed. Some of these items could be included in the charter of the Council.

Camp Grayling JMTC Community Council Goals:

- *Community Education and Outreach*
- *Communication Forum Between Camp Grayling and Communities*
  - *Transportation*
  - *Noise/Training Activities*
- *Consider and implement a formalized written agreement, such as a charter, between Camp Grayling and the surrounding communities as an outcome of the Community Council*
- *The charter should include language that a primary objective of the Community Council is to work together to resolve the noise issues.*
- *Have NEMCOG provide a document library for all JLUS and Implementation files to include supporting documentation that has been collected as part of this process.*
- *Develop a five-year plan to achieve the top JLUS Implementation recommendations (to be identified by the TC/PC).*

Glen A. Eberly
9699 Shupac Lake Road
Grayling, Michigan 49738

October 15, 2018

Ms. Denise M. Cline, NEMCOG Deputy Director
80 Livingston Blvd., Suite U-108
PO Box 457
Gaylord, MI 49734

Dear Ms Cline:

I am responding again with public comment regarding the Camp Grayling JLUS currently being developed.

I attended the October 10th meeting and was very disappointed by the National Guard representatives' disregard to address the NOISE PROBLEM. Col. Burrell seemed pleased with the Guard's "transparency" in notifying the public when heavy artillery activity will occur. Notification alone is unacceptable!

Our Lovells Township Supervisor, Gary Neumann, properly identified day and night blast noises from large guns and bombing, that extend beyond camp boundaries, as the major issue concerning surrounding residents.
The National Guard can resolve this problem!

NOISE PROBLEM: In answer to a question at a meeting with annoyed Lovells homeowners in 2002 a Camp Grayling National Guard representative, I believe it was LTC Thomas F. Lamie, stated that the purpose of artillery and bombing training is not to evaluate the destructive force of ordnance explosions but to develop accuracy skills. It is not the detonation of an outgoing shell that is the problem. Its is the concussion, noise and shock waves of the round exploding at landing!

Suggested Solution: The military uses blank machine gun ammunition for training to prevent harm to the soldiers on maneuvers. I know because, while bird hunting, I have picked up belts of such ammo left in the woods by the Guard. I have pictures of such abandoned training ordnance.
I suggest that the Guard have all Camp Grayling training rounds for 105 and 155mm Howitzers and 120mm tank guns loaded with low charges: just enough powder to determine accuracy upon detonation. Such a reduction in explosive power would very likely eliminate the serious resident disturbance and make progress in returning the National Guard to Good Neighbor status from their present Bad Neighbor status.
This action would even save money and reduce chemicals inload to the environment.

Please take this suggestion seriously!!!

Concerned citizen,

Glen A. Eberly

October 1, 2018

Ms. Denise Cline, (by email)
80 Livingston BLVD, Suite U-108
PO Box 457
Gaylord, MI 49734

Dear Ms. Cline,

I am writing to you on behalf of the Au Sable North Branch Area Foundation (ASNBAF), to express our concerns and opposition to the recommendations for land expansion and increased training activities made in the Joint Land Use Study (JLUS) for Camp Grayling. We are a non-profit organization established in 1943 to preserve, protect and enhance the natural endowments of the watershed of the North Branch of the Au Sable River. The current JLUS indicates that Camp Grayling intends to expand its geographic footprint and increase training level usage. We strongly oppose any further expansion and increased use of Camp Grayling.

At the outset let me state that we support our troops and recognize the need to train our military forces. But we also support the proposition that we as residents and land owners living next to the military training areas have a right to the quiet enjoyment of our property. So too, do the tourists who travel to this area seeking to enjoy the peace and quiet of the forests, trails, camp grounds, lakes and rivers in the greater Camp Grayling area. The noise levels that we are all now experiencing are unacceptable. Night time shelling is particularly disturbing. This activity appears to have increased over the years despite a prior agreement by Camp Grayling representatives to discontinue shelling two hours after sunset.

We do not doubt that there is some economic benefit accruing to the county because of Camp Grayling. Although it is asserted in the JLUS that there is a compelling economic benefit to the area because of the military's presence, no recommendation has been made for an independent objective study to determine the accurate costs and benefits of Camp Grayling. In his September 16, 2018 letter to you, Tom Baird of the Anglers of the Au Sable, points to two economic studies showing the economic benefit to our area in terms of increased property values and property taxes paid by river front property owners. People purchase property in the area to enjoy the quiet solitude of the outdoors. Tourists, those looking to enjoy their cabins and cottages and those looking to purchase property won't come, won't remain and won't purchase properties if the activity and noise levels at Camp Grayling continue to increase. Reduced tourism and reduced property tax revenues most surely will have an adverse impact on the viability of the areas near the camp.

It appears that the military plans include geographic expansion by leasing additional land and purchasing contiguous properties. In 2014 efforts by the military to expand were met with protests and the expansion proposals were withdrawn. People do not want further expansion.

In closing, we oppose any further land expansion of Camp Grayling. We oppose increased usage of the current sites and facilities. We believe that we are at a point where the current activities are causing a negative impact on the rights of property owners, residents and tourists to the quiet enjoyment of their property and the area. We believe it is time for the military to acknowledge our rights and not pursue further expansion of Camp Grayling

Respectfully submitted,

Michael Inman – Chairman

Au Sable North Branch Foundation

E.3 Resources

Resources and reference information received during the JLUS process are provided on the following pages in electronic versions of this document.

Resources:

- Crawford County Land Act 172 of 1913
- Letter from Kamperman Associates Inc. in reference to Installation Environmental Noise Management Plan for Camp Grayling JMTC; February 25, 2002
- August 30, 1988, Public Hearing record, Bernard J. Fowler to Camp Grayling Management Advisory Committee
- An additional letter from Mr. Fowler to the committee dated September 21, 1988
- Long-term management agreement between the Department of Natural Resources and the Department of Military Affairs; November 26, 1984
- Sierra Club and Anglers of the Au Sable on NPDES permit No. MI0059209, Exhibit 242, Assessment of Economic Effects of INcreased Production at the Grayling Trout Hatchery; November 23, 2015
- Northern Michigan Property Values: The Significance of Riverfront Properties, prepared by Public Sector Consultants Inc. for Anglers of the Au Sable; August 2013
- Public Act 288 of 2016, which amends a 1994 act to protect the environment and natural resources of the state

CRAWFORD COUNTY LAND
Act 172 of 1913

AN ACT authorizing the acceptance by the state of a certain tract of land in Crawford county on certain conditions; providing for its control and management when so accepted; authorizing the leasing of a certain tract of that land upon certain conditions; making an appropriation for the purpose of making improvements thereon; and providing for payments in lieu of taxes on certain state lands in the counties of Crawford, Kalkaska and Otsego.

History: 1913, Act 172, Imd. Eff. May 2, 1913;—Am. 1955, Act 229, Eff. Oct. 14, 1955;—Am. 1976, Act 192, Imd. Eff. July 8, 1976.

The People of the State of Michigan enact:

32.221 Crawford county land; Michigan state military board authority to accept certain lands for state.

Sec. 1. The military board of the state of Michigan is hereby authorized and empowered to accept from the owner or owners thereof, for and in behalf of the state of Michigan, all those certain pieces or parcels of lands situated in Crawford county in this state, described in section 2 of this act, by deed of gift, in fee simple, free from lien of taxes or other encumbrances, upon the conditions and for the purposes prescribed in section 3 hereof.

History: 1913, Act 172, Imd. Eff. May 2, 1913;—CL 1915, 989;—CL 1929, 751;—CL 1948, 32.221.

32.222 Crawford county land to be given to state; description.

Sec. 2. The lands mentioned in section 1 hereof are described as follows, to-wit: The east 1/2 of the northeast 1/4 of section 2; east 1/2 of northwest 1/4 of section 2; northwest 1/4 of northwest 1/4 of section 2; west 1/2 of southwest 1/4 of section 2; southeast 1/4 of the southwest 1/4 of section 2; north 1/2 of the southeast 1/4 of section 2; entire section 3; east 1/2 of section 4; southwest 1/4 of section 4; south 1/2 of the northwest 1/4 of section 4; northwest 1/4 of northwest 1/4 of section 4; entire section 5; east 1/2 of southeast 1/4 of section 6; southwest 1/4 of southeast 1/4 of section 6; south 1/2 of northeast 1/4 of section 6; northwest 1/4 of northeast 1/4 of section 6; northeast 1/4 of northwest 1/4 of section 6; east 1/2 of section 7; southwest 1/4 of section 7; southeast 1/4 of northwest 1/4 of section 7; northwest 1/4 of the northwest 1/4 of section 7; northwest 1/4 of section 8; west 1/2 of southwest 1/4 of section 8; southeast 1/4 of southwest 1/4 of section 8; lot 1 of section 8; lot 3 of section 8; northeast 1/4 of section 10; northeast 1/4 of southeast 1/4 of section 10; southeast 1/4 of section 11; north 1/2 of southwest 1/4 of section 11; northwest 1/4 of section 11; west 1/2 of northeast 1/4 of section 11; east 1/2 of section 14; southwest 1/4 of section 14; north 1/2 of northwest 1/4 of section 14; lot 1 section 16; lot 2 section 16; lot 3 section 16; lot 4 section 16; southwest 1/4 of southeast 1/4 of section 16; south 1/2 of southwest 1/4 of section 16; south 1/2 of southeast 1/4 of section 17; lot 1 section 17; lot 2 section 17; south 1/2 of southwest 1/4 of section 17; northeast 1/4 of southwest 1/4 of section 17; west 1/2 of northeast 1/4 of section 18; northeast 1/4 of northeast 1/4 of section 18; east 1/2 of northwest 1/4 of section 18; northwest 1/4 of northwest 1/4 of section 18; entire section 19; entire section 20; west 1/2 of section 21; lot 1 section 21; lot 2 section 21; lot 3 section 21; lot 4 section 21; lot 4 section 22; south 1/2 of southeast 1/4 section 22; northeast 1/4 of southeast 1/4 of section 22; entire section 23; west 1/2 of section 24; southeast 1/4 of section 24; entire section 25; west 1/2 of section 26; southeast 1/4 of section 26; east 1/2 of northeast 1/4 of section 26; northwest 1/4 of northeast 1/4 of section 26; entire section 27; west 1/2 of section 28; southeast 1/4 of section 28; south 1/2 of northeast 1/4 of section 28; west 1/2 of section 29; southeast 1/4 of section 29; north 1/2 of northeast 1/4 of section 29; east 1/2 of northeast 1/4 of section 30; southwest 1/4 of northeast 1/4 of section 30; northwest 1/4 of southwest 1/4 of section 30; east 1/2 of section 31; east 1/2 of west 1/2 of section 31; northwest 1/4 of northwest 1/4 of section 31; north 1/2 of southwest 1/4 of northwest 1/4 of section 31; entire section 32; west 1/2 of section 33; north 1/2 of southeast 1/4 of section 33; southwest 1/4 of southeast 1/4 of section 33; northeast 1/4 of section 34; east 1/2 of northwest 1/4 of section 34; northwest 1/4 of northwest 1/4 of section 34; north 1/2 of southeast 1/4 of section 34; north 1/2 of northwest 1/4 of section 35; north 1/2 of northeast 1/2 of section 35; southeast 1/4 of northeast 1/4 of section 35, all in town 26 north, range 4 west, in the county of Crawford, state of Michigan, together with such land in said county suitable for the purposes of this act as may be acquired by the donor or donors of said property.

History: 1913, Act 172, Imd. Eff. May 2, 1913;—CL 1915, 990;—CL 1929, 752;—CL 1948, 32.222.

32.223 Crawford county land; uses, abandonment, reversion to donors, removal of buildings, timber rights.

Sec. 3. The said tract of land shall be used for the following purposes:

First, As a permanent encampment and maneuvering ground for the militia of this state;

Second, As a game preserve for the breeding and protection of game;

Third, As a forest reserve;

Fourth, For the establishment of fresh air camps, or for other recreational or health giving purposes by any state institution, county, city, village or township.

In case the said tract of land shall be abandoned as a permanent encampment and maneuvering ground for the state militia, the land shall revert to the donor or donors in fee simple, but in case of such reversion, the state shall have the right to take and remove therefrom, any building or other state property that may have been constructed or placed thereon by it, or to sell the same as may be deemed advisable by the board or body having control thereof. The state shall not be deemed to have abandoned said lands or any part thereof by reason of holding any encampment of the said militia at any other place within or without the state when the assembling of such militia elsewhere has been ordered by the President of the United States, the war department or other federal authority having jurisdiction of such forces, or when the safety or the health or lives in the state militia might be prejudiced or endangered by reason of the prevalence of disease or fire in or near said county of Crawford. No abandonment shall be deemed to be complete, unless the proper military authority of the state in time of peace shall have refused or failed for 5 successive years to hold a camp of instruction on said tract of land. As a further condition in the aeceptance of the gift of said tract of land, the donor or donors thereof shall be permitted to cut and remove from said land all merchantable timber for and during the period of 5 years next after the execution and delivery of the deed conveying said lands to the state of Michigan. All other timber on said lands shall be the property of and be protected by the state. Nothing herein shall be construed as prohibiting the cutting, removal and use of so much of said timber as may be necessary for military purposes, and in the protection of game or in the bettering of forestry on said lands.

History: 1913, Act 172, Imd. Eff. May 2, 1913;—CL 1915, 991;—Am. 1919, Act 373, Imd. Eff. May 13, 1919;—CL 1929, 753;—CL 1948, 32.223.

32.223a Camp Grayling facilities; lease by military board, public use.

Sec. 3a. The state military board may enter into a long term lease with a Michigan corporation for approximately 1200 acres of land at Camp Grayling, under which said corporation will agree to provide reasonable housing and other facilities to train military personnel in skiing and winter warfare. The state military board may agree in any such lease to pay a reasonable rental during the period of use of such facilities by military personnel, within appropriations available to the state military board. When said facilities are not being used by the military personnel, then said facilities shall be available to the general public at reasonable rates. All documents shall be examined by the attorney general both as to form and content.

History: Add. 1965, Act 336, Imd. Eff. July 23, 1965.

32.223b Grayling recreation authority; lease of property by military board; description; examination of documents; sublease; use; limitations; termination of leases under MCL 32.223a.

Sec. 3b. (1) The state military board created by section 360 of Act No. 150 of the Public Acts of 1967, being section 32.760 of the Michigan Compiled Laws, may enter into a long term lease with the Grayling recreation authority, consisting of the city of Grayling, the township of Grayling, and the Crawford-Au Sable school district, and established and operating pursuant to Act No. 156 of the Public Acts of 1917, being sections 123.51 to 123.54 of the Michigan Compiled Laws, for 400 aeres of land located in section 14, T26N, R4W, Grayling township in the county of Crawford, state of Michigan. All documents relative to the lease shall be examined by the attorney general both as to form and content.

(2) The Grayling reereation authority may sublease the property only after approval by the state military board and the attorney general. The Grayling recreation authority shall at all times make the tract of land available for use as a permanent encampment and a maneuvering ground for the militia of this state. The limitations contained in this subsection shall be stated in the lease agreement.

(3) Before a lease may be entered into under this section, all leases entered into under section 3a to a Michigan corporation upon approximately 1,200 acres of land shall be terminated.

History: Add 1976, Act 192, Imd. Eff. July 8, 1976.

32.224 Repealed. 1967, Act 150, Imd. Eff. June 30, 1967.

Compiler's note: The repealed section provided limited control over certain lands by the quartermaster general.

32.224a Camp Grayling; authority of military board as to highways leading to reservation.

Is this what you were looking for? Marcia

Sec. 4a. The military board is hereby authorized to enter into an agreement or agreements with the township board of the township of Grayling in said county of Crawford, for the construction or repair of the public highways leading into and through the reservation, or to take over from said township any highway approaching or running through the reservation after its construction and repair by the said township, for such consideration as may be agreed upon between the military board and the township board. The military board may alter, straighten, or lay out highways within said reservation and improve such highways, using therefor any moneys to the credit of the military fund not otherwise required for military purposes.

History: Add. 1915, Act 102, Imd. Eff. Apr. 28, 1915;—CL 1915, 993;—CL 1929, 755;—CL 1948, 32.224a.

32.224b Crawford county; lease of dwellings by military board for military personnel.

Sec. 4b. In carrying out the intent of section 4 relative to the military board providing suitable lodges or dwellings thereon for the use of such persons or officials as may be necessary in the enforcement of the general land, game, military or forestry laws of the state on the lands, and in carrying out the provisions of section 3 relative to the uses for which the tract of land shall be used, the military board may enter into a lease, not to exceed 25 years, with any private group or organization which will agree to provide suitable lodges or dwellings thereon for the use of such persons or officials and their families as may be necessary. When not in use by such persons or officials, such suitable lodges or dwellings and the equipment, fixtures, devices and contrivances now located on such lands or placed on such lands are to be for the benefit and use of the general public.

History: Add. 1965, Act 336, Imd. Eff. July 23, 1965.

32.224c Jurisdiction of department of natural resources; prohibitions; fishing by Camp Grayling military personnel in Lake Margrethe; penalty.

Sec. 4c. The department of natural resources has jurisdiction of the wildlife, fish, fire, and forestry interests on the lands and waters. The hunting, killing, or molestation of wildlife is prohibited. Military personnel encamped at Camp Grayling may take fish from Lake Margrethe without a license, subject to other laws pertaining to the taking of fish from Lake Margrethe. A person violating this section is guilty of a misdemeanor.

History: Add. 1973, Act 29, Imd. Eff. June 14, 1973.

Compiler's note: For transfer of powers and duties of department of natural resources to department of natural resources and environment, and abolishment of department of natural resources, see E.R.O. No. 2009-31, compiled at MCL 324.99919.

For transfer of powers and duties of department of natural resources and environment to department of natural resources, see E.R.O. No. 2011-1, compiled at MCL 324.99921.

32.225 Crawford county land; examination and certification of title by attorney general.

Sec. 5. The attorney general or such of his assistants as he may designate therefor, shall examine the title to all of said lands, and the deed thereto from the donor to the state, and such deed shall not be accepted without the certificate of the attorney general or his duly authorized assistant, that such title has been examined and that the conveyance is sufficient to vest in the state a good and sufficient title thereto free from liens or incumbrances.

History: 1913, Act 172, Imd. Eff. May 2, 1913;—CL 1915, 994;—CL 1929, 756;—CL 1948, 32.225.

32.226 Military lands; payments in lieu of taxes on certain state lands; allocating, distributing, and accounting for payments; payments to be made from appropriations; list of lands.

Sec. 6. Notwithstanding any provision of law to the contrary, the tract of land acquired by this act for the purpose of a permanent encampment and maneuvering ground for the militia of this state and all other land in Crawford, Kalkaska and Otsego counties now or hereafter owned by the state and controlled by the state military board shall not be subject to taxation, but the state, in lieu of taxes, shall pay an annual amount equal to $1.00 an acre for each acre or major fraction of an acre. The payment in lieu of taxes of this amount shall be paid annually in December to the treasurers of the respective townships, villages, and cities in the counties of Crawford, Kalkaska, and Otsego according to the number of acres of that land in the respective counties and the respective treasurers shall allocate, distribute, and account for the payments in the same manner and in the same proportions as the tax millage for that year has been allocated by the county tax allocation board. Payment of the amounts shall be made from appropriations made by the legislature for the operation of the military establishment and the officer having control and management of those lands under section 4 of this act shall cause to be prepared annually in the month of November and delivered to the respective treasurers of the townships, villages, and cities in those counties entitled to payments under this section a complete list of

all lands in the several townships, villages, and cities and the acreage therein upon which payment is to be made pursuant to this section. A copy of the lists shall be furnished to the county treasurer.

History: Add. 1954, Act 118, Eff. Aug. 13, 1954;—Am. 1955, Act 229, Eff. Oct. 14, 1955;—Am. 1986, Act 309, Imd. Eff. Dec. 23, 1986.

Former law: See Act 172 of 1913, which was repealed by Act 267 of 1945.

ACOUSTICAL CONSULTANTS
KAMPERMAN ASSOCIATES INC.

26620 Racquet Circle
Leesburg, FL 34748-8056

Phone 352-787-6626
800-787-6624
FAX 352-787-5804

February 25, 2002

The AuSable Manistee Action Council
Attn: Mr. Dan L. Alstott
6726 Hawthorn Trail
Grayling, MI 49738

Subject: Review of "Installation Environmental Noise Management Plan –
Camp Grayling Maneuver Training Center –
Fort Custer Training Center –
Michigan Army National Guard –
November 2001"

Dear Mr. Alstott:

The Subject report prepared by Aberdeen Proving Ground contains meaningful advice on the importance of maintaining good and active communications between Camp Grayling and the surrounding community with respect to noise emission from the "Installation." The serious environmental noise problem for the surrounding area is acknowledged on the first page in the first sentence under the Conclusions in the Executive Summary. "The environmental noise zones II and III, and the land use planning zones from activities at Camp Grayling Maneuver Training Center extend beyond the camp boundary." FAA, HUD and other Federal agencies utilize noise zone contour maps to show the long-term average noise exposure surrounding a noise generating activity. The highest noise levels are in zone III near the source(s) and the lowest noise exposure levels are in zone I and beyond. Noise zone I includes the area around a noise source in which the average day-night sound level (DNL) is less than 65 dBA or less than 62 dBC. Noise zone II consists of an area where the average day-night sound level is between 65 and 75 dBA or 62 and 70 dBC. Noise zone III is the area around a source in which the day-night sound level is greater than 75 dBA or 70 dBC. Neither HUD nor VA will make loans in areas identified as noise zone III. Only when the average day-night sound level is less than 65 dBA (noise zone I or lower) is a site totally acceptable to HUD and the VA.

The Installation Environmental Noise Management Plan is based on an extensive environmental noise Army research program with only a small fraction of the results summarized in the report. During the last two decades the Army has performed detailed noise measurements on all significant sources of environmental noise and published the results of their findings in technical reports and has presented the information at numerous technical meetings open to the public. They have also performed detailed studies on the sound propagation of blast noise over long distances with varying terrain and weather conditions. By utilizing the extensive noise emission database available to it is possible to predict the environmental noise level outside Camp Grayling at any given time based on the noise generating activities within Camp Grayling. Local weather

conditions do have a dramatic impact on long-range sound propagation. Weather conditions alone can change the sound attenuation with distance as much as 10 to 20 decibels per 1,000 feet between source and receiver. The continuous sound monitoring stations around the perimeter of Camp Grayling North are extremely important for this reason because understanding the micrometeorological conditions at and around Camp Grayling is far too complex with present day technology.

The methodology used in the Subject report is similar to a noise study for a commercial airport. I have a somewhat different perspective than the report authors and would like to share my concerns with the residents living near Camp Grayling.

1. It would appear the noise level contours are based on the annual day-night noise level average. This concept was developed for highway and airport noise exposure in urban areas. Averaging the environmental noise level over an entire year is great for describing highway noise or other nearly continuous noise source. As the noise level variations increase or worse, become impulsive plus a time varying pattern then the yearly noise energy exposure concept can no longer be used to predict community response.

2. The Federal Office of Noise Abatement (EPA) funded many environmental noise studies and submitted a report to Congress about thirty years ago recommending a maximum environmental residential day-night average noise exposure level of 55 dBA. These studies were based primarily on surface traffic noise and noise from aircraft over flights. However, the EPA studies were very concerned with documenting the actual noise impact introduced by the source(s) of interest. The ambient noise level without the noise source(s) of interest is very important in evaluating the noise impact from the source(s) and determining the percent of highly annoyed residents with the source(s) present. The Subject report does not consider the background noise level (without noise from Camp Grayling) in the residential areas surrounding Camp Grayling. There is no discussion of the magnitude of noise impact caused by the activities at Camp Grayling.

3. There is a reference to noise complaints on page 60 of the Subject report on the firing of 105 and 155 mm howitzer and 120 mm tank gun. "The expected noise levels from these weapon systems will cause a moderate risk of noise complaints." This is an understatement if the largest guns to date are 105 mm howitzers. Look at the data on page 60 and compare the peak sound pressure level (dBP) output of the 105 mm verses the 155 mm or the 120 mm main tank gun. The difference in level over a mile away is 10 dB to 20 dB depending on azimuth. This is equivalent to firing 10 to 100 guns (105 mm howitzers) simultaneously. Or alternately, increasing the distance between the gun and residents by a factor of three to a factor of ten.

4. Table A.1. Typical Building Construction Noise Level Reduction is on page 97. This shows the A-weighted sound reduction associated with different types of

construction. These are typical noise reduction values for highway traffic and jet aircraft noise sources. The information in this table does not apply to sources with strong low frequency energy such a helicopters and of course large guns and bombing. In fact the impact noise level from large guns and bombing can be higher inside a closed dwelling than immediately outside the dwelling due to resonant frequencies in the dwelling structure. Wood dwellings are subject to "house rattle" caused by nearby low flying helicopters, artillery firings and bombing. The "house rattle" and impact noise inside a home can be highly annoying to the residents in the home without causing any damage to the dwelling structure. Unfortunately, there are no noise control options available to the homeowner for these very low frequency noise sources. To reduce the loudness of the impact noise inside the dwelling in half (50%) would require moving the dwelling about three times farther from the noise source or constructing the entire dwelling of reinforced concrete. The State of Illinois has a blasting noise limit based on the blast noise research work by the Army. The regulated blast noise limit at residential receiving property is 109 dB C-weight slow meter response during daytime and 99 dB C-weight slow during nighttime (10 PM to 7 AM). Although the C-weighted blast sound exposure level (SEL_c) was used in the development of the Noise Contours in Figures 4 of the Subject report, the Army now uses a measurement of the peak sound pressure level (dBP) to monitor blast events. The peak SPL (dBP) may be 10 to 20 dB above the C-weight or SEL_c. Aircraft noise is measured with the A-weighted sound level (dBA). Table 4.19 on page 64 illustrates the maximum aircraft noise and annoyance as a function of slant distance to the aircraft. About twenty-five percent of the residents will be highly annoyed by the noise from a F-16 aircraft passing at one mile or a helicopter passing at 500 to 1,000 feet.

5. It is clear from the Subject report that the impact noise level around Camp Grayling is expected to increase significantly in the future. The cooperation and open communication between Camp Grayling and the surrounding residents is paramount to prevent the noise issue from becoming an intractable situation. I have one specific recommendation for Camp Grayling on how to involve the residents so they feel that Camp Grayling is always doing there level best to accomplish its training mission with the minimum noise exposure to the residents. It is my recommendation that all acoustic data from each of the nine BLAM noise-monitoring locations be uploaded to a special Internet site at the end of each hour of the day and night. The continuously uploaded data would be stored on the web site for the number of days agreed upon by a representative from Camp Grayling and the neighborhood. It will be the responsibility of the neighboring residents to hire a summer grad student in engineering or physics to construct a simple spreadsheet program to summarize and printout the hourly reports on a daily basis. This timely information will permit an interested committee of residents to really relate the acoustic data to their own subjective experiences. This could form the basis for more informed discussions between Camp Grayling and the residents on the noise issues. If Camp Grayling is willing to share some

of its software for handling the data from the noise monitors that would also be a plus. The data from the BLAM monitors is significant but limited. The monitors record only blast noise and time stamp each measured event. The monitoring threshold should be set low enough to record all blast events. The maximum blast level "Alert" signal sent to Operations can be set at the choosing of Camp Grayling. Unfortunately, the BLAM monitors have no capability for measuring wind speed and direction. In as much as weather conditions have more influence on the blast noise levels at the residences than the weapons being fired some information on the prevailing wind conditions around the perimeter of Camp Grayling could be very useful to the Range Operators.

6. Aberdeen Proving Ground is responsible for the design of the BLAM monitor. The original design was developed by the Air Force to measure sonic booms. The geophone signal is compared to the signal from the air blast microphone to minimize false reports of blast signals from the BLAM. Although the manufacturer of the BLAM units would not discuss the unit with me they did eventually put me in touch with Mr. Bill Russell at Aberdeen (410-436-3829) who is very cooperative and recently became responsible for the BLAM system. Mr. Russell has no knowledge of what Camp Grayling plans to do with the data from the BLAM monitors. At Aberdeen they monitor all blasts plus wind direction and velocity. At the beginning of each day they set off a small charge that is recorded by each blast monitor and the results are sent to a central location to determine the sound propagation characteristics from Aberdeen at that time. This information is disseminated to all interested parties. Aberdeen has a full time person just to deal with the air blast information and analysis. The public relations office also has an 800 number for receiving air blast complaint from residents. Residents can also call directly the person analyzing the air blast data.

7. AMAC should consider purchasing a hand held sound level meter (meeting ANSI S1.4-1983 [R2001]) for measuring air blast events independent of the results provided by Camp Grayling. After an acoustic calibration check, the instrument should be set to simultaneously measure broadband peak (dBP) and C-weighted sound exposure level (SEL_c). The peak level (dBP) may relate best to the magnitude of "house rattle" for individual blast events. However, there could be one to a hundred or more identical blast events in one day and the peak level remains unchanged but the annoyance increases with the number of blast events in a day. The sound exposure level (SEL) is a measure of the time-weighted energy of a transient sound normalized to a period of one second. Assume for this simplified example there are multiple identical blast events. The SEL value for each event would be the same. The dBP for each event would also be the same but different than SEL, which is a one second average. It is not possible to sum multiple peak values and obtain meaningful information. SEL is related to the blast noise energy level and multiple SEL values can be added (logarithmically) to obtain the time weighted blast noise level for the hour (LEQ_{HR}), for the day or longer. Assume for our example the blast noise level for

one event per hour is 100 SEL. Then the one hour LEQ = 64 dB (SEL - 10 Log (3600 seconds)). Two blast events in one hour = 67 dB. Ten blast events in one hour = 74 dB and 100 blast events in one hour = 84 dB LEQ for the hour. This procedure of the time weighted average noise level (LEQ) is the basis for the noise level contours shown in Figures 4-2 through 4-8 of the Subject report. But I have absolutely no information or insight into the assumptions made to generate these noise contours.

Please let me know if you have any questions on this report.

Sincerely,

KAMPERMAN ASSOCIATES INC.

George W. Kamperman

George W. Kamperman, P.E., INCE Bd. Cert. Emeritus

AUGUST 30, 1988 PUBLIC HEARING

CAMP GRAYLING MANAGEMENT ADVISORY COMMITTEE

MY NAME IS BERNARD J. FOWLER. I LIVE OFF EDGEWATER LANE, UPSTREAM FROM STEPHAN BRIDGE. I WAS BORN IN ROSCOMMON, MICHIGAN AND GREW UP IN THE ROSCOMMON AREA AND SOUTH BRANCH TOWNSHIP OF CRAWFORD COUNTY. I MOVED TO THE GRAYLING AREA IN THE FALL OF 1946 UPON RETURNING FROM SERVICE WITH THE U.S. MARINE CORP. IN 1955 MY WIFE AND I PURCHASED A HUNTING AND FISHING CAMP AT STEPHAN BRIDGE KNOWN AS EDGEWATER ON THE AUSABLE. IN APRIL OF 1961 I WAS ELECTED TO THE OFFICE OF GRAYLING TOWNSHIP SUPERVISOR AND SERVED IN THAT POSITION UNTIL MY RETIREMENT IN 1984. IN 1965 I WAS ELECTED TO THE BOARD OF DIRECTORS OF THE MICHIGAN TOWNSHIPS ASSOCIATION AND SERVED AS PRESIDENT IN 1971. I PRESENT THIS BACKGROUND INFORMATION TO YOU TO REFUTE THE STATEMENT BY THE MICHIGAN NATIONAL GUARD THAT PERSONS SUPPORTING THE AUSABLE MANISTEE ACTION COUNCIL ARE ALL A BUNCH OF OUTSIDERS OR JOHNNY COME LATELYS THAT HAVE A PERSONAL AXE TO GRIND. I HAVE DEVOTED WELL OVER 40% OF MY LIFE TO PUBLIC OFFICE OR SERVICE TO THIS COUNTRY. I RESENT VERY MUCH THE ACCUSATIONS MADE THIS PAST YEAR THAT BECAUSE WE QUESTION THE NATIONAL GUARD ACTIONS WE ARE ANTI AMERICAN, COMMUNIST ETC.

AS A CITIZEN OF CRAWFORD COUNTY, A FORMER ELECTED PUBLIC OFFICIAL, A PROPERTY OWNER, TAXPAYER AND BUSINESS OWNER I HAVE GREAT CONCERNS ABOUT WHAT I SEE HAPPENING IN CRAWFORD AND SURROUNDING COUNTIES. A MAJOR PART OF THESE CONCERNS ARE DIRECTLY RELATED TO ACTIONS OF THE MICHIGAN NATIONAL GUARD. PERHAPS MY FIRST MISTAKE WAS NOT MAKING AN ISSUE OVER THE GUARD NOT KEEPING ITS WORD IN THE EARLY 1950'S WHEN THE CRAWFORD COUNTY GRANGE WAS TOLD THAT ALL MILITARY ACTIVITY WOULD BE KEPT 1/2 MILE NORTH OF THE NORTH DOWN RIVER ROAD. LESS THEN TWO YEARS LATER A MOVING TARGET RANGE WAS CONSTRUCTED AT THE NE CORNER OF STEPHAN BRIDGE ROAD AND NORTH DOWN RIVER. THE FIRING LINE FOR THE

TANKS WAS ONLY A FEW HUNDRED FEET FROM THE NORTH DOWN RIVER ROAD. THIS FIRING LINE HAS SINCE BEEN ABANDONED BUT I SEE IT SHOULD OF FORWARNED US OF THINGS TO COME. IT IS A GOOD EXAMPLE OF THE TYPE OF GUARD ACTIONS I HAVE WITNESSED OVER THE YEARS. AS ONE WHO HAS LIVED HERE FOR MANY YEARS I WANT TO RELATE THE FOLLOWING OBSERVATIONS. I REMEMBER WHEN MOST OF THE GUARD ACTIVITY EASTERLY OF GRAYLING WAS BETWEEN JONES LAKE ROAD AND STEPHAN BRIDGE ROAD. IT THEN MOVED FURTHER EAST AND WAS BETWEEN JONES LAKE ROAD AND DAMON TRUCK TRAIL. NEXT IT WAS EXTENDED FROM JONES LAKE ROAD TO NORTH DOWN RIVER NEAR BALD HILL ROAD. IT THEN MOVED ACROSS NORTH DOWN RIVER TOWARD THE FABLE HILLS AREA AND DYER TRUCK TRAIL. IT IS NOW ALL THE WAY TO CONNORS FLAT ROAD. ALL THIS WITHOUT EXPANDING THEIR BOUNDARIES. I SPEAK OF THIS AREA BECAUSE IT IS THE ONE I AM CLOSEST TO AND MOST FAMILIAR WITH. I HAVE HOWEVER SEEN VERY SIMILIAR CHANGES COME ABOUT IN OTHER AREAS AND FEEL CONFIDENT THAT A VERY SIMILIAR PICTURE COULD BE DRAWN IN MOST IF NOT ALL THE OTHER RANGE AREAS.

AS SUPERVISOR I WAS AWARE OF MANY CASES OF TRESPASS BY THE GUARD ON PRIVATE PROPERTY. I KNOW BECAUSE MANY OF THE OWNERS CAME TO MY OFFICE SEEKING RELIEF. IT IS SAD TO SAY THAT VERY LITTLE RELIEF WAS AVAILABLE AND THAT TRESPASS CONTINUES TODAY. IT IS MY OPINION THAT A GREAT MANY OWNERS FOUND THEIR RELIEF BY SELLING OUT TO THE GUARD. SOMEHOW I FIND IT HARD TO RELATE PROTECTION OF THE AMERICAN WAY OF LIFE WITH SUCH ACTIONS.

IN THE AREA OF LAND AVAILABLE FOR PUBLIC USE I HAVE SEEN MORE AND MORE AREAS SHUT OFF TO THE PUBLIC BE IT FOR HUNTING, FISHING OR OTHER USE. AS A HUNTING AND FISHING GUIDE THIS IS A VERY IMPORTANT ISSUE. THE DETERIORATION OF ROADS DUE TO GUARD ACTIVITY ALSO DIRECTLY EFFECTS AVAILABILTY OF LAND. ROADS ARE SO TORN UP THAT EVEN IF THE LAND REMAINS OPEN ONE MAY NOT BE ABLE TO GET TO IT. STEPHAN BRIDGE ROAD

FROM NORTH DOWN RIVER TO COUNTY ROAD 612 IS A PRIMARY ROAD BUT IS TORN UP MOST OF THE SUMMER AND FALL. BALD HILL ROAD IS ALSO TORN UP MOST OF THE TIME.

THE LAKE MARGRETHE PROPERTY OWNERS ASSOCIATION WORKED MANY YEARS TO TRY AND RESOLVE THE PROBLEM OF LOW FLYING AIRCRAFT OVER POPULATED AREAS OF THE LAKE. I KNOW THIS TO BE A FACT BECAUSE AS SUPERVISOR I ATTENDED MOST OF THEIR ANNUAL MEETINGS. IN 1984 JUST PRIOR TO MY RETIREMENT WE BEGAN TO SEE SOME COOPERATION FROM THE GUARD IN RESOLVING THIS PROBLEM. AS A PROPERTY OWNER ON THE AUSABLE RIVER I HAVE PROBLEMS WITH LOW FLYING AIRCRAFT. THERE ARE TIMES WHEN LOW FLYING HELICOPTERS ACTUALLY TWIST THE TOP OF THE WILLOW TREES ON THE RIVER BANK IN FRONT OF MY HOUSE. WHEN CALLED THE GUARD RESPONSE HAS BEEN, "DID YOU GET THE NUMBER". OVER TWO YEARS AGO AT A MEETING OF THE AUSABLE PROPERTY OWNERS ASSOCIATION A GUARD REPRESENTATIVE STATED THAT LARGE NUMBERS WOULD BE PLACED ON THE BOTTOM OF THE, HELICOPTERS TO MAKE IDENTIFICATION POSSIBLE. AGAIN THIS YEAR IN A CRAWFORD COUNTY AVALANCHE ARTICLE GENERAL ANDREWS AGAIN MADE THE SAME STATEMENT. TO DATE I HAVE SEEN NO NUMBERS BUT WE STILL CONTINUE TO HAVE LOW FLYING HELICOPTERS AND GET THE SAME RESPONSE WHEN WE CALL CAMP. ONE THING I LEARNED IN PUBLIC OFFICE IS THAT YOUR WORD IS THE BEST THING GOING FOR YOU. IT CERTAINLY IS NOT SURPRISING TO ME THAT SO MANY ARE EXPRESSING CONCERN ABOUT THE GUARD.

ALONG THIS SAME LINE I WANT TO RELATE TWO SPECIFIC CASES WHICH I BELIEVE INDICATIVE OF GUARD ACTION. 1. AT A PUBLIC HEARING MUCH LIKE THIS I WAS ON A PANEL ALONG WITH SOME GUARD OFFICERS. WORD WAS PASSED DOWN TO ME THAT NO QUESTIONS SHOULD BE ASKED ABOUT THE AIRPORT. NOW ANYONE THAT KNOWS ME WOULD KNOW THAT IS A SURE WAY TO GET ME TO ASK AN AIRPORT QUESTION. AS I RECALL MY QUESTION TO THE GUARD WAS REGARDING HOW THE GUARD MIGHT ASSIST THE LOCAL GOVERNMENTS IN MAINTENANCE AT THE

AIRPORT. THEY NEVER DID RESPOND TO THAT QUESTION BUT CHOSE INSTEAD TO TRY AND MAKE THE PUBLIC BELIEVE I WAS ATTEMPTING TO HAVE THEM DO SOMETHING ILLEGAL. AFTER THE HEARING A NUMBER OF PEOPLE TOLD ME THEY WERE AWARE OF WHAT THE GUARD WAS TRYING TO PULL. 2. AT A MEETING WITH THE GUARD REGARDING THE AIRPORT HELD IN THE GUARD OFFICES IN LANSING WE WERE TOLD THAT UNLESS WE STOPPED TALKING TO OUR ELECTED OFFICIALS ABOUT THE AIRPORT WE WOULD RECEIVE NOTHING FROM THE GUARD. I WAS PRESENT AT THAT MEETING ALONG WITH JEANETTE KITCHEN FROM THE COUNTY BOARD OF COMMISSIONERS, JERRY MORFORD, CITY MANAGER AND DAVE FREDERIC, CRAWFORD COUNTY TRANSPORTATION AUTHORITY. ON THIS SECOND ISSUE I HAVE BEEN UNDER THE IMPRESSION THAT OUR ELECTED REPRESENTATIVES IN LANSING AND WASHINGTON ARE THERE FOR THAT VERY PURPOSE. IT DISTURBS ME THAT A GOVERNMENTAL UNIT (THE GUARD) FEELS THEY ARE SUCH UNTOUCHABLES THAT THEY CAN THREATEN THE PUBLIC OR LOCALLY ELECTED OFFICIALS IN ORDER TO GET THEIR WAY.

THE FORMER BEAR MOUNTAIN, NOW HANSON HILLS AREA IS ANOTHER MATTER WHICH I AM MOST FAMILIAR WITH. MOST ARE AWARE OF THE THOUSANDS OF DOLLARS OF DEVELOPMENT THAT WAS DESTROYED IN ORDER TO COMPLY WITH TERMS OF THE HANSON GRANT. THE GUARD WAS VERY FIRM IN SEEING THAT NOTHING CONTINUED TO EXIST THAT MIGHT BE IN VIOLATION OF THE GRANT. I NOTE THAT GUARD ATTORNEYS RESPONDING TO THE A.M.A.C. COURT PLEA STATED THAT EVEN IF THE GRANT DID STATE FOR MICHIGAN MILITIA, IT DID NOT MEAN ANYTHING BECAUSE THE GRANT WAS WRITTEN SO MANY YEARS AGO AND THE GUARD HAD SO MUCH INVESTED IN THE PROPERTY. IT SEEMS A CLEAR CASE OF CHANGING THE RULES TO SUIT THEIR PURPOSE.

THE STATE OF MICHIGAN, D.N.R. HAS DECLARED THE AUSABLE RIVER SOMETHING SPECIAL. IT IS SO VALUABLE THAT INDIVIDUAL PROPERTY RIGHTS MUST BE SACRIFICED IN ORDER TO PROTECT IT. THIS IS BEING CARRIED OUT THROUGH THE MICHIGAN NATURAL RIVERS ACT. RATHER SEVERE RESTRICTIONS HAVE BEEN PLACED ON PROPERTY ADJOINING THE RIVER. THE GOAL SEEMS TO BE THAT ANY

NEW STRUCTURES NOT BE VISABLE FROM THE RIVER. IN ADDITION NO EXCAVATION OR CHANGE IN THE CONTOUR OF THE LAND MAY BE MADE EXCEPT UNDER A VERY HIGHLY RESTRICTIVE PERMIT SYSTEM. AS A PROPERTY OWNER FACED WITH LOSS OF PROPERTY VALUE DUE TO THE CREATION OF UNUSABLE LAND I AM CONCERNED BECAUSE IT DOES NOT APPEAR THAT OTHER USERS OF THE LAND, WATER OR AIR ADJACENT TO THE RIVER ARE BEING REQUIRED TO GIVE THEIR SHARE TOWARD PRESERVATION OF THIS GREAT RESOURSE. ONCE AGAIN WE ARE FINDING DIFFERENT RULES FOR DIFFERENT PEOPLE. THE ONLY BENEFIT I AM ASSURED OF IS THE RIGHT TO CONTINUE PAYING TAXES. IF THIS RIVER IS SUCH A VALUABLE RESOURSE, AND I AGREE IT IS, THEN I BELIEVE LOW FLYING AIRCRAFT SHOULD BE RESTRICTED. WITH THE THOUSANDS OF ACRES OF LAND UNDER GUARD CONTROL I SEE NO REASON WHY A FLIGHT CORRIDOR CAN NOT BE ESTABLISHED OVER MILITARY LAND AND HELP PRESERVE THE NATURAL ATMOSPHERE ALONG THE RIVER. THE PIGEON RIVER COUNTRY HAS CERTAIN OVER-FLIGHT RESTRICTIONS.

THIS PAST SUMMER MILITARY ACTIVITY WAS CARRIED OUT AT MANY OF THE BRIDGES IN THE COUNTY. I PERSONALLY WITNESSED THIS ACTIVITY AT STEPHAN BRIDGE WITH TROUPS IN BATTLE GEAR APPROACHING THE BRIDGE FROM THE NORTH. I IMMEDIATELY CALLED THE MAIN CAMP AND WAS ASSURED THAT SUCH ACTIVITY WAS NOT BEING CONDUCTED. LATER THAT DAY I TALKED TO A NEIGHBOR IN THE WAKELEY BRIDGE AREA AND WAS TOLD THAT SIMILIAR ACTIVITY WAS CONDUCTED AT WAKELEY BRIDGE WITH TROOPS TRESPASSING ON PRIVATE PROPERTY. WITH THE NUMBER OF LAKES AND RIVERS CONTROLED BY THE GUARD I DO NOT FEEL IT IS NECESSARY TO EXPAND OUT INTO AREAS WHERE PEOPLE ARE TRYING TO CONDUCT BUSINESS. WITH OVER THIRTY YEARS EXPERIENCE I KNOW THAT GUARD ACTIVITIES ARE DETRIMENTAL TO MY BUSINESS.

FOR MORE THEN 30 YEARS I HAVE SERVED AS A FOREST FIRE KEYMAN. DURING THAT TIME I HAVE FOUGHT NUMEROUS MILITARY FIRES. THE GENERAL PUBLIC COMES UNDER POLICY THAT REQUIRES PAYMENT OF FIRE SURPRESSION COSTS FOR ANY FIRES THEY START. AS NEAR AS I CAN DETERMINE WE ONCE AGAIN ARE USING TWO SETS OF RULES. THE MILITARY IS NOT REQUIRED TO

PAY SUPPRESION COSTS. AT THE SAME TIME THE D.N.R. DOES NOT HAVE THE MONEY NEEDED TO BUILD AND MAINTAIN ADEQUATE SAND TRAPS IN THE AUSABLE RIVER TO HELP PROTECT THIS VALUABLE RESOURSE.

AS A MEMBER OF THE BOARD OF DIRECTORS OF A.M.A.C. AND THE AUSABLE RIVER PROPERTY OWNERS ASSOCIATION I HAVE MANY MORE ITEMS IN MY FILE WHICH CAUSE ME GREAT CONCERN. I AM CERTAIN THAT EXCEPT FOR A.M.A.C. THE GENERAL PUBLIC WOULD KNOW LITTLE OR NOTHING ABOUT THE ENVIRONMENTAL VIOLATIONS AT CAMP GRAYLING. EVEN IF THE GENERAL PUBLIC TAKES A SO WHAT ATTITUDE I HAVE PERSONALLY SEEN TO MANY DOCUMENTED ITEMS INDICATING VIOLATIONS AT CAMP GRAYLING NOT TO BE CONCERNED.

I HAVE MANY TIMES STATED THAT I CONSIDER MYSELF A HAWK WHEN IT COMES TO A STRONG MILITARY. I BELIEVE VERY FIRMLY IN A STRONG MILITARY BUT UNDER CIVILIAN CONTROL. WHILE THE LAWS ETC. SEEM TO INDICATE OUR GUARD IS UNDER CIVILIAN CONTROL I HAVE MY DOUBTS IF IN PRACTICE THAT IS REALLY THE CASE. I THINK WE NEED TO TAKE A HARD LOOK AT THE GUARD AND ITS OPERATIONS. ARE THE BENEFITS IN BALANCE WITH THE DETRIMENTAL EFFECTS. I PERSONALLY FEEL THE PRICE WE ARE PAYING IS TO HIGH. IT IS OBVIOUS TO ME THAT THERE ARE THOSE IN THE COMMUNITY WHO ARE WILLING TO PERMIT ANYTHING FOR A BUCK. FOR ME THE AUSABLE RIVER IS A SPECIAL PLACE. I FEEL I HAVE INVESTED MY LIFE HERE. FOR ME IT IS NOT FOR SALE AT ANY PRICE.

Grayling, Michigan
September 21, 1988

Camp Grayling Management Advisory Committee
c/o AAA Michigan
One Auto Club Drive
Dearborn, MI 48126

At the Grayling Hearing on August 30 I indicated I would submit some additional material. Rather then take up your time on material which I suspect you are already aware of I will just make a few comments and then list some recommendations. I think that the result of all the problems people are having with the Guard is that the quality of life has diminished. At one time here on the AuSable I was proud as a guide and business person because we really had a quality product to offer the tourists. That is not true today, largely due to the activity of the Guard. I am listing some of the things I would like you to consider.

1. There should be no further purchase of land by the Guard without Public Notice and Hearings.
2. No land under the control of the D.N.R. should be released for Military use without Public Notice and Hearings.
3. The Military should be required to abide by all Laws, Rules or Regulations that private citizens must abide by.
4. Violations of any items under #3 should result in the same penalties as applied to private citizens.
5. Military air traffic should be assigned air routes to and from the ranges that will avoid residential and tourist areas including the rivers. All FAA regulations should be strictly enforced.
6. The State of Michigan should establish the rules for use of Camp Grayling. Military units not willing to abide by "Our" rules should not be permitted to use the facilities.
7. The Guard forest fire unit should be capable of handling all Guard related fires. The D.N.R. forest fire units should only act as backup. The D.N.R. should have full authority to stop firing during high fire danger (degree of fire danger at the sole discretion of the D.N.R.)
8. A Committee made up of private citizens should be established for continued review of Military - Civilian problems with enought authority to bring about needed changes.
9. All firing points should be no less then 1/2 mile from public roads or private property.
10. Military trespass upon private property should carry the same penalties as private trespass upon military property.
11. County roads damaged by Military activities should be repaired at Military expense.

12. Operation of Military vehicles within the lands covered by the State of Michigan Wild and Scenic Rivers Act should be prohibited. The State of Michigan should undertake action to close to vehicle traffic the ford below Dam 2 on the North Branch of the AuSable.
13. Action should be taken to prohibit the Military from stopping civilians outside of military lands.
14. Consideration should be given for handling civilian complaints against the military through a civilian office or agency so that a record can be established on the number and validity of complaints and how they are resolved.
15. A time frame for night firing needs to be established.
16. Perhaps the most difficult will be to bring about a change in attitude of the Guard powers that be toward the civilian population and in particular those persons who disagree with the Guards actions.

I "Thank You" for your time and efforts in seeking solutions to what many consider to be serious problems.

Sincerely,

Bernard J. Fowler
Rte. 2, Box 2333
Grayling, MI 49738

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

NOV 28198-

November 26, 1984

TO: John A. Scott, Acting Deputy Director

FROM: Gerald A. Rose, Assistant Chief, Forest Management Division

SUBJECT: Long Term Management Agreement - Lands Adjacent to Camp Grayling - DNR and DMA

Attached is a copy of the long term management agreement between the DNR and DMA for lands adjacent to Camp Grayling. The agreement has been signed by both Directors and is ready for implementation.

Regional Director MacGregor and I have scheduled a meeting between key staff from the DNR and DMA to discuss the agreement and assure its proper implementation. The meeting will be held in Roscommon at 10:00 am on December 10, 1984.

GAR:wbs
attachment

cc: J. Cleary
J. MacGregor
R. Harmes
R. Borak
W. Montgomery

1984

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
MANAGEMENT AGREEMENT

The Department of Natural Resources (DNR) hereby grants to Department of Military Affairs (DMA) permission to use the below described state-owned forest land for military training purposes for 20 years, with renewable 10 year options as delineated in condition 1 of this Management Agreement (MA).

Crawford County: T25N, R4W, Section 8, Entire; Section 9, Entire except NW¼ of NE¼ and NE¼ of NW¼; Section 10, N½ of S½ of NE¼, NW¼, S½; Section 15, Entire; Section 16, NE¼, N½ of NW¼, SE¼ of NW¼, E½ of SW¼, N½ of SE¼, SW¼ of SE¼; Section 17, N½ of NE¼, NW¼, N½ of SW¼, SW¼ of SW¼, E½ of SE¼; Section 20, NE¼, E½ of NW¼, S½; Section 21, Entire; Section 22, NE¼, W½ of NW¼, SW¼; Section 27, Entire; Section 28, Entire except NE¼ of SE¼; Section 29, NE¼, E½ of NW¼, S½; Section 32 and 33, Entire; Section 34, Entire NW'ly of Military Road; T27N, R1W, Section 6, W½ of NE¼, N½ of NW¼, S½ of SW¼, SE¼; T27N, R3W, Sections 19 and 20, W'ly of I-75; Section 20, SE'ly of M-93; Section 21, N½ of NE¼, SW¼ of NE¼, NW¼ of SE¼; Section 29, N 3/4 of E½, NE of NW¼ E of I-75, SW¼ of SW¼; Section 30, Entire except E½ of NE¼; Section 31, NE¼, N½ of NW¼, NE'ly of Old 27, SE¼ of SE¼; Section 32, W½ of NW¼, SE¼ of NW¼ W of I-75; T27N, R4W, Section 19, W 3/4 except SW¼ of NE¼, Section 21, Entire; Section 22, W½; Section 24, Entire E of RR r/w; Section 25, Entire E. of RR r/w except SE¼ S. of Old U.S-27; Section 27, NW¼; Section 28, N½, SW¼; Section 29, SE¼; Section 30, Entire except E½ of SE¼; T28N, R3W, Section 3, NE¼, W½ of NW¼, SW¼, W½ of SE¼, SE¼ of SE¼; Section 10, Entire except SW¼ of SW¼.

Kalkaska County: T25N, R5W, Entire Sections 7, 8, and 9; Section 10, Entire except SE¼ of SE¼; Entire Sections 11 and 12; Section 13, N½; Entire Sections 14 thru 19; Section 20, N½; Section 21, Entire; T25N, R6W, Section 12, Entire except SW¼ of NE¼; Section 13, NE¼, NW¼ of NW¼, SW¼, W½ of SE¼, SE¼ of SE¼; Sections 22 thru 28, Entire; Section 29, NE¼, W½ except NE¼ of NW¼, N½ of SE¼, SE¼ of SE¼; Section 32 thru 36, Entire; T26N, R5W, Section 6, S½; Section 7, Entire; Sections 8 and 9, S 3/4; Section 16, W½ of NE¼, W½, NW¼ of SE¼; Sections 17 and 18, Entire; T26N, R6W, Section 1, S½; Section 2, N½ of SW¼, SE¼ of SW¼, SE¼; Section 10, E'ly of River; Section 11, Entire except NW¼ of NW¼, N½ of SE¼; Section 12, Entire; Section 13, Entire except SW¼ of SW¼; Section 14, Entire; Section 15, E'ly of River; Section 21, E'ly of River; Section 22, Entire except E½ of NW¼; Section 23, Entire; T27N, R5W, Section 24, Entire; Section 25, Entire except S½ of S½ of SE¼.

This Management Agreement is subject to the following conditions.

1. The principle term of this MA is 20 years from the originating date. The DMA may on the tenth year of the MA and at subsequent ten year intervals enter into negotiation with the DNR for a 10 year extension of the MA. Extensions of this agreement shall be by mutual agreement.
2. The DMA and DNR may by mutual agreement terminate this MA at anytime.
3. The issuance of this MA does not negate the DMA responsibility to obtain all regulatory permit(s) and/or licenses as may be required by law now or in the future whether issued by the DNR or others.

4. The DNR reserves jurisdiction over and control of all lands covered by this MA, with respect to the game, fish, forestry, minerals, and all other interest except for the use conveyed to the DMA for military training proposed under the conditions set forth in this MA.
5. Use of the area by the DMA shall be primarily for troop maneuvers and special training such as communications systems installation and operation. Tanks and armored personnel carriers shall not be used. Use of large trucks shall be limited to troop carriers, communications systems vehicles, food service vehicles and other troop support vehicles.
6. The DNR and DMA shall meet annually during the fourth quarter of each calendar year to discuss issues of concern, including but not limited to,
   a) Planned troop encampment and maneuvers and other military use of the area
   b) Public concerns
   c) Resource management activities
   d) Recreation activities
   e) Fire management through the Mutual Aid Agreement

   Each party to this MA shall formally respond in writing to all concerns and issues addressed at these meetings.
7. The DMA shall place and maintain signs and/or fencing to identify areas and to limit access to lands under state ownership where access and/or use by DMA personnel is not desirable because of a social or environmental concern, or where access by the public during actual troop maneuver could be injurious to the health and safety of the forest user.
8. The DMA is solely responsible for the safe operation of the area under the MA and shall make all reasonable efforts to eliminate any hazards.
9. The DMA shall not conduct troop maneuvers or other activities on lands under this MA during the annual deer firearm season.
10. The DMA shall annually reimburse the DNR for taxes paid to local units of government for lands purchased within this MA by the DNR.
11. The DMA shall <u>limit</u> off road use of vehicles and shall not allow the construction nor development of roads by DMA personnel.
12. The DMA is responsible for the maintenance and/or repair of all roads.
13. The DMA shall not allow the crossing of any stream (wetland) by troops or vehicles except on bridges or at crossings, acceptable to the DNR, which are designed to mitigate any <u>undo</u> degredation of the stream and associated ecological system. DMA personnel may cross streams at locations where the numbers of troops or the frequency of crossings are such that it does <u>not</u> cause streambank cave-in or erosion, elimination of shoreline vegetation, silting of the stream, or other alterations of the natural habitat including paths which would be observable for more than one growing season.

14. Use of areas designated as winter deer range shall be limited to type of use and intensity of use which does not conflict with yarded deer from December 1-April 1.
15. Use of areas providing nesting habitat for Kirtland's Warblers is forbidden from May 1 to August 15 of each year. Any area that has been burned during the previous 10 years with a history of Kirtland's Warbler use shall be managed to either encourage or discourage Warbler use according to a mutual agreement for each site.
16. Areas leased and/or developed for oil and gas production may contain facilities which need to be protected from damage. The DMA assumes responsibility for this protection from military personnel and use.
17. The DMA will be notified when lands under this agreement are nominated for oil and gas leasing. The conclusion and recommendations of the DNR as to the appropriate classification shall be based on an evaluation of the effects of oil and gas exploration and potential development would have on current and future uses of lands. DMA comments and concerns will be considered in the review process along with comments and concerns of the DNR divisions of Forest Management, Wildlife, Parks, Fisheries and others involved in the field review. Final field recommendations shall be made by the DNR Regional Director. All classifications are subject to DNR Commission approval.

The originating date of this Management Agreement is October 11, 1984.

Signature of Permittee

Title Dept of Military Affairs.

Ronald O. Skoog

Ronald O. Skoog, Director

In the matter of:

Sierra Club and Anglers of the Au Sable
on the permit issued to Harrietta-Grayling
Fish Hatch (Consolidated Cases)
NPDES Permit No. MI0059209

Petitioner Anglers of the Au Sable
Exhibit 242

Assessment of Economic Effects of Increased Production at the Grayling Trout Hatchery

November 23, 2015

Prepared by Frank Lupi, Ph.D.
1045 Whittier Dr.
East Lansing, MI 48823

Introduction

There are many effects that conduct under the NPDES permit issued to Harrietta Hills Trout Farm could have on the local economy and on the people that benefit from unimpaired quality of the Au Sable River. For example, increased phosphorus and possible increases in whirling disease threaten to decrease the amount of fish in the river. The degradations to water quality are also expected to increase algae.

The public interest: From an economic perspective, the public has an interest in natural resources because they provide people with well-being and hence provide economic values and support business activities. Some of these economic values are reflected in market transactions. These are called market values. Other values for natural resources are referred to as non-market values because they are for environmental goods or services not directly traded in markets. There is also a public and private distinction to be made.

For example, consider growing fish in a river for later sale. The value of the fish that are sold would be a privately captured market value whereas the value of public recreational uses of the river would be a nonmarket good (river use is not directly sold in a market and does not have a readily observed price). Economists and the public are familiar with the idea of values for market goods. The field of environmental and natural resource economics has developed well-established techniques for valuing non-market values for natural resources.

Types of economic values and impacts: This summary presents two distinct economic concepts that relate to the issue of impairments to the Au Sable: (1) economic impacts and (2) economic values. Economic impacts measure changes in regional economic activity such as economic output (e.g., sales), incomes, and jobs (Watson et al., 2007). Broadly speaking, economic values accrue to people and businesses and reflect their well-being net of their costs, whereas economic impacts are the total effects on the economy. Notably, the two types of economic measures are not always directly comparable (i.e., care is required if both types of measures are to be used in a benefit-cost analysis that is conducted following economic standards). However, both types are directly relevant to the permit at issue since they are standard approaches for measuring changes in public well-being (i.e., people's welfare) and measuring economic importance.

1. **Property values**:

Based on a Public Sector Consultants report (PSC, 2013), there are a large number of properties along the river (11%) and these properties hold a disproportionately large share of the total value of property in Crawford County (26%). Consequently, the properties pay a large relative share of property tax (11% of parcels pay 23% of property taxes).

It is well established in the real estate and economics literature that proximity to amenities, especially water, increases property values. Although no specific study is available to link water quality and fishing quality to property values surrounding the Au Sable River, such relationships are well known in the literature. For example, the literature on factors affecting property values routinely demonstrates the increased property values associated with proximity to lakes and rivers (Olmstead 2010; Muller 2009). The relationship between property values and water quality has also been widely documented (Leggett & Bockstael 2000; Michael et al, 2000; Epp and Al-Ani, 1979; Poor et al. 2007).

As a premier trout stream, the literature suggests that proximity and access to the river would influence property values, and hence any changes in the quality of the fishery would affect property values. Anecdotally, a search of rental properties along the river reveals that several dozen advertise their proximity to the Au Sable for its fishing, floating, and aesthetic offerings.

In sum, the published literature shows a range of impacts that water quality can have on property values, but it consistently shows that lower water quality adversely affects property values. Considering the value and economic significance of riparian property in Crawford County, taking percentage declines in property value from the existing literature that are on the low end of the published amounts and applying these percentage declines to affected properties would generate significant total reductions in property values due to lower water quality. Correspondingly, reductions in property value will reduce property tax receipts.

2. **Recreation**:

The increased pollution associated with the lowering of water quality is expected to have several effects, including increased phosphorus, increased dissolved solids, increased organic matter, increases in algae, and potential increases in whirling disease, among others. Any of these could have deleterious effects on water-based recreation. I focus in this section on the impacts of increased P on fishing followed by a discussion of the impacts of degraded water quality on water sports (canoeing, kayaking, and floating).

2.1 Recreational Fishing

The Au Sable River is a premier trout fishing destination and numerous businesses support the fishing-related activities. A decrease in water quality is expected to result in fewer trips, and hence a loss in economic value to the recreational anglers and a corresponding loss in economic impacts to the region. Table 1 summarizes my estimated losses for recreational fishing. The text that follows provides details of the derivations.

Table 1. Estimated high and low range of losses of recreational fishing days, lost value to anglers, and lost economic impacts associated with increased phosphorous in the Au Sable River.

	Fishing	
	Low*	High**
Days	17,425	45,291
Effect of pollution (% trip decline)	69%	69%
Lost days	11,981	31,142
Value per lost day	$20.70	$20.70
Lost value to recreation users	$248,022	$644,660
Spending per day	$82.75	$82.75
Lost Spending (direct)	$991,452	$2,576,988
Multiplier	1.78	1.78
Lost Economic Impact	$1,764,537	$4,586,397
Annual full-time jobs lost	14.6	37.9

* extrapolated from creel studies
** derived from NSFHWAR MI (2011) data combined with Klatt (2014)

Effect of Phosphorus on Fish:

The first step in connecting recreational fishing to phosphorus (P) is to relate fish abundance to P levels. Key sport fish in the East Branch and in the Au Sable River are Brook Trout and Brown Trout. Trout are known from the literature and from nutrient criteria for Michigan to be sensitive to high P levels (Stevenson et al, 2006). A recent peer-reviewed publication utilizes available data from the Michigan DNR's fish sampling stream surveys to develop statistical models of fish biomass in Michigan rivers. The amounts of fish are related to summer baseflow P loading. Models for brook and for brown trout confirm these species are particularly sensitive to small increases in P. Figure 1 shows graphs of the response of trout biomass to levels of P. As Esselman et al (2015) note, the decrease in brook trout biomass when µg/l TP increases from 13 to 20 was sharp and statistically significant ($P < 0.05$). Similarly, brown trout had a stress response to increased TP concentrations, with biomass showing a declining trend as TP concentrations increased.

Note from figure 1 the pronounced predicted decrease in both species' biomass as TP increases from 13 to 25 mg/l.

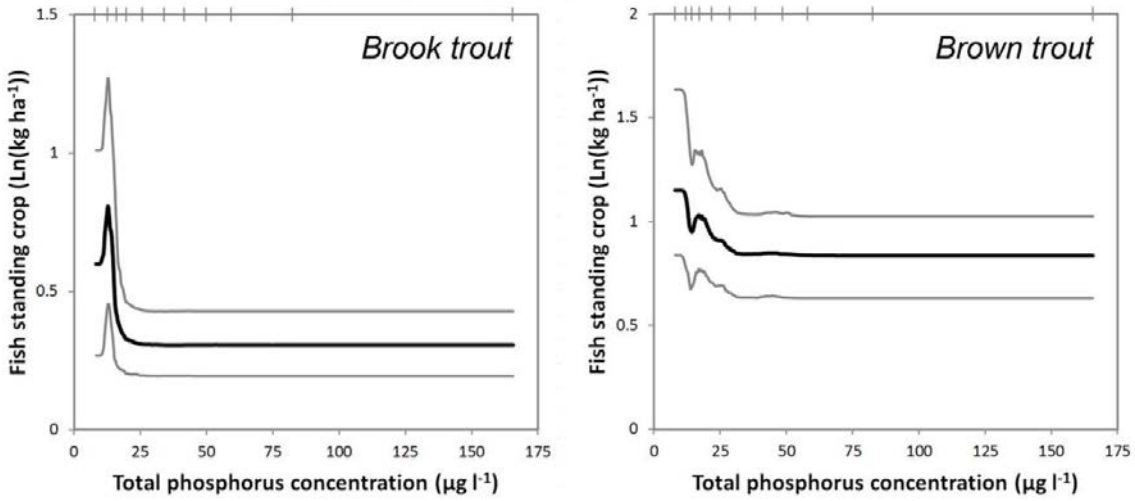

Figure 1. Plots showing the predicted response (black line) of target fisheries to total phosphorus concentrations with 95% confidence interval (gray lines). *[Excerpt from author's pre-publication copy of Figure 4, Esselman et al, 2015]*.

Linking Fishing Trips and Values to Fish Biomass:

The next step in connecting recreational fishing to phosphorus (P) is to relate fish biomass to the locations where recreational anglers choose to go fishing. This is done using an economic demand model. Such models are well-established methods for estimating the economic demand and values of users, and can relate both of these to the features of a site such as fish biomass. A recent peer-reviewed publication presents such a model for river fishing in Michigan (Melstrom et al, 2015). The model shows that biomass of brook and brown trout (as estimated by the Esselman et al biomass models) are significant predictors of where anglers go fishing (i.e., angler demand for fishing sites). Thus, reductions in fish biomass at a site will reduce trips to the site and will reduce the economic value anglers receive from fishing.

To proceed with the estimation of losses, we need estimates of the number of fishing trips in the baseline without any increase in P. Two separate estimates are derived to give an idea of the range of results. The first is derived from information in Table 27 of Zorn et al (2001), which reports average results from past creel studies of the Au Sable River from Grayling to Wakeley Bridge. For fishing, they report an average of 3290 hours per river mile. This can be expanded to days for the river segment by multiplying by the 14.3 miles of river in this segment and dividing by an estimate of hours fished per day. Studies of angling on other trout rivers report values of 1.7 hours per day in Wisconsin and 2.7 hours per trip in Pennsylvania. I also made calculations for hours per trips using Michigan DNR Creel data for the Au Sable just downstream of Mio (DNR 2015). Since that segment of the river is larger and includes a significant boat fishery, I used the shore fishing data, which across the four zones sampled averaged 2.68 hours per trip. Thus, to convert the hours to trips I used 2.7 hours per day. This translates into an estimated 17,425 days fished per year.

For comparison, I provide another approach to estimating the baseline number of trips. The U.S. Census provides bi-decadal surveys that estimate fishing in each state (NSFHWAR MI 2011). The data reveals an estimated 23.37 million fishing days in Michigan. Using data from Klatt (2104), 25% of fishing in Michigan is at rivers, and using data from Melstrom et al, 0.78% of river fishing in Michigan is to the affected stretch of the Au Sable. Combining these yields an estimated 45,291 days fished per year.

The Melstrom et al model is used to map changes in fish biomass into estimates of the lost number of fishing trips. Using the percentage changes in biomass derived from Figure 1 for a change in TP from 13 mg/l to 25 mg/l TP results in a predicted decline in trips to the upper portions of the Au Sable River and East Branch of 69%.

The Melstrom et al model is also used to derive the economic value to anglers of these lost trips. The estimate is that lost trips were worth $20.70 in net economic value to the anglers. Since this value is smaller than the values estimated in many other river fishing studies of economic value, the value can be considered conservative relative to the use of other studies.

Combining the lost trips with the value per day yields a total lost value to anglers of $248,022 to $644,660 depending on which estimate of baseline trips is used. Either way the losses are significant and are likely conservative since single day trip values are used in place of multiple day trip values.

Lost Economic Impacts:

In addition to the losses in economic values to the recreational anglers, the reduction in biomass has an associated loss of economic impacts due to the lost trips. To derive this, spending data for trout fishing in rivers comes from a survey conducted by Knoche (2014), which gives spending on trout fishing trips to rivers of $70 on single day trips and $278 on multiple day trips. These are converted to a day equivalent of $82.75 using information from Klatt (2014) on the statewide share of single and multiple day trips in Michigan. Note that this spending figure is for the portion of trip expenditures that occurs within 35 miles of the fishing site so it is a contribution to the local economy and does not include money spend outside the region.

The estimates of lost fishing days are combined with the spending per day to develop a range of lost spending. The literature provides a multiplier on fishing trip expenditures of 1.78 (Southwick 2007). Combining the lost spending with the multiplier yields a range of estimated economic impacts on the economy of about $1.7 to $4.6 million per year, depending on the baseline estimate of trips.

Note too that these are for impacts from tourists. Ninety-four percent of the anglers fishing this reach are from outside of Crawford County, with 74% being from other counties in Michigan, and 20% from other states and Canada (author's calculations from data in Gigliotti and Peyton, 1993). Moreover, most river fishing trips come from outside the local area of a fishing site; even for day trips 95% are from greater than 35 miles away from the fishing locations (author's calculations from data in Melstrom et al, 2015). The economic model in Melstrom et al (2015) does not include multiple day trips and does not include trips by non-residents. Thus, for visitors that are not Michigan residents, I assumed their trip lengths and spending per day is the same as for residents. This almost certainly underestimates spending and associated economic impacts given the greater distances these people would need to travel and the usual observation that people that travel farther distances tend to spend more time on-site and spend more; data suggests that 20% of the fishing trips to this part of the river are made by non-residents (author's calculations from data on page 494, Gigliotti and Peyton, 1993). Thus failing to account for these added on-resident expenditures leads to smaller estimated economic impacts.

In summary, recreational fishing is expected to be affected by degradation in water quality with increased P and thereby decreased brook and brown trout biomass. Two estimates of baseline trips for the Au Sable were used to derive estimates of losses in economic value *to recreational anglers* of about $250,000 to $645,000 per year and *lost impacts to the regional economy* of about $1.77 to $4.6 million per year.

2.2 Water Sports: Canoeing, Kayaking, Floating

The Au Sable River is a desired destination for water sports and numerous businesses support these activities. A decrease in water quality is expected to result in fewer trips and hence a loss in economic value to the recreational users and a corresponding loss in economic impacts to the region. Table 2 summarizes my estimated losses for water sports. The text that follows proves details of the derivations.

Table 2. Estimated losses of recreational watersports days, lost value to recreational users, and lost economic impacts associated with decreased water quality in the Au Sable River.

	Watersports
Days	31,460
Effect of pollution (% trip decline)	50%
Lost days	16,359
Value per lost day	$25.81
Lost value to recreation users	$422,173
Spending per day	$37.87
Lost Spending (direct)	$619,481
Multiplier	1.42
Lost Economic Impact	$879,664
Annual full-time jobs lost	12.1

This section provides the details of the derivations in Table 2 for watersports.

Lost Value for the Users:
The literature reports values per trip for canoeing of $20 to $50 dollars per day in 2015 dollars (Boxall et al 1996; Englin et al, 1996). Another study yields values per trip of $25.81 in 2015 dollars for boating activities that include canoeing, kayaking, floating and tubing (Parsons et al, 2004). The latter study is most appropriate for our application since it better matches the range of activities on the Au Sable and it also relates trips to levels of water quality. The study used three water quality levels: high, medium and low, where high water quality was characterized by high levels of dissolved oxygen and low levels of suspended solids. In their study, a change in water quality reduces the value of a trip by about 50%. They do not report demand elasticities (i.e., how trips respond to quality changes), but in my experience they tend to be proportional to value changes. Thus, the trip change that corresponds with this change in value is a 50% reduction in trips. Table 1 uses the Parsons

et al (2004) value per day and trip response. This is the best matching estimate from the literature on how water-sports would change in response to a change in water quality similar to that expected in the Au Sable.

The baseline trips in Table 1 are derived from information in Table 27 of Zorn et al (2001), which reports average results from past creel studies of the Au Sable River from Grayling to Wakeley Bridge. For pleasure boating (canoeing, kayaking, and floating), they report an average of 8800 hours per mile. This can be expanded to days for the river segment by multiplying by the 14.3 miles of river in this segment and assuming 4 hours per day. The result is an estimated 31,460 days.

Combining the estimated baseline days for water sports with the 50% reduction in trips yields 16,359 lost trips. The resulting lost benefits to recreational users are about $422,000. This is my best estimate of the economic costs incurred by those engaging in water sports due to a reduction of water quality on this segment of the Au Sable River from a high level to a medium level of water quality.

Lost Economic Impacts:

In addition to the losses in economic values to the recreational users, the reduction in water quality has an associated loss of economic impacts due to the lost trips. To derive this, estimates of spending per day are computed from available literature. Using data from Stynes for canoeing in Michigan, I derive a spending per day of $37.87. This is computed by converting Stynes' estimate for spending per party per trip into a spending per day and applying his reduction for trips that are not for the primary purpose of canoeing and excluding the portion of spending that is not in the area of the site. This result is in the range of estimates from other states, if not lower. In a multi-state study, Southwick and Bergstrom (2007) report paddle-sport spending of $60 per person per day trip, and Pollock et al (2007) report expenditures of $25 for day visitors and $186 for overnight visitors.

To get the relevant multiplier to convert spending changes into total changes in economic impact, I also rely on Stynes, whose results imply a multiplier of 1.42, which is consistent with the multiplier for canoeing of 1.5 that can be derived from Southwick (2012).

Note too that for the watersport recreational uses of the river, we can infer that, like fishing, the vast majority of visitors are non-locals. In a study on the Manistee River, MI, Nelson and Valentine (2002) found about 93% of those camping and 86% of others visiting the river were from outside their 3-county study area. Similarly, data from a national study of river recreation shows that for 75% of trips the primary purpose for visiting was using the river and that 85% of visits were from 35 miles away or more (Cole 2014).

In summary, water sports of canoeing, kayaking and floating are expected to be affected by degradation in water quality. The best matching study from the literature was applied to trip information for the Au Sable to derive estimates of losses in economic value to watersport recreation users of about $422,000 per year and lost impacts to the regional economy of about $880,000 per year. Alternative ways of linking algae or other water quality declines to this recreational activity might yield different results for predicted lost

trips, but the values at risk are well aligned with what is found in the literature on recreational values and impacts.

2.3. Other pathways of effects on recreation

Above, evidence was presented on likely effects decreased water quality would have on recreational fishing and on water sports. There are other pathways of possible effects that have not yet been quantified. For example, the increased pollution could lead to increased whirling disease in trout, which is known to adversely affect trout populations. It was established above that decreased trout biomass can have significant affects on trips, angler wellbeing, and the local economy. While this potential also exists via whirling disease, estimates of economic effects would require linking the increased risk of disease to risks of biomass declines. Though not quantified, the risk remains.

3. Other economic effects

There are a variety of other ways that reduced water quality in the Au Sable River can harm the public interest and affect well-being. Better documentation of these is an area of ongoing investigation. An example of as yet undocumented harms would be trail uses and camping along the Au Sable. Not all visitors engage in the recreation activates examined above. Some of these visitors would be adversely affected by reductions in water quality and increases in algae.

Another area of possible harm that this report has not attempted to quantify are the non-use values Michigan citizens might have for natural resource quality of the Au Sable. For example, members of the public that will likely never make use of the resource might still have a willingness to pay to avoid any degradation in a renowned pristine river. Such nonuse values are valid for natural resource damage assessment cases (e.g., in oil spill damage recoveries) and are recognized as appropriate for inclusion in Federal benefit-cost analyses (BCA) that follow Office of Management and Budget economic guidelines for BCA.

4. **Anti-degradation**:

The Antidegradation Demonstration of the permittee and the associated Responsiveness Summary claim that a lowering of water quality is necessary to support important social and economic development in the area. The documents mention types of benefits which I paraphrase and regroup as follows:

A. Economic contributions from fish production: Preserve current employment and economic activity and allow increases (possibly 2 full time and two part time positions), allow for increases in related businesses, and help supply demands of Michigan food industry for Michigan-branded product.

B. Hatchery tourism: Maintaining the summer tourism and interpretation center, increased rate of tourism since permittee began managing the facility, preserving the associated local expenditures of tourism visits.

C. Youth exposure to fishing: Introducing children to fishing which might ultimately increase license sales and contribute to the fishing industry.

D. Abandonment and preservation: Prevent the facility from being abandoned and preserve the improvements that were made.

I will discuss these items in turn.

A. Economic contributions from fish production:

The economic contributions likely to stem from production expansion are uncertain and likely to be small for many reasons.

First, as noted in the antidegradation documentation, the expansion will add few jobs to the regional economy and the bulk of the economic gains from the use of the public resource will accrue to a handful of private individuals.

Second, the size of the likely amount of economic activity related to the expanded facility will depend in part on its profitability, which depends in turn on the prices it can receive for trout. It appears from the company's website and sales of fish caught on site that the prices currently received for their trout are significantly above the national prices. This likely reflects the niche markets in which the products are being sold, but such prices are more difficult to sustain with larger production volumes because the national prices for trout filets are low. For example, the National Agricultural Statistics Service of USDA maintains a well-regraded and reliable database on regional and national agricultural production and prices. The average national average prices for trout were $1.08 in 2005 and $1.63 in the 2013 (NASS 2015). However, the NASS database also reports a lone price of $3.39 specific to Michigan for 2013. It is possible that Michigan prices in NASS reflect niche markets (otherwise we would expect them to converge on the national price levels) and because the

2013 NASS data indicate only 13 Michigan producers reporting sales of trout for food fish (only 171,000 pounds were reported sold by Michigan producers out of 58 million pounds nationally). One possibility is that the trends in consumer preferences for local foods could be exploited to maintain prices above the national average (as alluded to in the Responsiveness Summary), but the possibility of capturing a price premium for being locally grown must be weighed against risks to this branding and pricing strategy that result from consumer awareness of the harms from expanded operations. Thus, it is unlikely higher prices can be sustained that are significantly above the national average at dramatically larger production volumes, especially in light of the small role Michigan suppliers play in this food chain. Lower retail prices for the increased production will dampen profitability and reduce any impacts on the broader regional economy.

Third, a recent peer-reviewed study has shown a limited market for fresh trout grown in the Midwest. Specifically, the published study shows limited local retailer willingness to pay any price premium for Midwestern (fresh on ice) fish, further suggesting the market may not support a price well above the national average. The study found 57% of retailers would not pay a price premium for fresh trout and the resulting overall mean price premium for was $0.29 for Midwestern-grown fresh trout. The study concludes there "is no room" to capture price premiums from retailers for fresh trout from Midwestern producers (Gvillo et al. 2013).

Thus, expanded production is likely to be beneficial for a few people and several connected businesses, but the above factors suggest the overall economic impacts for the broader community are likely limited.

B. Hatchery tourism:

The tourism impact of hatchery is likely limited. Why?

Regarding the above mentioned benefits of preserving the benefits of tourism visits, I begin by setting aside questions about the size of these benefits and consider the following question: Is an increase in production (a lowering in water quality) necessary to support these benefits? The antidegradation argument suggests that the only way to maintain any such benefits is to increase production (lower water quality). To the extent there are some tourism benefits to the local economy (and some benefits from introducing youth to angling), these benefits exist equally at the current production levels and at the proposed higher productions levels. Providing these benefits does not require expanded production and the accompanying pollution.

Second, public representatives have determined these tourism benefits are not worth it. News reports suggest the county was losing money operating the facility to produce these benefits, thereby suggesting that from the perspective of Crawford County administrators, the contributions the facility makes to Crawford County are not worth the costs of operating the facility. Regardless, if these benefits were deemed to be significant enough to warrant sustaining them, then there should be a willingness to pay to provide them from some source, and they can be provided without added pollution.

Third, the economic impact of the hatchery "tourism" is likely small. All else being equal, economic impacts from tourism will be larger for activities that attract non-local visitors who bring "outside" dollars into the community. To fully assess this would require data on the origins of the clientele of the fish farm, and data for the non-local visitors on their spending patterns, length of stay in the community, and primary purpose for their visits. However, given experiences with other types for recreation, I expect that for hatchery a nontrivial portion of visits are from local residents, and experts agree that local residents should be excluded from properly conducted economic impact analyses of tourism as their visits do not bringing new money into the region. Moreover, the activities at the hatchery, e.g., fish feeding or catching fish at the hatchery, are unlikely to be the primary purpose for a large number of visitors from outside of the Grayling area. For example, the downtown market plan notes that many visitors to Grayling "usually continue on to other attractions in Traverse City, Mackinac Island, or the Upper Peninsula" (p48, Vokes et al, 2004). Similarly, most of the visits to the hatchery likely constitute what tourism economists sometimes consider "stopover" or "side-trip" visits, that is, visits that are "along the way" or are part of a trip with another primary purpose. As such, only a small portion of the spending for these trips counts as a net economic impact to the area. (Alternatively, fishing and canoeing/floating are almost all non-local visitors and mainly for the primary purpose of that activity, so most of the spending factors into net economic impacts.)

C. Youth exposure to fishing:

The argument in the documents was that the hatchery introduces children to fishing, which might ultimately increase license sales and contribute to the fishing industry. As above, this may well be a benefit of hatchery visitation, but this benefit can be provided without expanding production and degrading water quality.

Note too that one could make a comparable argument associated with impairments to the fishery. That is, due to the degradation of water quality which affects fishing success and results in fewer trips, there will likely be (1) reduced purchases of fishing gear and reduced license sales from some current anglers, and (2) reduced exposure of youth to angling thereby reducing future license sales and fishing expenditures. In the above documented potential economic impacts due to decreased fishing, such impacts were not included (only the trip-spending in the vicinity of fishing sites was used to determine impacts).

Thus, while this type of future beneficial effect of exposing youth to fishing is possible as an outcome of hatchery visitation, I expect it is easily outweighed by the effect decreased water quality has on drop-off of current anglers (1 above) or future anglers (2 above).

D. Abandonment and preservation:

The point that was made here was that increased production would prevent the facility from being abandoned and preserve the improvements that were made. As with some of the other anti-degradation arguments, there would be other ways to accomplish this. Regarding

the preservation of improvements, while understandable, economists typically calculate benefits and costs with respect to current and future actions. Effort and money spent to make these improvements are not irrelevant, but they are considered sunk costs (costs that were already incurred). From the standpoint of making more efficient current and future decisions, sunk costs are typically excluded.

5. Conclusions

The available evidence and related economics literature suggests that with increased production by the permittee there is the potential for significant losses to recreational anglers, to those engaged in recreational water sports, and to riparian and nearby property owners. In addition, associated reductions in trips would significantly affect the local economy. Alternatively, the likely economic impacts of the fish farm are modest relative to the likely costs. Many of the benefits laid out in the antidegradation documents can be sustained without altering the production amounts or increasing pollution. As such, the benefits of increased production accrue to a few people and businesses, whereas a comparatively large and dispersed number of others will bear the costs of reduced water quality.

I reserve the right to revise this report.

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Frank Lupi, Ph.D.

References

Boxall, Peter C., David O. Watson, Jeffrey Englin, Backcountry recreationists' valuation of forest and park management features in wilderness parks of the western Canadian Shield, Canadian Journal of Forest Research, 1996, 26(6): 982-990.

Cole, David N. 2014. National river recreation study data: a nationwide survey of river recreation use from 1977-1984. Fort Collins, CO: Forest Service Research Data Archive. http://dx.doi.org/10.2737/RDS-2014-0007

DNR 2015, Survey Report for AuSable, , Summer, 2009, Accessed Nov 8, 2015. http://www.michigan.gov/documents/dnr/AuSable_455438_7.pdf.

Englin, J. and P. Boxall, K. Chakraborty, and D. Watson. 1996. "Valuing the Impacts of Forest Fires on Backcountry Forest Recreation." Forest Science. 42:450-455

Epp, D.J., and KS Al-Ani, 1979. The effect of water quality on rural nonfarm residential property values. American Journal of Agricultural Economics.

Esselman, P., R. Stevenson, F. Lupi, C. Riseng, M Wiley. 2015. Landscape prediction and mapping of game fish biomass, an ecosystem service of Michigan rivers. *N. Amer. J. of Fish. Mgmt*. 35:302-320

Gvillo, R., K. Quagrainie, N. Olynk, and J. Dennis. 2013. Are Midwestern fish retailers willing to pay more for regionally grown fresh-on-ice fish? Agricultural Sciences 4(6A):39-45.

Klatt, Jessica, 2014. Linked Participation-Site Choice Models of Recreational Fishing, M.S. Thesis, MSU. East Lansing, MI.

Knoche, Scott, 2014. Discrete Choice Models of Hunting and Fishing in Michigan, Ph.D. Dissertaiton, MSU. East Lansing, MI.

Leggett, C., and N. Bockstael. 2000. Evidence of the effects of water quality on residential land prices. Journal of Environmental Economics and Management 39:121–44.

Melstrom, R., F. Lupi, P. Esselman, R.J. Stevenson. 2015. Valuing recreational fishing quality at rivers and streams. *Water Resources Research*, *51*, 140–150.

Michael, H. J., K. J. Boyle, and R. Bouchard. 2000. Does the Measurement of Environmental Quality Affect Implicit Prices Estimated from Hedonic Models? Land Economics 76:283-298.

Nelson, C., and B. Valentine, 2002. Assessing River Recreation Use and Perceptions of Environmental Quality Trends on Michigan's Upper Manistee River, Proceedings of the 2002 Northeastern Recreation Research Symposium, GTR-NE-302. Pages 286-290.

NSFHWAR MI 2011, U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Parsons, George R., Eric C. Helm, and Tim Bondelid. 2003. "Measuring the Economic Benefits of Water Quality Improvements to Recreational Users in Six Northeastern States: An Application of the Random Utility Maximization Model" University of Delaware Manuscript. https://rti.org/pubs/Parsons_12_02.pdf

Pollock et al, 2007. The Northern Forest Canoe Trail: Economic Impacts and Implications for Sustainable Community Development.

Poor, J., K.L. Pessagno, and R.W. Paul. 2007. Exploring the hedonic value of ambient water quality: A local watershed-based study, Ecological Economics, 60:797-806.

PSC. 2013. Northern Michigan Property Values: The Significance of Riverfront Properties. Prepared by Public Sector Consultants, Lansing MI.

Southwick Associates. 2007. Sportfishing in America: An Economic Engine and Conservation Powerhouse (American Sportfishing Association). Available at http://www.southwickassociates.com/wp-content/uploads/2011/10/sportfishiginamerica_2007.pdf.

Southwick, R. and J. Bergstrom, 2007. State-Level Economic Contributions of Active Outdoor Recreation – Technical Report on Methods and Findings, Prepared by Southwick Associates, Inc. Fernando Beach, FL.

Southwick, R., 2012. Economic Contributions of Outdoor Recreation on the Colorado River & Its Tributaries, Prepared by Southwick Associates, Inc. Fernando Beach, FL. http://protectflows.com/wp-content/uploads/2013/09/Colorado-River-Recreational-Economic-Impacts-Southwick-Associates-5-3-12_2.pdf

Stevenson et al, 2006. Chart, Total Phosphorus Thresholds (Response Factors) Summary for Michigan. Annex 1 below.

Vokes, Sharon M., Christine A. LeNet, and Vladimir Hlasny. 2004. Downtown Market Study. Anderson Economic Group, Lansing, MI.

Watson et al., 2007. Determining Economic Contributions and Impacts: What is the difference and why do we care? JRAP 37(2):1-15.

Zorn, T. G., and S. P. Sendek. 2001. Au Sable River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report 26, Ann Arbor, Michigan

Annex 1.

Stevenson et al, 2006

Annex 2.

Esselman et al. 2015

Annex 3.

Melstrom et al. 2015

Total Phosphorus Thresholds (Response Factors) Summary for Michigan [Stevenson et al. (1/19/2006)]

Database	Parameter	TP (ug/l) Threshold	
SAIN-MI	Diatom similarity to reference decreases	10	Low
SAIN-MI	Invert # Tolerant Taxa Increases	10	Low
SAIN-MI	% Sensitive Diatom Indicator drops	15	Low
SAIN-MI	Chlorophyll a increases	15	Low
MRI Data	Trout and cold water fish diversity decreases	15	Low
SAIN-MI	Non-native algal (individuals and taxa) increase	15	Low
SAIN-MI	Invertebrate similarity to reference decreases	15	Low
SAIN-MI	Cladophera cover increases	20	Low
MRI Data	Many fish metrics decrease	20	Low
MRI Data	Sculpin taxa decrease	20	Low
SAIN-MI	Cladophera cover jumps (increases)	30	Medium
SAIN-MI	Sensitive algal taxa drop	30	Medium
SAIN-MI	Invert # Sensitive Taxa decrease	30	Medium
MRI Data	Intolerant fish taxa decrease	30	Medium
MRI Data	Darter taxa decrease	30	Medium
SAIN-MI	Diatoms escape grazing	40	Medium
MRI Data	All and native fish taxa decrease	40	Medium
MRI Data	Moderately tolerant fish taxa decrease	40	Medium
MRI Data	Fish IBI I and II decrease	40	Medium
ILWIMI	Dissolve oxygen decreases	40	Medium
STORET	Water column chlorophyll a increases	45	Medium
STORET	Invertebrate EPT metrics and P51 decrease	>50	High
MRI Data	Cool/Warm Water fish taxa decrease	60	High
MRI Data	Increasing loss of many fish	60	High
MRI Data	Minimum restoration target for fish	80	High

AGU PUBLICATIONS

Water Resources Research

RESEARCH ARTICLE

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Valuing recreational fishing quality at rivers and streams

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Key Points:
- Demand was modeled for recreational fishing to rivers and streams
- Fishing site qualities were measured by biomass of five game fish species
- Fishing sites were defined by hydrological boundaries and stream type

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Abstract This paper describes an economic model that links the demand for recreational stream fishing to fish biomass. Useful measures of fishing quality are often difficult to obtain. In the past, economists have linked the demand for fishing sites to species presence-absence indicators or average self-reported catch rates. The demand model presented here takes advantage of a unique data set of statewide biomass estimates for several popular game fish species in Michigan, including trout, bass and walleye. These data are combined with fishing trip information from a 2008–2010 survey of Michigan anglers in order to estimate a demand model. Fishing sites are defined by hydrologic unit boundaries and information on fish assemblages so that each site corresponds to the area of a small subwatershed, about 100–200 square miles in size. The random utility model choice set includes nearly all fishable streams in the state. The results indicate a significant relationship between the site choice behavior of anglers and the biomass of certain species. Anglers are more likely to visit streams in watersheds high in fish abundance, particularly for brook trout and walleye. The paper includes estimates of the economic value of several quality change and site loss scenarios.

1. Introduction

Fishing at rivers and streams is a major recreational activity in the United States, with nearly 12 million participants in 2011 [*U.S. Fish and Wildlife Service (USFWS)*, 2012]. Rivers also support swimming, paddling and boating activities, provide ecosystem services such as spawning habitat for marine fishes, and are a source of substantial nonuse value [*Sanders et al*., 1990; *Loomis*, 2003; *Debnath et al*., 2014]. However, rivers and streams are susceptible to landscape and climate change, and the value of these resources is frequently impaired by human activity [*Allan*, 2004; *Suplee et al*., 2012; *Ficklin et al*., 2013]. A comparison of water quality indicators in the United States over the past decade indicates a significant decline in stream condition, predominantly in the Midwest and Plains regions [*U.S. Environmental Protection Agency (USEPA)*, 2013]. Stream anglers in particular will be sensitive to these changes, which directly affect valuable stream characteristics such as the biomass of game fish species.

The economic effects of watershed changes on stream anglers and other users can be measured with nonmarket valuation techniques. The random utility maximization (RUM) model is now a common means of estimating values for the recreational use of natural resources. In a recreational angling context, the RUM model explains the choice of fishing trip to a site among a set of many possible alternatives. By describing choice as a function of site characteristics, a RUM model is capable of predicting the monetary benefits or damages that will arise from changes in the environmental quality of sites [*Haab and McConnell*, 2003]. Below, we describe a RUM model of recreational fishing that can be used to value detailed changes in fish abundance and stream quality.

Identifying the influence of fishing quality on site choice can be challenging. Data on appropriate measures (e.g., fish abundance, catch and harvest) are often not available or are difficult to obtain for most sites. Several prior studies of stream fishing have addressed this problem by using proxies for fishing quality [*Jones and Lupi*, 2000] and presence-absence indicators [*Hunt et al*., 2007]. Many others have elected to use anglers' self-reported catch rates, averaged by site (Table 1). These methods are less than ideal: proxies provide few insights into fishing quality, presence-absence indicators only capture discrete changes and some types of catch rate measures are prone to measurement error and estimation bias in the demand model

Table 1. Stream Angling RUM Model Studies

Authors and Year	Study Area	Site Definition	Selected Site Quality Variables
Hunt et al. [2007]	Ontario lakes and rivers	Known access points	Species-specific presence-absence indicator, walleye and trout catch rates (from observed trips)
Ji et al. [2014]	Iowa rivers	River segments	Fish presence index, water quality index, land use measures
Jakus et al. [1998]	Tennessee reservoirs	Reservoirs	Total catch rate (from observed trips) fish advisory indicator
Jones and Lupi [2000]	Michigan lakes and rivers	Counties	Species-specific catch rates at Great Lakes (from creel data), stream type indicators, landscape characteristics
Lin et al. [1996]	Willamette River basin	Four river segments	Fishing quality index, congestion
MacNair and Cox [2000]	Montana lakes and rivers	River segments and lakes	Total species biomass, restricted species, site size
Morey et al. [1993]	North Atlantic salmon rivers	Maine rivers and Canadian provinces	Total catch rate (from observed trips)
Morey and Waldman [1998]	Montana rivers	River segments	Total catch rate (from observed trips)
Morey et al. [2002]	Clark Fork River basin	River segments	Total catch rate (from observed trips), site size
Murdock [2006]	Wisconsin lakes and rivers	Rivers grouped by quadrangles and lakes	Species-specific catch rates (from observed trips), boating facilities, landscape characteristics
Parsons and Hauber [1998]	Maine lakes and rivers	River segments and lakes	Salmon presence-absence indicator, water toxicity
Peters et al. [1995]	Alberta lakes and rivers	River segments and lakes	Total and trout-specific catch rates (from observed trips), water quality index, site size
Phaneuf [2002]	North Carolina lakes and rivers	Subbasin watersheds	Phosphorous, dissolved oxygen, ammonia, acidity indexes
Train [1998]	Montana rivers	River segments	Total species biomass, restrictedspecies, site size
Von Haefen [2003]	Susquehanna River basin	Sub-subbasin watersheds	Trophic state index, dissolved oxygen index

[*Morey and Waldman*, 1998; *Train and McFadden*, 2000]. Furthermore, many of the catch rate measures employed in the literature are not designed to distinguish between fish species, although there is evidence that the impact of fishing quality on site choice is species-specific [*Peters et al*., 1995; *Murdock*, 2006].

Another challenge in modeling the demand for stream fishing is determining what constitutes a fishing site. There is not yet a consensus in the literature on the site definition for stream fishing (Table 1), although it is generally recognized that large individual sites tend to be heterogeneous in site quality, suggesting that using small sites will result in a better model [*Lupi and Feather*, 1998]. Indeed, there does appear to be a trend toward more refined site definitions. For example, *Morey et al*. [1993] used rivers, *Parsons and Hauber* [1998] used river segments and *Hunt et al*. [2007] used river access points as sites. Several papers have also used hydrological boundaries to assist in defining sites [*Phaneuf*, 2002; *Von Haefen*, 2003].

This paper presents a site choice model of stream fishing using species-specific biomasses as measures of fishing quality. The biomass data come from biological stream surveys, i.e., a form of fisheries-independent data, which are generally preferred to self-reported angler catch rates, a form of fisheries-dependent data which can vary based on angler skill and gear [*Maunder and Punt*, 2004]. Fishery-independent biomass estimates are well suited to capturing relative differences in abundance across freshwater streams [*Hayes et al*., 2007]. To date, biomass measures are rarely employed in models of stream fishing (*Train* [1998] is an exception), even though catch rates directly relate to biomass [*Clark*, 1990]. Our data are also unique in that they include several different species-specific measures of biomass rather than a single composite measure.

Valuation of recreational fishing is a key component in the science of river restoration. By including species-specific biomass, the site choice model can be used to value detailed and diverse changes in fishing quality—e.g., abundance increases for some species but decreases for others, as might be expected under a climate change scenario, under management changes that alter hydrology, or as a consequence of ecosystem restoration [*Meyer et al*., 1999; *Bond and Lake*, 2003; *Palmer and Bernhardt*, 2006]. Communicating the role that restored ecosystem services have on individual and social benefits can have a significant impact on ecosystem management decisions, especially when there is conflict over which services a river system or watershed should support [*Wohl et al*., 2005]. Valuation is especially useful if benefits can be measurably related to riparian landscape and habitat conditions that drive fishing quality, which is a major motivation for the fish biomass data used in the angler model below.

Table 2. Fishing Trip Characteristics

Characteristic	Mean
Restricted license[a]	0.397
Fished in spring[b]	0.292
Fished in summer	0.321
Fished in fall	0.341
Targeted trout[c]	0.395
Targeted bass	0.314
Targeted panfishes	0.272
Targeted walleye	0.176
Targeted other fishes	0.267
Did not target particular species	0.179

[a]Anglers have about a dozen different fishing license options in Michigan but there are two basic types: restricted licenses and all-species licenses. Restricted licenses permit fishing for all species except trout, salmon, lake sturgeon, lake herring, amphibians, reptiles and crustaceans. Typical sales consist of about 60% restricted and 40% all-species licenses.

[b]Spring: March–May. Summer: June–August. Fall: September–November. Approximately 4% of sample trips were taken in an unspecified month.

[c]A trip could have targeted more than one species group.

Our model makes several further contributions to the literature. Hydrological boundaries are used to construct the choice set in which fishing sites are classified at the subwatershed level. Additionally, many of the largest subwatersheds are broken down into two sites using information on site characteristics that relate to fish assemblages. This advances the trend in the literature to further refine fishing site definitions. To account for the role of latent fishing site characteristics, the variant of the model presented here includes site fixed effects (sometimes referred to as alternative specific constants). The model is applied to stream fishing in Michigan and the results are used to estimate the economic benefits of several hypothetical improvements in fishing quality.

2. Methods

2.1. Fishing Trip Data

We use data from the Michigan Recreational Angler Survey (MRAS), a mail survey that has been administered monthly to a random sample of Michigan fishing license holders since July 2008. The survey questionnaire inquires about the two most recent fishing trips and the household characteristics of anglers. The response rate is approximately 47%. Details of the MRAS survey instrument can be found in *Simoes* [2009]. The questionnaire includes the usual questions about demographics and economic status, including household income. Data from the MRAS available for our analysis include the responses from 2008 through the 2010 survey period. We focus on the subsample of day trips that respondents reported were for the purpose of fishing a river or stream and were within 200 miles of an angler's home. We dropped trips taken in December–February because these would have visited a distinct subgroup of sites, e.g., frozen impoundments. These refinements yielded a total of 2064 trips taken by 1591 anglers (some anglers reported only their most recent trip or a second trip that did not fall into the defined subsample). Relevant descriptive statistics of this sample are consistent with our expectations (Table 2), in that the most popular months for fishing are in the summer and fall. Approximately 40% of the stream trips are taken by anglers with a restricted license (which means they are not allowed to fish for trout). About 60% of the licenses sold in the state are restricted, so the data for stream fishing trips reflect the increased emphasis stream anglers place on trout.

We use hydrologic units to define the set of possible fishing destinations. A hydrologic unit defines an area of land with a common drainage outlet point (e.g., a river mouth). The U.S. Geological Survey and U.S. Department of Agriculture has divided the United States into nested hydrologic units that are classified within a six-level hierarchy, where each unit is identified by a "HUC" code consisting of two to twelve digits based on the position of a unit within the system [*U.S. Geological Survey (USGS) and U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS)*, 2012]. At the top level of classification are 2-digit HUCs representing the major national river drainage regions, such as the Great Lakes. Each region then consists of several subregions (HUC4) that nest perfectly within them, with additional 6, 8, 10, and 12-digit nested units defined at progressively finer spatial resolutions. We initially distinguished fishing destinations at the level of the 10-digit HUC, which produced a tentative choice set of 258 watershed units (Figure 1). Fishable river reaches were defined within these units so that reach-level summaries of fisheries biomass and other covariates (described below) could be summarized without accounting for unfished headwater streams. A fishable reach was defined as a stream segment in the 1:100,000-scale National Hydrography Dataset (NHD) [*US Environmental Protection Agency (USEPA) and US Geological Survey (USGS)*, 2005] with an upstream catchment area greater than or equal to 50 km^2. Ninety seven percent of reported river fishing sites in the MRAS that could be matched to a specific reach fall within this cutoff.

A further refinement of the site definition was made to reduce heterogeneity of stream types within a watershed. Distinctive fish assemblages are associated with warm water and cold water habitats in Michigan on the basis of the fisheries they support [*Wehrly et al.*, 2006; *Zorn et al.*, 2011]. The NHD stream reaches

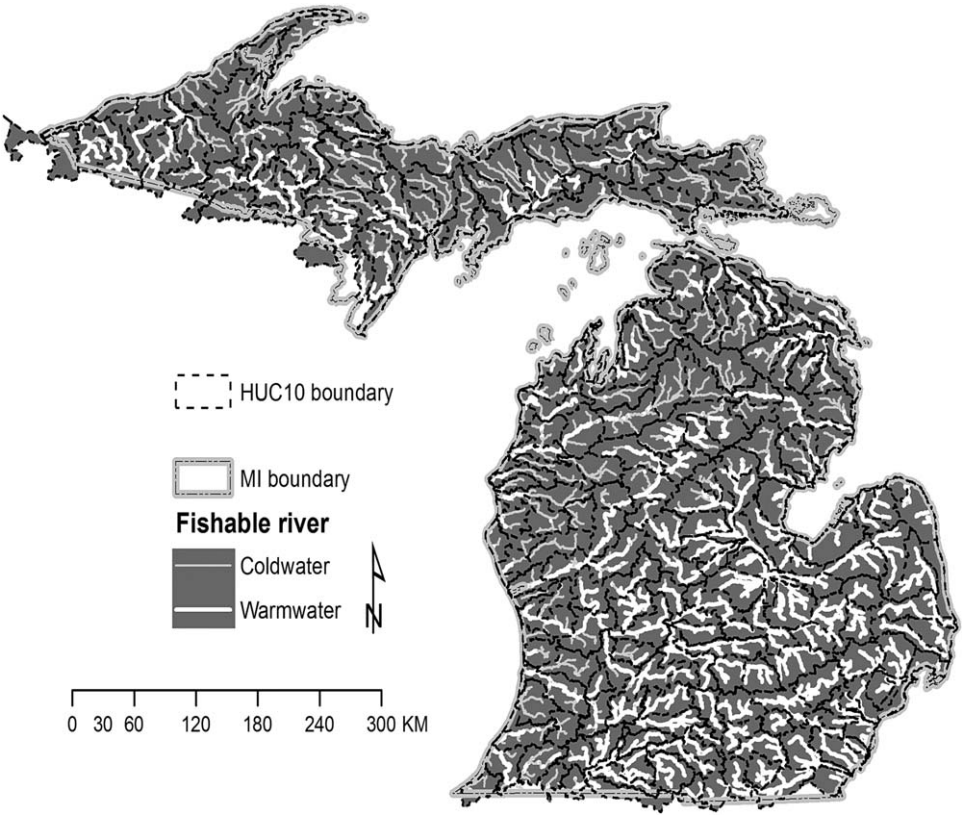

Figure 1. Fishable rivers and streams in Michigan with hydrological boundaries.

within each watershed were classified as cold water or warm water using a July mean temperature of 19.5° C as a cutoff [*Zorn et al*., 2009]. A small watershed might only contain warm water streams and would therefore consist of a single, warm water fishable alternative, while a large watershed might contain both warm water (e.g., downstream) and cold water (e.g., upstream) reaches and would consist of two alternatives in each stream class. This refinement resulted in 408 fishable alternatives—the sites in the RUM model. Trip destinations were matched to sites based on the stream name, county and/or nearest city reported by the angler.

Although our river fishing model has a very large choice set with a broad range of fishing options, it does not include fishing at other waters such as the Great Lakes and inland lakes. This decision was made to maintain a tractable model but also because we know that for certain anglers (e.g., brook trout anglers) there are no feasible alternative water body types in Michigan. Moreover, prior research with models covering a statewide scale has demonstrated that for many changes in quality of site access there is a relatively small degree of substitution between fishing in different water body types in Michigan [*Jones and Lupi*, 2000; *Kotchen et al*., 2006]. Thus, the insights from our model are likely to be accurate as long as they are interpreted in the context of the relevant population (in this case, only stream anglers) [*Jones and Lupi*, 2000; *Parsons et al*., 2000].

Travel costs were calculated from travel distances, angler characteristics and gasoline prices. Travel distances from the centroid of an angler's home zip code to the centroid of each fishable alternative were estimated using the PC*Miler program [*ALK*]. The midpoint of an angler's income category from one of six possible categories on the questionnaire or, for anglers who omitted a response, the census-reported zip code median income was used as a measure of income. We then used one third of an angler's income divided by 2000 to proxy for the opportunity cost of travel time [*Parsons*, 2003]. Per-mile driving costs were computed from Michigan monthly retail gasoline prices (per gallon) [see *US Energy Information Administration (EIA)*, 2012] divided by the average per-gallon fuel economy for light vehicles in the year of the trip, plus per-mile maintenance and depreciation costs gathered from AAA reports. For undated trips we used the 2007–2010 average gasoline price and fuel economy. This yielded an average per-mile cost of fuel,

Table 3. Fish Biomass Estimates Across Fishable Alternatives[a]

Species	Min	Median	Mean	Max	% Occupied[b]
Brook trout	0.00	0.00	0.48	6.78	39
Brown trout	0.00	0.05	2.38	32.42	54
Smallmouth bass	0.00	0.00	0.62	9.60	49
Panfishes	0.00	1.98	3.67	292.66	83
Walleye	0.00	0.00	0.09	1.59	46

[a]These refer to the untargeted biomass estimated from *Esselman et al*. [2014].
[b]This is the percentage of sites that are predicted to have a positive amount of biomass for each species.

maintenance and depreciation of $0.40. Finally, travel costs were calculated as round-trip distance in miles times per mile fuel, maintenance and depreciation costs plus the opportunity cost of travel assuming an average driving speed of 45 miles per hour.

2.2. Fish Biomass Data

The fish biomass estimates for each HUC come from a series of models developed by *Esselman et al*. [2014]. To summarize, fish biomass for commonly targeted sport fisheries was modeled using biomass measures compiled in the Michigan Rivers Inventory (MRI) [*Seelbach and Wiley*, 1997]. The MRI data set contains biomass (kg ha^{-1}) by species measurements for 675 sites in Michigan cold and warm water rivers. Modeled fish species include brook trout, brown trout, walleye, smallmouth bass, and a combined group of panfishes that are targeted more generally with hook and line (including black crappie, white crappie, bluegill, green sunfish, hybrid sunfish, pumpkin seed sunfish, redear sunfish and rock-bass). For each species or species group, a boosted regression tree model was trained and optimized on the MRI data. Predictors in the models were drawn from databases developed in the Great Lakes Aquatic Gap Analysis Program [*US Geological Survey Great Lakes Science Center (GLSC)*, 2006] and the Classification and Impairment Assessment of Upper Midwest Rivers project [*Brenden et al*., 2006; *University of Michigan (UM)*, 2006]. The regression tree models predicted fish biomass to all confluence-to-confluence river reaches in fishable rivers predicted to be occupied by each species based on *Steen et al*. [2008]. Fish biomass was then summarized to the angler choice set as the length-weighted mean value of all warm or cold water reaches in each fishable alternative (Table 3). The predictions indicate that fish biomass for a particular species or species group is characterized by little-or-no abundance at most of our sites and high abundance at some sites. Among the species, brook trout are least likely to be found at our sites, which is not surprising given their habitat requirements. On the other hand, some kind of panfish can be expected at most sites, which is consistent with the variety of fish included in this species group.

The biomass measures enter the RUM model as individual (angler)-specific variables. The MRAS database includes information on the particular species targeted, if any, by anglers during a fishing trip. Five indicators classify anglers as targeting some combination of trout, bass, panfishes, walleye or other species, while a sixth indicator accounts for anglers who did not target a particular species on a trip (Table 4). Interacting these indicators with the species biomass predictions from Esselman et al. creates targeted biomass variables. This adjustment allows us to focus on the desirability of biomass for site choice taking fish preferences as given [*Scrogin et al*., 2004]. The resulting biomass variables are used as individual-specific explanatory variables in the recreational fishing site choice model.

2.3. Site Choice Model

We use a RUM model to test and measure the importance of the site characteristics travel cost and fish biomass on stream choice. In general, recreational demand RUM models explain observed trip patterns in terms of the characteristics a trip-taker would experience at different alternatives. Each angler i has the choice to visit N_i sites, while each site $j \in 1,\ldots,N_i$ is associated with a utility level of U_{ij}. The indirect utility level measures the benefits an angler enjoys on a trip occasion to alternative j and is expressible as:

$$U_{ij} = U\left(y_i - p_{ij}, b_{ij}, q_j, \varepsilon_{ij}\right) \tag{1}$$

where y_i is the angler's income, p_{ij} is the travel cost, b_{ij} is the targeted species biomass, q_j is a vector of site-specific quality measures and ε_{ij} is the part of utility determined by factors unobserved by the researcher.

Table 4. Stream Fishing RUM Model Results[a]

Parameter	Coefficient	Clustered Standard Error
Targeted Fish Biomass		
Brook trout	0.400	0.180
Brown trout	0.132	0.057
Smallmouth bass	0.098	0.031
Panfishes	0.109	0.023
Walleye	0.364	0.084
Price Measure		
Travel cost	−0.031	0.003
Landscape		
NWSR[b]	0.563	0.236
Forest[b]	−1.540	0.491
Agriculture[b]	−2.325	0.745
Urban[b]	−3.165	1.279
Length[b]	0.181	0.073
Group Class		
Cold water[b]	−0.495	0.194
Dissimilarity, θ	0.582	0.065
Trips		2064
Rows of data		273,378

[a]All reported estimates are significant at the 5% level. The results for the site fixed effects are withheld for brevity.
[b]Identified via a regression of the site fixed effects on these variables (N=232; R^2=0.552), which included 12 basin-level fixed effects withheld for brevity.

Assuming utility is linear and additively separable in the observed and unobserved components, we can rewrite equation (1) as

$$U_{ij}=V_{ij}+\varepsilon_{ij} \text{ where } V_{ij}=\alpha(y_i-p_{ij})+\beta b_{ij}+\gamma q_j. \quad (2)$$

Trips are taken to the alternative that yields the highest utility among all possible choices, implying that site j is chosen when $U_{ij} > U_{ik}$, although the researcher only observes the portion V_{ij} and cannot predict with certainty the preferred fishing alternative for any given trip. However, by specifying a distribution for ε_{ij} the probability that the site visited is best can be formed:

$$\begin{aligned} prob_i(choose\ j) &= prob(U_{ij} > U_{ik}) \ \forall\ j \neq k \\ &= prob(V_{ij}+\varepsilon_{ij} > V_{ik}+\varepsilon_{ik}) \ \forall\ j \neq k \\ &= prob(V_{ij}-V_{ik} > \varepsilon_{ik}-\varepsilon_{ij}) \ \forall\ j \neq k \end{aligned} \quad (3)$$

Note that in the probability only differences in utility matter so that with equation (2) angler-specific characteristics such as income are differenced away and have no role in the model. Following one common approach in the recreation demand literature, we assume ε_{ij} is distributed generalized extreme value. This yields the nested logit site choice model, which allows alternatives to be placed in groups to account for unobserved similarities between grouped alternatives. Within a group the alternatives are assumed to share common but unobserved characteristics that drive correlation between choices. We adopt a two-level model, where the upper level consists of the choice of group and the lower level consists of the choice of alternatives within the preferred group. We distinguish the alternatives by their cold water and warm water classification so the nested model consists of two groups. The probability of visiting a particular site j is therefore

$$prob_i(choose\ j)=e^{V_{ij}/\theta}\times\left[\sum_{k=1}^{N_g} e^{V_{ik}/\theta}\right]^{\theta-1} \Big/ \sum_{g=1}^{G}\left[\sum_{k=1}^{N_g} e^{V_{ik}/\theta}\right]^{\theta} \quad (4)$$

where N_g is the number of sites in group g (in our particular case g = cold water, warm water) and θ is a "dissimilarity" parameter that captures the degree of correlation between alternatives within a group.

There are several types of variables used in the RUM model. Of primary interest are the targeted biomass variables, *brook trout*, *brown trout*, *smallmouth bass*, *panfishes* and *walleye*, measuring the fishing quality at each site. Although one could argue that biomass does not directly enter into an angler's utility function, using it as a measure of fishing quality has several advantages over catch rates: First, catch data gathered from surveys where the anglers are sampled rather than the sites tend to produce expected catch rates with measurement error, particularly for the least visited sites, and therefore biased demand model parameters [*Morey and Waldman*, 1998; *Train and McFadden*, 2000]. Second, catch is a function of biomass and fishing effort, which is endogenous [*Clark*, 1990; *Harley et al*., 2001], so using biomass can be viewed as a sort of reduced-form approach to measuring site quality independent of effort. Third, fisheries managers in Michigan tend to stock streams based on added fish per unit area, which is akin to our biomass formulation [*Dexter and O'Neal*, 2004]. Of course, anglers might care about other factors such as fish sizes, but size-specific measures are generally unavailable for both biomass and catch rates.

Next, we include the variable *travel cost* to account for the individual-specific price of taking a fishing trip. The coefficient on this variable reflects the change in utility from a small increase in the cost of visiting a site.

The final set of variables controls for the influence of site-specific features on site choice, including landscape characteristics and built amenities. In the version of the model reported here we use site fixed effects

– that is, a full set of alternative specific constants – to avoid problems with omitted variables bias in the biomass and travel cost parameter estimates [*Moeltner and von Haefen*, 2011; *Weber et al*., 2012]. We considered alternative specifications that combined observable landscape variables with more aggregated fixed effects but the results suggested that controlling for site-specific omitted characteristics was critical. To identify the importance of observed site-specific factors on site choice the estimated fixed effects were regressed on several landscape variables [*Murdock*, 2006], including: *NWSR*, a proxy for the remote and scenic setting around stream segments protected under the National Wild and Scenic Rivers Act of 1968 [*Sanders et al*., 1990]; *forest*, *agriculture*, and *urban*, the percentages of the riparian landscape in different land uses (the omitted category is composed of scrub/shrub, grass and bare land); *length*, the natural logarithm of the aggregate stream lengths in the site (in km); and, finally, *cold water*, an indicator to capture the share of trips taken to cold water sites relative to warm water sites that remains unexplained by the other variables.

The RUM model is parameterized on the Michigan stream angler and biomass data. We use equation (4) to create a likelihood function across the possible choice alternatives for all trips and estimate the parameters by maximum likelihood. To control for monthly changes in MRAS surveying intensity, each trip is weighted by the inverse of the probability that it was collected from a survey in a particular month. Trips are also clustered by angler to account for individuals who have multiple trips in the sample. Due to the use of site fixed effects, the 176 of 408 fishable alternatives that did not receive any visits in the sample could not be included in the final RUM model choice set. We estimated variations of the model without site fixed effects that did and did not include unvisited sites and found few significant changes between the variants, suggesting that this decision has little bearing on the results.

2.4. Value Measurement

Changes in the characteristics and quality of the choice alternatives can be valued using the estimates of the RUM model. Monetary values are computed as anglers' willingness to pay (WTP) to forgo a quality change on a choice occasion [*Haab and McConnell*, 2003]. Following a quality change, WTP is the amount that leaves the angler no better or worse off than before the quality change. Let V_j and V_j^* refer to measurable utility before and after a quality change, respectively. In the context of the RUM model estimated as a nested logit it can be shown that

$$\mathrm{WTP}_i = \frac{-1}{\rho}\left[ln\sum_{g=1}^{G}\left[\sum_{j=1}^{N_g} e^{V_{ij}/\theta}\right]^{\theta} - ln\sum_{g=1}^{G}\left[\sum_{j=1}^{N_g} e^{V_{ij}^*/\theta}\right]^{\theta}\right] \tag{5}$$

per choice occasion. Equation (5) can also be used to estimate the monetary damage of site loss, where the affected alternative is removed from the summation of V_j^* in the right hand side of the equation.

Following estimation of the RUM model, WTP is computed using the estimated parameters and the observed quality measures for V_j and quality measures for V_j^*. In our applications, we report WTP for several quality change scenarios. The first set of scenarios measure the benefits arising from a 50% increase in biomass for each species at all sites. The second set of scenarios evaluates the benefits arising from a 1 kg per ha increase in biomass at all sites. Each of these WTP estimates is a type of per-trip gain, and should be interpreted as the expected monetary benefit across day trips to every fishing site in the model.

We also examine the monetary damages from closing some of the fishable alternatives. These damages are calculated as loss-to-trip ratios by evaluating equation (5) and dividing by the average probability that a trip was taken to the affected (closed) site [*Parsons et al*., 2009]. Loss-to-trip ratios are interpreted as the monetary damage to those fishing trips taken specifically to the lost site. Whether expressed as values across all trips in the choice set as in equation (5) or as loss-to-trip ratios, the measures are highly nonlinear in the estimated parameters. Thus, confidence intervals were computed by bootstapping the estimation of the model parameters 200 times.

3. Results and Discussion

3.1. RUM Model Estimates

Table 4 presents the estimated parameters of the RUM model. The travel cost parameter has the expected negative sign and is statistically significant at the 0.01 level, indicating that the probability of a trip to a site

is decreasing in the trip price. Overall, the RUM model predicts a strong targeted biomass effect. The biomass parameters are positive and significant at traditional confidence levels for all five species. These estimates show that Michigan stream anglers respond to differences in fish abundance between sites and, specifically, that the probability of visiting a site increases with targeted biomass.

The estimates demonstrate that anglers do not react equivalently to changes in fish biomass across species. The hypothesis that the effect of targeted biomass on site choice is the same for all species is rejected at a high confidence level. Of the biomass parameters, the point estimates are greatest for brook trout and walleye, implying that anglers' site preferences are particularly sensitive to the biomass of these two species.

The fixed effects add significantly to the model based on the Akaike information criterion goodness-of-fit measure. For brevity the 232 estimates for these parameters are not reported but, in general, the fixed effects suggest that unmeasured site attributes enjoyed by all anglers tend to be important components of utility. The role of observed site attributes on site choice can be gauged through an auxiliary regression of the estimated fixed effects on site-specific variables [*Murdock*, 2006]. The results of this procedure in the present case are reported in Table 4 (that auxiliary regression also included 12 basin fixed effects which are omitted for brevity). The landscape variable estimates indicate that anglers tend to fish at sites with the National Wild and Scenic Rivers designation but avoid sites with a high proportion of urban or agricultural development in the riparian area, other things being equal.

The results further suggest that there are unobserved characteristics that are correlated within the nested groups. The dissimilarity parameter, which was constrained to be equal across groups, is significantly different from 1, suggesting that alternatives within the cold water or warm water group exhibit more similarities with alternatives in their own group than with alternatives in the other group. Though not reported here, we also considered a specification with different dissimilarity parameters by nests; we found this had a negligible effect on the estimated effects, although it did suggest that cold water alternatives were less correlated with one another than warm water alternatives.

3.2. Benefit Estimates

Welfare estimates are calculated for a 50% and for a one kilogram per hectare increase in biomass at all sites for each species (Table 5). Although these scenarios are for illustration of the model, in practice managers do adopt stocking strategies based on the added weight of a particular species per unit area [*Dexter and O'Neal*, 2004]. As discussed above, in these scenarios WTP is expressed in terms of a trip taken to any river or stream in Michigan.

WTP varies between the two welfare scenarios largely due to differences in the estimated parameters on the targeted biomass levels and differences in the mean targeted biomasses (see last column, Table 5). For example, the value of changing walleye biomass is less than that for panfishes for an equivalent percentage increase in in situ biomass, though walleye is more valuable per unit biomass. A 50% increase in walleye is worth about \$1.1/trip while a 50% increase in panfishes is worth about \$3.7/trip, but this equi-proportional increase in targeted biomass leads to a much greater total increase in panfishes (about 0.897 kg ha^{-1}) than in walleye (about 0.028 kg ha^{-1}). The WTP for walleye is greater for an equal increase in biomass: a 1 kg ha^{-1} increase is worth about \$4.0/trip for walleye versus \$1.5/trip for panfishes.

Overall, these estimates imply that increasing brook trout and walleye abundance would return the most value to Michigan's stream fisheries. These two game fish species also happen to have the least in situ biomass of the species considered in the model (Table 3 and last column of Table 5).

Comparing the WTP estimates from our quality change scenarios with those reported in the literature is difficult because our measures of fishing quality are distinct from prior studies. The ranking of values we identify is similar to *Murdock*'s [2006] results for a RUM model of Wisconsin fishing; both indicate that anglers are willing to pay significantly for increases in walleye and trout abundance. *Melstrom and Lupi* [2013] find that on average Great Lakes anglers are willing to pay \$4–6 per trip to avoid a 50% decline in walleye catch rates, which is more than our own willingness to pay estimate of about \$1 to obtain a 50% increase in walleye biomass in rivers (that could be expected to have a proportional impact on walleye catch); however, this difference may be attributable to the larger share of anglers who target walleye in the Great Lakes.

The average loss-to-trip ratio ranges from about \$19–23 depending on the closed site. For example, we find that, on average, trips to the warm water portion (i.e., the main stem) of the Muskegon River below Hardy

Table 5. Average per Trip WTP ($) for Increase in Targeted Biomass[a]

Species	50% Increase	1 kg ha^{-1} Increase	RUM Model Mean Targeted Biomass (kg ha^{-1})
Brook trout	2.372 (0.773–6.971)	7.104 (2.655–14.670)	0.249
Brown trout	3.370 (1.605–7.931)	2.346 (1.275–4.523)	1.198
Smallmouth bass	1.707 (0.836–2.571)	1.567 (0.836–2.216)	0.531
Panfishes	3.692 (2.531–4.836)	1.549 (1.073–1.984)	1.793
Walleye	1.149 (0.704–1.771)	4.032 (2.649–5.792)	0.055

[a]WTP 95% confidence intervals in parentheses below estimates computed by bootstrapping the model 200 times.

Dam, the most popular fishing alternative in the sample (receiving about 6% of sample trips), are worth $23 (95% confidence interval: $21–$24). For trips to the southern watershed of the Au Sable River, a more typical sportfishing site (receiving less than 1% of sample trips), we estimate an average value of $19 ($17–$21). Jointly closing groups of alternatives or entire river systems will produce higher damages on a per-trip basis: we find that access to the Au Sable River system subbasin has a mean estimated value of $26 ($23–$28). Furthermore, we estimate that access to the northwestern Lake Huron basin, which includes the Au Sable River subbasin, has a mean value of $45 ($40–$51).

The damages of lost access that we estimate, about $20 per trip, are somewhat smaller than those reported in the literature due in part to the comparatively fine scale of our site definitions. Not surprisingly, our damage estimates grow closer to these other estimates after conditioning on the scale of lost access. For example, *Train* [1998] estimates that the Madison River in Montana is worth around $40 per trip and *Von Haefen* [2003] estimates that the lower Susquehanna River is worth about $30 per trip, after adjusting for inflation. Both of these sites are on the scale of a subbasin, which makes the Train and the von Haefen estimates very similar to our own for access to subbasins in Michigan.

4. Conclusion

This paper developed a site choice model capable of valuing recreational fishing quality at Michigan rivers and streams. The objective was to identify angler preferences for various fish—trout, bass, panfishes and walleye—using species-specific biomass as an exogenous measure of fish abundance. Prior research has largely relied on presence-absence indicators or average catch rates to characterize fishing quality and was not designed to value a variety of individual fish species or biomass. Our model took advantage of species-specific biomass measures in order to derive anglers' willingness-to-pay for improvements in the quality of fishing for individual species. Our estimates indicate that anglers, conditional on the species or species groups they are targeting, tend to visit sites that are high in fish biomass. In particular, we found that brook trout followed by walleye had the most valuable biomasses for stream fishes in Michigan.

The set of fishable alternatives used in the model was characterized by watershed boundaries. These boundaries resulted in watershed areas that were generally 100–200 square miles (260–520 km^2) in size with the site containing a short river reach and its fishable tributaries. This site definition is useful because, first, it allows the researcher to value changes in the quality at a variety of watershed levels and, second, it was based on both stream temperatures and USGS hydrologic units (10-digit HUC), so the classification could be applied to any US state or region.

There are some caveats to this analysis that could be addressed by future research. The model only included single-day trips, and thus may not capture values and substitution in the same manner as a model that incorporates the behavior of anglers who take multiple-day trips. Furthermore, while angler heterogeneity was partially embedded into the model via targeted-species preferences, further insight may be gained by exploring the influence of other observable and unobservable angler characteristics on site choice. In terms of the species-specific biomass measures, our sites include tributaries considered fishable, but smallmouth bass were predicted by *Esselman et al.* [2014] to be limited to larger rivers, which might be taken into account in future site definitions focused on bass angling. Finally, angler welfare may be influenced by both the rate and size of catch, which biomass cannot distinguish between. The willingness of anglers to tradeoff catch rate for catch size needs further study.

Managing aquatic ecosystem services requires knowledge about the benefits that users gain from the resource. This paper provided benefit estimates that can be easily used in cost-benefit analysis. Although

the model was applied to stream anglers taking single-day trips in Michigan, we expect that the reported WTP estimates are suitable for benefits transfer to streams around the Midwest and the Great Lakes region.

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References

ALK. PC Miler, (2012), Version 26, ALK Technologies, Inc., Princeton, N. J.
Allan, J. D. (2004), Landscapes and riverscapes: The influence of land use on stream ecosystems, *Annu. Rev. Ecol. Evol. Syst.*, *35*, 257–284.
Bond, N. R., and P. S. Lake (2003), Characterizing fish–habitat associations in streams as the first step in ecological restoration, *Austral Ecol.*, *28*, 611–621.
Brenden, T., R. Clark, A. Cooper, P. Seelbach, L. Z. Wang, S. S. Aichele, E. G. Bissell, and J. S. Stewart (2006), A GIS framework for collecting, managing, and analyzing multiscale landscape variables across large regions for river conservation and management, *Am. Fish. Soc. Symp.*, *48*, 49–74.
Clark, C. W. (1990), *Mathematical Bioeconomics: The Optimal Management of Renewable Resources*, John Wiley, N. Y.
Debnath, D., T. Boyer, A. Stoecker, and L. Sanders (2014), Nonlinear reservoir optimization model with stochastic inflows: Case study of Lake Tenkiller, *J. Water Resour. Plann. Manage.*, 04014046.
Dexter, J. L., Jr., and R. P. O'Neal, editors (2004), Michigan fish stocking guidelines II: With periodic updates, *Fish. Spec. Rep. 32*, Mich. Dep. of Nat. Resour., Ann Arbor.
Esselman, P., R. J. Stevenson, F. Lupi, M. J. Wiley and C. M. Riseng (2014), Landscape prediction and mapping of game fish standing crops—A highly-valued ecosystem service of Michigan rivers, working paper.
Ficklin, D. L., I. T. Stewart and E. P. Maurer (2013), Effects of climate change on stream temperature, dissolved oxygen, and sediment concentration in the Sierra Nevada in California, *Water Resour. Res.*, *49*, 2765–2782, doi:10.1002/wrcr.20248.
Haab, T. C., and K. E. McConnell (2003), *Valuing Environmental and Natural Resources*, Edward Elgar, Northampton, Mass.
Harley, S. J., R. A. Myers, and A. Dunn (2001), Is catch-per-unit-effort proportional to abundance?, *Can. J. Fish. Aquat. Sci.*, *58*, 1760–1772.
Hayes, D. B., J. R. Bence, T. J. Kwak, and B.E. Thompson (2007), Abundance, biomass, and production, in *Analysis and Interpretation of Freshwater Fisheries Data*, edited by C. S. Guy and M. L. Brown, pp. 327–374, Am. Fish. Soc., Bethesda, Md.
Hunt, L. E., P. E. Boxall, and B. Boots (2007), Accommodating complex substitution patterns in a random utility model of recreational fishing, *Mar. Resour. Econ.*, *22*, 155–172.
Jakus, P. M., D. Dadakas and J. M. Fly (1998), Fishing consumption advisories: Incorporating angler-specific knowledge, habits, and catch rates in a site choice model, *Am. J. Agric. Econ.*, *80*, 1019–1024.
Ji, Y., J. Herriges, and C. Kling (2014), Modeling recreation demand when the access point is unknown. Working paper.
Jones, C. A., and F. Lupi (2000), The effect of modeling substitute activities on recreational benefit estimates, *Mar. Resour. Econ.*, *14*, 257–274.
Kotchen, M., M. Moore, F. Lupi, and E. Rutherford (2006), Environmental constraints on hydropower: An ex-post benefit-cost analysis of dam relicensing in Michigan, *Land Econ.*, *82*, 384–403.
Lin, P., R. M. Adams, and R. P. Berrens (1996), Welfare effects of fishery policies: Native American treaty rights and recreational salmon fishing, *J. Agric. Resour. Econ.*, *21*, 263–276.
Loomis, J. (2003), Travel cost demand model based river recreation benefit estimates with on-site and household surveys: Comparative results and a correction procedure, *Water Resour. Res.*, *39*(4), 1105, doi:10.1029/2002WR001832.
Lupi, F., and P. M. Feather (1998), Using partial site aggregation to reduce bias in random utility travel cost models, *Water Resour. Res.*, *34*, 3595–3603.
MacNair, D. J., and S. D. Cox (2000), A heteroskedastic nested RUM of freshwater fishing, *Mar. Resour. Econ.*, *14*, 333–341.
Maunder, M. N., and A. E. Punt (2004), Standardizing catch and effort data: A review of recent approaches, *Fish. Res.*, *70*, 141–159.
Melstrom, R. T., and F. Lupi (2013), Valuing recreational fishing in the Great Lakes, *North Am. J. Fish. Manage.*, *33*, 1184–1193.
Meyer, J. L., M. J. Sale, P. J. Mulholland and N. L. Poff (1999), Impacts of climate change on aquatic ecosystem functioning and health, *J. Am. Water Resour. Assoc.*, *35*, 1373–1386.
Moeltner, K., and R. von Haefen (2011), Microeconometric strategies for dealing with unobservables and endogenous variables in recreation demand models, *Annu. Rev. Resour. Econ.*, *3*, 375–296.
Morey, E. R., and D. M. Waldman (1998), Measurement error in recreation demand models: The joint estimation of participation, site choice, and site characteristics, *J. Environ. Econ. Manage.*, *35*, 262–272.
Morey, E. R., R. D. Rowe, and M. Watson (1993), A repeated nested-logit model of Atlantic salmon fishing, *Am. J. Agric. Econ.*, *75*, 578–592.
Morey, E. R., W. S. Breffle, R. D. Rowe and D. M. Waldman (2002), Estimating recreational trout fishing damages in Montana's Clark Fork River basin: Summary of a natural resource damage assessment, *J. Environ. Manage.*, *66*, 159–170.
Murdock, J. (2006), Handling unobserved site characteristics in random utility models of recreation demand, *J. Environ. Econ. Manage.*, *51*, 1–25.
Palmer, M. A., and E. S. Bernhardt (2006), Hydroecology and river restoration: Ripe for research and synthesis, *Water Resour. Res.*, *42*, W03S07, doi:10.1029/2005WR004354.
Parsons, G. R. (2003), The travel cost model, in *A Primer for Nonmarket Valuation*, edited by P. A. Champ, K. J. Boyle, and T. C. Brown, chap. 9, pp. 269–329, Springer Sci., N. Y.
Parsons, G. R., and A. B. Hauber (1998), Spatial boundaries and choice set definition in a random utility model of recreational demand, *Land Econ.*, *74*, 32–48.
Parsons, G. R., A. J. Plantinga, and K. J. Boyle (2000), Narrow choice sets in a random utility model of recreation demand, *Land Econ.*, *76*, 86–99.
Parsons, G. R., A. K. Kang, C. G. Leggett, and K. J. Boyle (2009), Valuing beach closures on the Padre Island National Seashore, *Mar. Resour. Econ.*, *24*, 213–235.
Peters, T., W. L. Adamowicz, and P. C. Boxall (1995), Influence of choice set considerations in modeling the benefits from improved water quality, *Water Resour. Res.*, *31*, 1781–1787.
Phaneuf, D. J. (2002), A random utility model for total maximum daily loads: Estimating the benefits of watershed-based ambient water quality improvements, *Water Resour. Res.*, *38*(11), 1254, doi:10.1029/2001WR000959.
Sanders, L. D., R. G. Walsh, and J. B. Loomis (1990), Empirical estimation of the total value of protecting rivers, *Water Resour. Res.*, *26*, 1345–1357.
Scrogin, D., K. Boyle, G. Parsons, and A. J. Plantinga (2004), Effects of regulations on expected catch, expected harvest, and site choice of recreational anglers, *Am. J. Agric. Econ.*, *86*, 963–974.

Seelbach, P. W., and M. J. Wiley (1997), Overview of the Michigan Rivers Inventory project, *Fish. Tech. Rep. 97-3*, Mich. Dep. of Nat. Resour., Ann Arbor.
Simoes, J. C. (2009), Recreational angler surveys: Their role and importance nationally and the 2008 Michigan Angler Survey, Master's thesis, Mich. State Univ., East Lansing, Mich.
Steen, P. J., T. G. Zorn, P. W. Seelbach, and J. S. Schaeffer (2008), Classification tree models for predicting distributions of Michigan stream fish from landscape variables, *Trans. Am. Fish. Soc.*, *137*, 976–996.
Suplee, M. W., V. Watson, W. K. Dodds, and C. Shirtley (2012), Response of algal biomass to large-scale nutrient controls in the Clark Fork River, Montana, United States, *J. Am. Water Resour. Assoc.*, *48*, 1008–1021.
Train, K. E. (1998), Recreation demand models with taste differences over people, *Land Econ.*, *74*, 230–239.
Train, K. E., and D. McFadden (2000), Discussion of Morey and Waldman's "measurement error in recreation demand models," *J. Environ. Econ. Manage.*, *40*, 76–81.
University of Michigan (UM) (2006), Ecological classification of rivers for environmental assessment. Department of Natural Resources and Environment; Ann Arbor, Mich. [Available at http://sitemaker.umich.edu/riverclassproject/home.]
US Energy Information Administration (EIA) (2012), *Michigan Total Gasoline Through Company Outlets Price by All Sellers (Dollars per Gallon)*. U. S. Energy Information Administration, Washington, D. C. [Available at http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EMA_EPM0_PTC_SMI_DPG&f=M.]
U.S. Environmental Protection Agency (USEPA) (2013), *National Rivers and Streams Assessment 2008–2009—A Collaborative Survey*, Off. of Wetlands, Oceans and Watersheds, Off. of Res. and Dev., Washington, D. C.
US Environmental Protection Agency (USEPA) and US Geological Survey (USGS) (2005), National Hydrography Dataset Plus—NHDPlus Version 1.0., Horizon Systems Corporation, Herndon, Va. [Available at http://www.horizon-systems.com/nhdplus/.]
U.S. Fish and Wildlife Service (USFWS) (2012), *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*, U.S. Dep. of the Interior., Washington, D. C.
US Geological Survey Great Lakes Science Center (GLSC) (2006), The Great Lakes Aquatic GAP Project., U.S. Geological Survey; Ann Arbor, Mich. [Available at http://www.glsc.usgs.gov/.]
U.S. Geological Survey (USGS) and U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS), (2012), *2012 Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD)*, U.S. Geol. Surv. Tech. Methods 11–A3, 3rd ed., 63 pp. U.S. Geological Survey and U.S. Department of Agriculture, Natural Resource Conservation Service, Washington, D. C.
Von Haefen, R. H. (2003), Incorporating observed choice into the construction of welfare measures from random utility models, *J. Environ. Econ. Manage.*, *45*, 145–165.
Weber, M. A., P. Mozumder, and R. P. Berrens (2012), Accounting for unobserved time-varying quality in recreation demand: An application to a Sonoran Desert wilderness, *Water Resour. Res.*, *48*, W05515, doi:10.1029/2010WR010237.
Wehrly, K. E., M. J. Wiley, and P. W. Seelbach (2006), Influence of landscape features on summer water temperatures in lower Michigan streams, *Am. Fish. Soc. Symp.*, *48*, 113–127.
Wohl, E., P. L. Angermeier, B. Bledsoe, G. M. Kondolf, L. MacDonnell, D. M. Merritt, M. A. Palmer, N. L. Poff, and D. Tarboton (2005), River restoration, *Water Resour. Res.*, *41*, W10301, doi:10.1029/2005WR003985.
Zorn, T. G., P. W. Seelbach, and M. J. Wiley (2009), Relationships between habitat and fish density in Michigan streams, *Fish. Res. Rep. 2091*, Mich. Dep. of Nat. Resour., Ann Arbor.
Zorn, T. G., P. W. Seelbach, and M. J. Wiley (2011), Developing user-friendly habitat suitability tools from regional stream fish survey data, *North Am. J. Fish. Manage.*, *31*, 41–55.

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Landscape Prediction and Mapping of Game Fish Biomass, an Ecosystem Service of Michigan Rivers

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ARTICLE

Landscape Prediction and Mapping of Game Fish Biomass, an Ecosystem Service of Michigan Rivers

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Abstract

The increased integration of ecosystem service concepts into natural resource management places renewed emphasis on prediction and mapping of fish biomass as a major provisioning service of rivers. The goals of this study were to predict and map patterns of fish biomass as a proxy for the availability of catchable fish for anglers in rivers and to identify the strongest landscape constraints on fish productivity. We examined hypotheses about fish responses to total phosphorus (TP), as TP is a growth-limiting nutrient known to cause increases (subsidy response) and/or decreases (stress response) in fish biomass depending on its concentration and the species being considered. Boosted regression trees were used to define nonlinear functions that predicted the standing crops of Brook Trout *Salvelinus fontinalis*, Brown Trout *Salmo trutta*, Smallmouth Bass *Micropterus dolomieu*, panfishes (seven centrarchid species), and Walleye *Sander vitreus* by using landscape and modeled local-scale predictors. Fitted models were highly significant and explained 22–56% of the variation in validation data sets. Nonlinear and threshold responses were apparent for numerous predictors, including TP concentration, which had significant effects on all except the Walleye fishery. Brook Trout and Smallmouth Bass exhibited both subsidy and stress responses, panfish biomass exhibited a subsidy response only, and Brown Trout exhibited a stress response. Maps of reach-specific standing crop predictions showed patterns of predicted fish biomass that corresponded to spatial patterns in catchment area, water temperature, land cover, and nutrient availability. Maps illustrated predictions of higher trout biomass in coldwater streams draining glacial till in northern Michigan, higher Smallmouth Bass and panfish biomasses in warmwater systems of southern Michigan, and high Walleye biomass in large main-stem rivers throughout the state. Our results allow fisheries managers to examine the biomass potential of streams, describe geographic patterns of fisheries, explore possible nutrient management targets, and identify habitats that are candidates for species management.

The increasing integration of ecosystem service concepts into environmental management places a new emphasis on research addressing the ecological drivers of fish productivity. Ecosystem services are defined as components of nature that are directly enjoyed or consumed by humans or that are used to yield human well-being (Boyd and Banzhaf 2007). Biomass of target fish populations is a crucial "provisioning service" of ecosystems that has a high economic and cultural value to

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society (Millennium Ecosystem Assessment 2005). In Michigan alone, total expenditures by recreational anglers are estimated at more than $2.4 billion annually (Southwick Associates 2007). Although the economic service values of Michigan's Great Lakes fisheries have been linked to fish catch rates (Melstrom and Lupi 2013) and fish productivity (Kotchen et al. 2006), the connection between ecosystem service values and fish productivity in rivers is poorly understood. An understanding of this connection is complicated because the species targeted by river and stream anglers are spread across heterogeneous landscapes with different capacities to provide fish to anglers and, by extension, differing capacities to accrue economic benefits to society. An understanding of which landscape conditions have the greatest potential to provide fish to anglers is a precursor to economic valuation and could facilitate strategies for maximizing this provisioning service of rivers. Maps of productive fish provisioning areas could be particularly useful to decision makers.

An important research question underlies the ability to map spatial variability in game fish availability to anglers: what factors constrain fish productivity at the landscape scale? If the constraints on measures of fish productivity (e.g., biomass) can be mapped continuously across the landscape, then it should also be feasible to model and continuously map the productivity of habitats. Previous work in rivers has identified a suite of local factors that are thought to constrain fish production. For instance, fishes in Michigan are strongly influenced by water temperature (Wiley et al. 1997; Wehrly et al. 2003; Zorn and Wiley 2006), which affects their metabolism and growth (Diana 2004) and has been correlated with fish presence and standing crops (Steen et al. 2008; Zorn et al. 2009). Other habitat characteristics that have been commonly associated with fish abundance or biomass are species dependent but include river depth, substrate, fish cover availability, and bank and riparian conditions (Jones et al. 1974; Hokanson 1977; Stuber et al. 1982a, 1982b; Johnson et al. 1988; Page and Burr 1991; Zorn and Wiley 2004).

Fish biomass has also been linked to concentrations of limiting nutrients, which are thought to act indirectly via a bottom-up trophic cascade to influence game fishes at higher trophic levels. For instance, Askey et al. (2007) found fivefold and 25-fold increases in biomass of Brown Trout *Salmo trutta* and Rainbow Trout *Oncorhynchus mykiss*, respectively, downstream from a municipal effluent source near Calgary, Alberta, and these increases were also accompanied by increases in invertebrate, macrophyte, and phytoplankton biomass. An 11-fold to 73-fold increase in piscivore biomass was found below sewage effluents in a river near Montreal, Quebec, with Smallmouth Bass *Micropterus dolomieu* being among the greatest beneficiaries in terms of increased daily production (deBruyn et al. 2003). In experimental settings, bottom-up trophic cascades in response to phosphorus enrichment have been demonstrated to increase production at all trophic levels (Slavik et al. 2004), and salmonids have been shown to attain greater lengths and biomasses in response to nutrient additions (Johnston et al. 1990; Peterson et al. 1993; Slaney et al. 2003). Thus, in addition to temperature and other local habitat factors, nutrients are an important mediator of rivers' ability to provide fish to anglers.

The local habitat constraints on fishes are in turn constrained by landscape factors occurring at coarser spatial scales (Frissell et al. 1986). For instance, channel depth, velocity, substrate, and food availability are all strongly linked to upstream catchment area or longitudinal position within the river continuum (Vannote et al. 1980; Wiley et al. 1990; Rahel and Hubert 1991; Poff 1997; Slaney et al. 2003). Landscape factors have been used previously to predict the productivity of river fishes, thereby creating the potential to map fish biomass continually as an index of fish availability to anglers. Zorn et al. (2004) used multiple linear regression to model standing crops of 63 Michigan fish species, and their models generally explained between 10% and 50% of the variance for game species. Steen et al. (2008) used classification tree models to predict and map abundance categories (low, medium, and high) of 93 fish species in Michigan rivers and obtained good classification accuracy (average of 76% correct classification across species). Species–habitat models using as many as 25 habitat variables explained between 35% and 91% of the variation in abundances of 11 fish species in the Genesee River basin, New York (McKenna et al. 2006), and other workers have also successfully modeled fish abundances by using landscape and local factors (e.g., Gido et al. 2006; Stanfield et al. 2006). Synthesis of prior work suggests that nonparametric machine learning modeling approaches perform favorably in comparison with linear models (McKenna et al. 2006) and that the inclusion of modeled local conditions (e.g., hydrology, nutrients, and temperature) with landscape variables can lead to greater predictive power (Zorn et al. 2004).

The primary goals of the current study were to (1) use models to predict game fish standing crops continuously across the entire state of Michigan by using landscape and modeled local habitat variables and (2) identify the strongest landscape constraints on the standing crops of economically important game fishes. Standing crops were thus treated as an indicator of a river's capacity to produce fish for anglers as an important provisioning service of waterways that yields benefits in the form of recreational and subsistence harvest (Boyd and Banzhaf 2007). We modeled standing crop (i.e., biomass density) rather than numerical density because standing crop is less affected by interannual variation in year-class strength (Zorn et al. 2004) and is a recommended indicator for ecosystem services (e.g., how much of the service is present; de Groot et al. 2010). Although biomass may be an imperfect measure of the availability of catchable fish to anglers, measures of catchable fish were not available for modeling. Furthermore, high biomass values in the Michigan Rivers Inventory data set were generally driven by the presence of large fish in a given sample (T. Zorn, Michigan Department of Natural Resources, personal communication), and a companion

paper (Melstrom et al. 2015) demonstrated that fish biomass predictions across the landscape as generated by the current study were significantly correlated with angler choices about where to fish.

We were secondarily interested in testing hypotheses about game fish responses to total phosphorus (TP) concentrations. We focused on TP because (1) streams in Michigan tend to be phosphorus limited (Hart and Robinson 1990); (2) TP concentrations in water are significantly correlated with total fish standing crop (Hoyer and Canfield 1991; Randall et al. 1995); and (3) TP has been shown to drive positive (subsidy) responses in trout and bass fisheries (reviewed above). Thus, TP has the potential to increase the provision of fish to anglers. However, phosphorus is also a pervasive pollutant that can act as a stressor on stream ecosystems at higher concentrations (Miltner and Rankin 1998). Phosphorus-enriched streams support greater biomasses of benthic algae, macrophytes, and phytoplankton, which can lead to alterations in near-substrate flow velocities, dissolved oxygen, and pH dynamics (Welch et al. 1992; Dodds and Biggs 2002). These changes can be detrimental to sensitive species (Miltner and Rankin 1998), such as Brook Trout and Smallmouth Bass, leading us to hypothesize that these two species would respond positively to TP at low concentrations (a subsidy response) and negatively at higher concentrations (a stress response). More tolerant species, such as many sunfishes and Brown Trout, were expected to show only a subsidy response. Because Walleyes *Sander vitreus* make long in-channel migrations for spawning and are often sampled during their migration, we hypothesized that Walleyes would exhibit no response to nutrient levels at their place of capture. Below, we describe our approach to modeling and testing our nutrient effect hypotheses, present our model results, and describe our predictions of fish biomass as an indicator of Michigan rivers' potential to provide fish to anglers.

METHODS

Study site.—Michigan is divided geographically into the Upper Peninsula (UP) and Lower Peninsula (LP) at the point where Lake Michigan meets Lake Huron (Figure 1). The state is drained by approximately 85,000 km of streams that discharge into Lakes Erie, Huron, Michigan, and Superior. There are few high-gradient streams in the state, which has a low elevational range (174–603 m above sea level) and many wetlands. The surficial geology in much of the LP is dominated by glacial till and outwash deposits, the presence of which lead to high infiltration rates, high groundwater discharge, stable hydrology, cold water temperatures, and generally low nutrient concentrations (Olcott 1992; Wiley et al. 1997; Zorn et al. 2009). Cold water temperatures in the UP also result from the colder air temperatures at these northern latitudes and from the higher amounts of forest cover. The southeastern portion of the LP (i.e., from Saginaw Bay to the southern border of the state) deviates from the general pattern of till and outwash geology and is characterized by fine-textured lake plain deposits or postglacial alluvium. Streams in this area have lower infiltration rates, cool and warm surface waters, more flashy flow regimes, and higher natural nutrient concentrations. Distinctive fish communities are associated with cold-water and warmwater streams (Wiley et al. 1997; Zorn et al. 2002; Wehrly et al. 2003). Streams in the southern LP and main-stem rivers of the UP have summer temperatures that exceed 19°C, a threshold above which warmwater communities are found in Michigan (Wehrly et al. 2003).

Data sources.—The fish data used in this study came from the Michigan Rivers Inventory database (Seelbach and Wiley 1997). Between 1982 and 1995, fish populations were sampled at 675 sites in the LP by using rotenone, electrofishing depletion, or mark–recapture techniques (methods are described in more detail by Seelbach and Wiley 1997 and Zorn et al. 1998). Rotenone samples were collected mostly in third- to fifth-order warmwater streams, and the weights of species captured and area sampled were recorded. Multiple-pass depletion sampling with electrofishing was conducted mostly in small (first- or second-order) streams by using two to five passes with block nets set at the upper and lower extents of most reaches. The biomass of each sample was estimated by using the following equation: $N_i = (N_t/C_t) \times C$, where N_i is the estimated weight of species i; N_t is the total weight captured of species i; C is the estimated weight of all species combined (after Zippin 1958); and C_t is the combined weight of all species captured. Mark–recapture population estimates were made primarily for salmonids by using the Bailey modification (Cooper and Ryckman 1981). Our response variable was the estimated total biomass density (kg/ha; standing crop) of different target species at a sampling site. Because some targeted sampling occurred, the number of sites available for model training varied among species from 335 to 397 sites spread across the LP (Figure 1). Targeted collection samples were only used in models of the species targeted.

The following fisheries were modeled: Brook Trout *Salvelinus fontinalis*, Brown Trout, Smallmouth Bass, Walleye, and panfishes as a group (Bluegill *Lepomis macrochirus*, Green Sunfish *L. cyanellus*, Pumpkinseed *L. gibbosus*, Redear Sunfish *L. microlophus*, White Crappie *Pomoxis annularis*, Black Crappie *Pomoxis nigromaculatus*, and Rock Bass *Ambloplites rupestris*). Standing crop values were $\log_e(x + 1)$ transformed to improve normality and reduce the leverage of high observations.

Landscape environmental predictor variables (Table 1) were obtained from the Great Lakes Aquatic Gap Analysis Program (GLSC 2006) and the Classification and Impairment Assessment of Upper Midwest Rivers (Brenden et al. 2006). These databases contain GIS-linked databases with catchment, riparian, and channel data attributed to interconfluence stream reaches. The river line geometry was taken from the 1:100,000-scale National Hydrography Dataset (USEPA and USGS 2005) with modifications to provide a more accurate

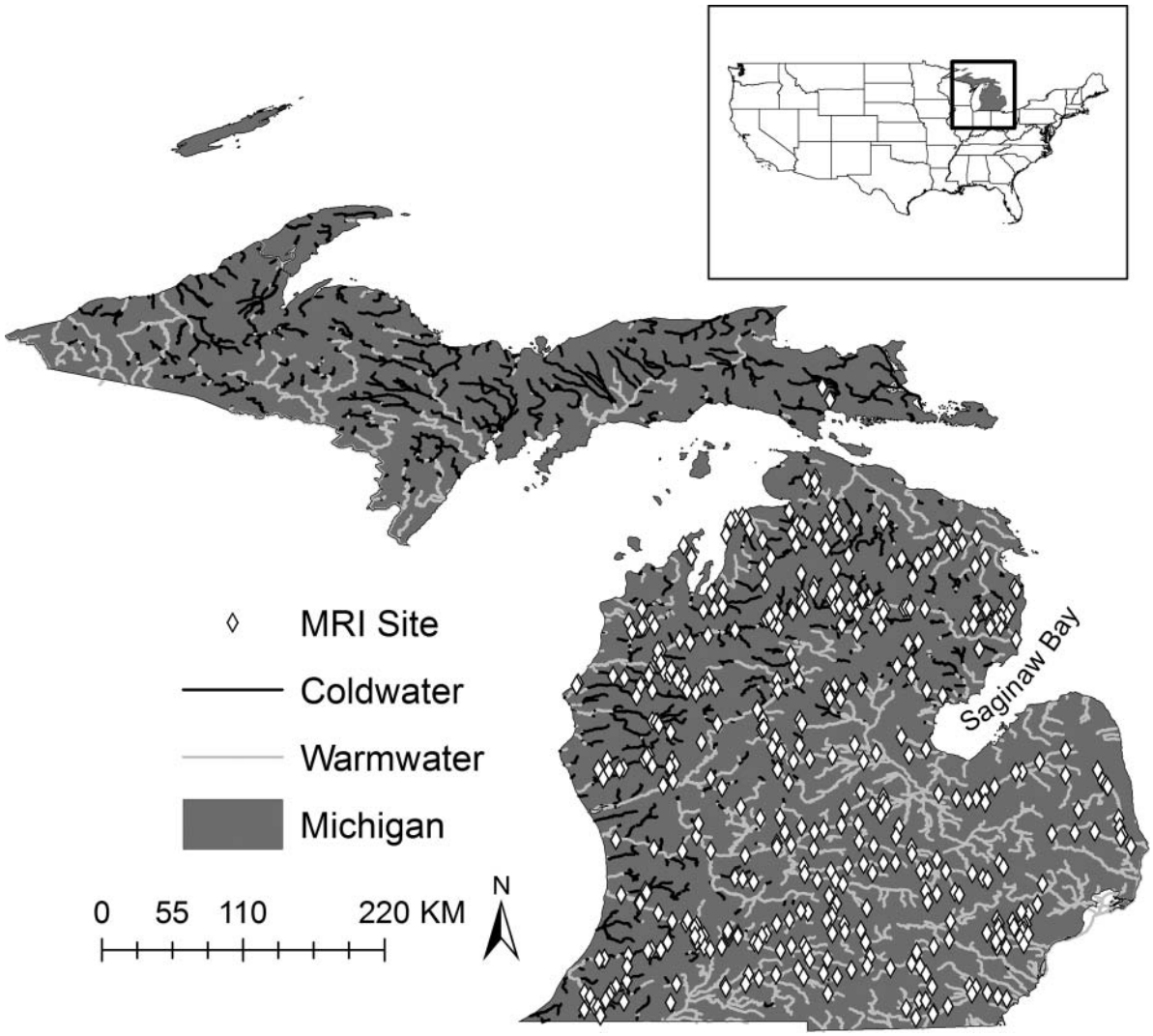

FIGURE 1. Locations of Michigan Rivers Inventory (MRI) sampling points for game fish standing crops. Not all points were sampled for all species. For the sake of clarity, only rivers with catchment areas greater than 50 km^2 are shown.

representation of Michigan rivers (Brenden et al. 2006). The databases contain approximately 320 variables for 31,817 stream reaches, including information about soil permeability, 1998 land cover, stream position, bedrock and surficial geology, climate, modeled hydrology, and modeled July mean stream temperatures (Brenden et al. 2006). Modeled summer TP concentrations (P. Esselman and R. J. Stevenson, unpublished data) were used to represent local nutrient conditions. The TP model explained more than 50% of the variation in a test data set of base flow TP concentrations and was used because it is superior to other TP estimates available for Michigan (Kleiman 1995). Reaches that had no upstream dams were attributed with an arbitrarily high value of 100,000 m for the "distance to upstream dams" variable to avoid missing values.

Fish standing crop models.—A boosted regression tree (BRT) model (Friedman 2001; Elith et al. 2008) was trained for each fishery considered. Boosted regression trees are good for the modeling problem at hand because they have generally high predictive performance and offer a clear way to describe potentially nonlinear statistical relationships between independent variables and a response. The latter characteristic of these models was necessary to test our hypotheses about subsidy and stress responses to TP concentration. We trained a model for each of the fish species by using the gbm.step algorithm of Elith et al. (2008) for the gbm package in R (R Development Core Team 2013). The algorithm progressively reduces predictive deviance until a stopping point is reached; the stopping point used was the point at which the average cross-validation deviation ceased to improve. Cross validation was performed after the addition of each set of 50 trees by dividing the data into 10 equal-sized subsets ("folds"), iteratively training the model with nine folds combined, and then calculating the deviation of predictions versus the held-out "test set" until all

TABLE 1. Predictors used to model game fish standing crops in Michigan, including summary statistics for measured values of predictors across all sampling sites (Min = minimum; Q25 = 25th percentile; Q75 = 75th percentile; Max = maximum).

Predictor variable	Min	Q25	Median	Mean	Q75	Max
Upstream catchment area (km^2)	1.3	37.7	189.5	712.3	636.1	14,103.5
Channel gradient ($^\circ \times 1{,}000$)	0.0	0.7	1.2	2.5	2.6	27.5
Water temperature (°C), predicted July mean	12.3	17.5	20.3	19.9	22.2	26.2
90% exceedance flow yield ($m^3 \cdot s^{-1} \cdot km^{-2} \times 1{,}000$)	0.1	1.2	2.7	3.4	4.9	13.5
50% annual exceedance flow (m^3/s)	0.0	0.2	1.0	5.5	4.6	110.8
50% exceedance flow in April (m^3/s)	0.0	0.7	3.2	12.4	11.6	215.6
10% annual exceedance flow (m^3/s)	0.0	0.9	5.4	18.7	15.8	290.3
Predicted base flow total phosphorus (μg/L)	8.4	14.9	28.9	37.8	51.5	165.7
Medium-grain surficial geology in the upstream riparian buffer (%)	0.0	0.0	0.0	15.0	25.6	100.0
Coarse and outwash geology in the upstream catchment (%)	0.0	37.5	81.4	67.5	99.0	100.0
Forest land cover in the local riparian zone (%)	1.7	54.7	70.8	65.8	82.7	99.1
Nonforested wetlands in the local riparian zone (%)	0.0	3.2	6.7	8.8	12.1	46.7
Upland forest cover in the local riparian zone (%)	0.0	14.1	24.0	28.2	39.1	85.3
Presence or absence of a dam downstream (0 or 1)	0.0	1.0	1.0	0.8	1.0	1.0
Distance to the nearest upstream dam (m/1,000)	0.1	7.7	25.7	52.1	100.0	100.0
Presence or absence of a dam upstream (0 or 1)	0.0	0.0	1.0	0.7	1.0	1.0

folds were used as test sets. The learning rate of each model was adjusted so that the cross-validation predictive deviance was minimized at between 1,500 and 3,500 trees.

A nonparametric permutation test was used to assess overall model significance. To implement this test, 1,000 data sets were created by randomizing the measured values of response variables. One-thousand models were run by using these data sets, and the cross-validation deviance of each model was recorded. The distribution of null deviance values was then compared to the model. The significance value (P) was calculated as the probability that the nonrandomized cross-validation deviance measured in the actual fishery was less than or equal to the mean of deviance values of all permutations assuming a standard normal distribution. After significance testing, the cross-validation results were used to examine (1) the precision of each fishery model based on the coefficient of determination (R^2); and (2) each model's accuracy based on the root mean square error (RMSE). The R^2 value was adjusted for the number of variables in each model relative to the number of observations (Theil 1961). The slope of the best-fit line between observed and predicted standing crop values was interpreted as a measure of model bias; residuals from the cross-validation calculations were plotted and examined for nonrandom structure and correlations with predictors to determine unmodeled input–output behavior.

A unique set of predictor variables was used to model each fishery based on a literature review of local habitat constraints on the species of interest (Supplementary Table S.1 available in the online version of this article). These constraining variables were then matched to our data set. In some cases, the habitat constraints could be represented directly from our data set by using modeled variables (e.g., temperature, phosphorus, and hydrology) or GIS-derived variables (e.g., sinuosity and channel gradient). In cases where local habitat constraints could not be represented directly, we attempted to identify suitable landscape proxies for the variable. Landscape proxies were established either as those with significant support from the analysis by Zorn and Wiley (2004) or as those with high correlation strengths to the corresponding local habitat variable in the Michigan Rivers Inventory (Table S.1).

Each predictor's relative importance for a model was expressed as the percentage of the total squared error improvement that could be attributed to that variable (Friedman 2001). We tested for the statistical significance of a TP effect by using a nonparametric permutation test in which 1,000 models were run with randomly reordered TP values while holding all other variables constant. Significance (P) was calculated as the probability that the relative importance of TP was greater than or equal to the mean relative importance value of all permutations assuming a standard normal distribution.

We interpreted partial dependence plots for each model to assess our hypotheses about the influence of TP concentration and the general effects of other variables. Partial dependence plots show the mean response of fish standing crops to a predictor after accounting for the average effects of all other predictors in the model (see Friedman and Meulman 2003). The y-axis of a partial dependence plot retains the original units of the response variable; thus, we were able to obtain insight into the magnitude of response that could be attributed to TP after controlling for the mean effects of other variables in the model. We used a bootstrap procedure whereby 1,000 models were run with a random selection of 75% of the data points to

establish the 95% confidence interval (CI) around each mean predicted partial dependence curve.

Standing crops were predicted to stream reaches and were mapped on a continuous scale. Although we did not train our models with samples collected in the UP, our LP samples encompassed a range of habitats similar to those found in the UP, so we felt justified in predicting fishery responses to landscape conditions there. We examined the precision of our reach-specific standing crop predictions by mapping the SD around the mean prediction from the bootstrap procedure described above.

RESULTS

Model Performance

All models were highly significant ($P < 0.0001$) when compared with a null distribution of predictive deviance values from the permutation test on randomized response variables. The BRT models explained between 50% and 87% of the variation in training data and between 22% and 56% of the variation in cross-validation data for the fisheries considered; on average, the models had relatively low RMSE values (Table 2). The strongest model was for panfishes, followed by Brook Trout and Smallmouth Bass, Brown Trout, and Walleye. Scatter plots of observed versus predicted standing crops showed that the pattern of zero-value observations had a strong influence on the slope of the best-fit line (Figure 2), thus leading to slightly negative intercepts and to characteristic patterns of residual distributions (Figure 3). Brook Trout and panfish models tended to overpredict the zero and low values of standing crop while underpredicting the higher standing crop observations (Figure 2), although slopes were close to 1.0 (Table 2). For the Brown Trout and Walleye models, the zero values were overpredicted, whereas many of the positive standing crop observations were underestimated. The Smallmouth Bass model did a better job at predicting zero-value observations than the Brook Trout and panfish models, and the best-fit line was well centered through the cloud of positive standing crop observations. Significant correlations between residuals and model predictors were not observed (at the $P <$ 0.05 level), suggesting that little to no additional variation in standing crop could be accounted for by our predictor set.

The overprediction of zero values resulted in residual plots with a characteristic pattern of negative residuals for zero-value observations, leading to a decreasing linear pattern of negative residuals in the lower left quadrant of each plot (Figure 3). This pattern indicates that our models tended to overpredict standing crops at sites where game fishes were not detected during sampling. Such a pattern may have resulted from including sites outside of the occupied range of each species, which would lead to overprediction of biomass values in potentially productive habitats that were unoccupied. Overprediction of biomass at sites with observed zero values may have also resulted from prediction to habitat conditions that are degraded by unmeasured variables. In our study, the primary anthropogenically influenced variable considered was TP, but some factors that are known to degrade fisheries potential (e.g., substrate embeddedness from fine sediments) could not be modeled. Thus, it is possible that observed zero-biomass values resulted from prediction outside of range boundaries, unmeasured stressors, or inefficient sampling. We believe that inefficient sampling was least likely to have been a factor, as intense sampling methods were used. To ameliorate inaccuracies associated with prediction outside of range limits, prior to mapping we masked our model predictions to only those river habitats that were predicted to be within the occupied range of each fishery as reported by Steen et al. (2008).

Relative Importance of Predictors

The predicted relative importance of variables was consistent with our understanding of controls on fish productivity in rivers. For instance, water temperature was the strongest predictor for all but the Walleye model, accounting for between 26% and 59% of the mean square error reduction in models of Brook Trout, Brown Trout, panfishes, and Smallmouth Bass (Table 3). Other variables with relatively high effect sizes included upstream catchment area, river flow, and TP concentration (Table 3). Total phosphorus concentrations had statistically significant effects for all models except the Walleye model (Table 2). The modeled relative importance of TP

TABLE 2. Model performance and results of significance tests (N = number of sampling sites used; % occupied = percentage of sampled sites with positive abundance; RMSE = root mean square error; training R^2 = adjusted R^2 for observed versus predicted values for training data; cross-val. R^2 = adjusted cross-validation R^2; % TP import = relative importance of total phosphorus [TP] in each model, expressed as a percentage; TP significance = statistical significance [P-values] of TP importance in the model as judged from a permutation test; NS = not significant).

Model	N	% occupied	RMSE	Training R^2	Cross-val. R^2	Slope	% TP import	TP significance
Brook Trout	335	61	0.82	0.69	0.43	1.20	18.70	<0.0001
Brown Trout	388	46	1.37	0.58	0.30	1.33	9.20	<0.05
Panfishes	397	17	0.89	0.76	0.55	1.16	9.00	<0.05
Smallmouth Bass	367	51	0.75	0.87	0.43	1.18	14.90	<0.001
Walleye	392	54	0.43	0.49	0.20	1.66	3.80	NS

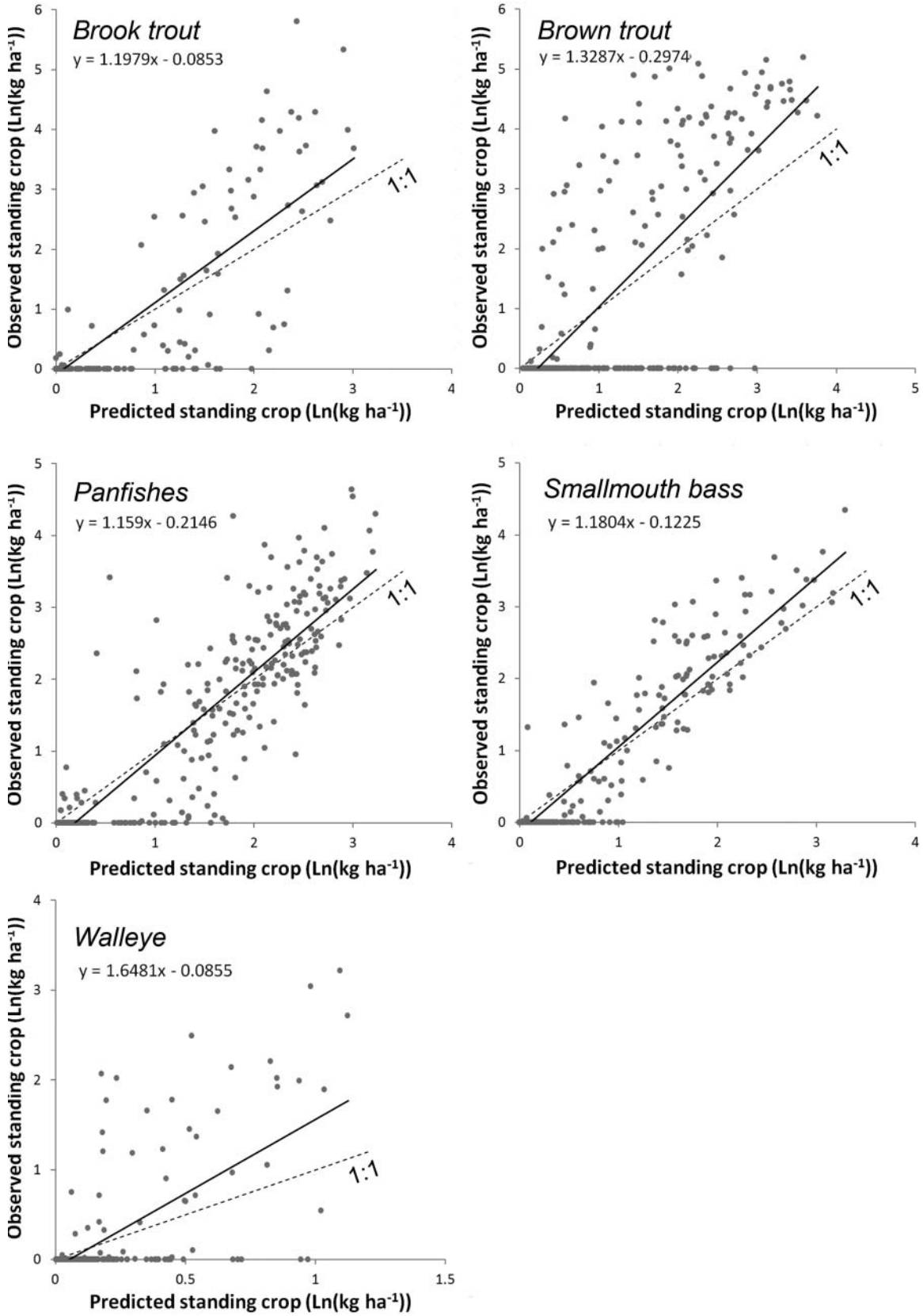

FIGURE 2. Observed versus predicted standing crops of Michigan game fishes for all sample data.

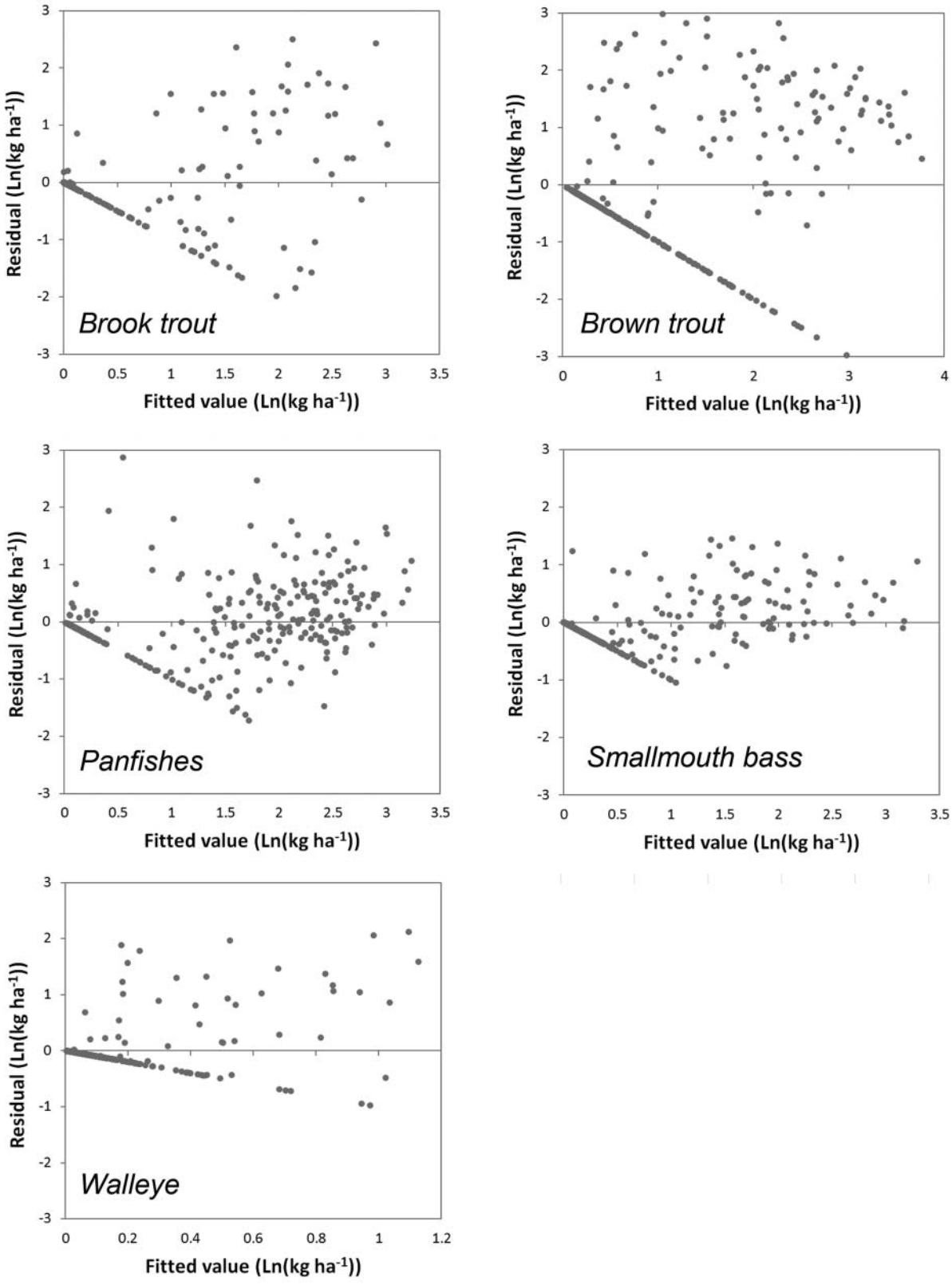

FIGURE 3. Residuals versus fitted values for predicted standing crops of game fishes in Michigan.

TABLE 3. Relative importance values of each predictor included in each species model expressed as a percentage of the total squared error improvement over all models. See Table S.1 for details about predictor selection for each model. A dash indicates that the predictor was not utilized for the model.

Predictor variable	Model				
	Brook Trout	Brown Trout	Panfishes	Smallmouth Bass	Walleye
Water temperature (°C), predicted July mean	58.7	29.6	55	26.1	10.4
Upstream catchment area (km^2)	8.7	7.6	4.7	23.8	30.4
Predicted base flow total phosphorus (μg/L)	18.7	9.2	9.0	14.9	3.8
90% exceedance flow yield ($m^3 \cdot s^{-1} \cdot km^{-2}$)	6.4	21.4	3.8	10.9	—
Channel gradient (°)	—	13.5	4.1	—	10.0
Forest land cover in the local riparian zone (%)	7.5	8.7	5.4	—	—
Medium-grain surficial geology in the upstream riparian buffer (%)	—	—	3.6	13.2	—
Nonforested wetlands in the local riparian zone (%)	—	—	6.1	—	7.3
50% exceedance flow in April (m^3/s)	—	—	—	—	29
Upland forest cover in the local riparian zone (%)	—	—	—	11.1	—
10% annual exceedance flow (m^3/s)	—	10.0	—	—	—
50% annual exceedance flow (m^3/s)	—	—	8.3	—	—
Distance to the nearest upstream dam (m)	—	—	—	—	4.7
Coarse and outwash geology in the upstream catchment (%)	—	—	—	—	3.3
Presence or absence of a dam downstream (0 or 1)	—	—	—	—	1.0
Presence or absence of a dam upstream (0 or 1)	—	—	—	—	1.0

ranged from 9% to 19% for all fishes except Walleyes (relative importance of TP = 3.8%). Relative importance values of TP were significantly greater than the null distribution for Brook Trout ($P < 0.0001$), Smallmouth Bass ($P < 0.001$), panfishes ($P < 0.05$), and Brown Trout ($P < 0.05$) according to the results of the permutation test on TP only.

Modeled Fish Responses to Predictors

Partial dependence plots illustrated the modeled influence of TP concentration (Figure 4) and the other predictors (Figure S.1) on the mean responses of fish standing crops and allowed us to examine our subsidy and stress hypotheses. Fish responses to TP agreed with our hypotheses for Brook Trout and Smallmouth Bass (predicted subsidy and stress responses), panfishes (subsidy responses only), and Walleyes (no response). In addition, the TP concentrations at which subsidy and stress responses occurred varied depending on the fishery. As hypothesized, the mean response of Brook Trout and Smallmouth Bass biomass increased to a peak at low TP concentrations and then declined to relatively low levels as TP increased. However, the subsidy effect was not statistically significant for Brook Trout because mean biomass at a TP concentration of 13 μg/L did not exceed the 95% CI for mean biomass at 8 μg TP/L (Figure 4). The decrease in Brook Trout biomass at TP values of 13 to 20 μg/L was statistically significant ($P < 0.05$). Smallmouth Bass biomass increased significantly between TP concentrations of 13 and 34 μg/L ($P < 0.05$) and decreased significantly at TP levels from 34 to 50 μg/L ($P < 0.05$), indicating that Smallmouth Bass are potentially less sensitive to the stressful effects of TP than are Brook Trout. The partial dependence plot for Smallmouth Bass (Figure 4) suggested that biomass increased at TP concentrations greater than 50 μg/L, but due to the wide 95% CI, the pattern was not significant relative to the minimum value.

Consistent with our hypothesis, panfish standing crops increased with increasing TP concentrations between 12 and 38 μg/L and thereafter remained at high levels (i.e., there was no obvious stress response across the range of TP concentrations studied). Contrary to expectations, Brown Trout exhibited a stress response to increased TP concentrations, as maximal biomass occurred at minimum TP concentrations and showed a declining trend as the TP level increased. Consistent with expectations, Walleye showed little response to TP, and 95% CIs were wide.

Partial responses to other variables revealed sometimes strongly nonlinear patterns of fish standing crops in relation to landscape constraints. For instance, fishery responses to temperature were strongly nonlinear: the two trout species presented distinct associations with streams having colder July mean temperatures (<18°C), while panfishes and Smallmouth Bass were associated with warmer waters (>22°C; Figure S.1). Brook Trout tended to occur in streams with small upstream drainage areas and benefited from local riparian forest cover that was greater than 90%. Brown Trout were predicted to benefit strongly from conditions with high discharge per unit area and higher channel gradients. Panfish biomass

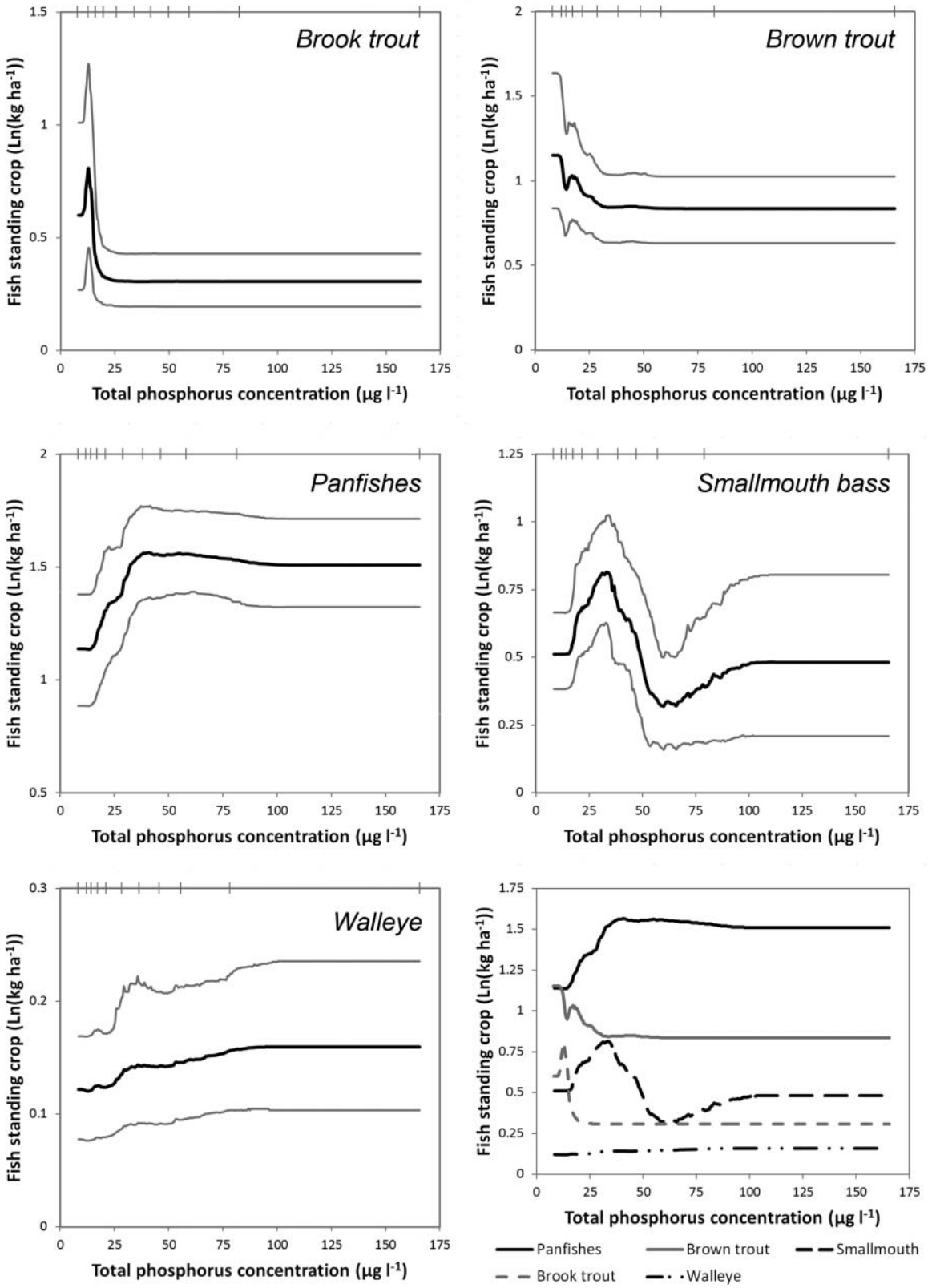

FIGURE 4. Partial dependence plots showing the predicted median response (black line) of target fisheries to predicted total phosphorus concentrations; the upper and lower boundaries of the 95% confidence interval (gray lines) are also shown. Small vertical lines at the top of each plot show the frequency distribution of sites (in deciles). The bottom right plot depicts the median responses for all fisheries on the same response scale.

was greatest in habitats with low median annual discharge magnitudes, higher proportions of nonforested wetland, and less forest cover within the local riparian buffer. Smallmouth Bass were constrained to warmwater streams with drainage areas greater than about 3,500 km^2 and higher proportions of medium-textured surface geology in the upstream riparian corridor. Medium-textured geology in the upstream landscape may translate to greater availability of cobble substrates in local habitats, which has been positively associated with Smallmouth Bass biomass (Zorn et al. 2004). Walleye biomass was predicted to be greatest in streams with large upstream catchments (>4,000 km^2) and high April flow volumes.

Maps of Results

Brown Trout were predicted to have the highest maximum biomass, followed by panfishes, Smallmouth Bass, Brook Trout, and Walleyes. However, predicted biomasses of panfishes and Brook Trout measured across their entire range in Michigan had higher means and medians than the biomasses of the other fisheries, including Brown Trout (Table 4). Brook Trout biomass was predicted to be greatest in the coldwater streams and rivers of the northern LP and streams draining north to Lake Superior in the UP (Figure 5). Streams with higher standing crop predictions corresponded well to those listed as "trout streams" and "Blue Ribbon trout streams" (www.trailstotrout.com/blueribbon.html) by the Michigan Department of Natural Resources (MDNR 2010). Brown Trout were predicted to occur at low relative biomass in streams throughout most of the LP, with patchy areas of higher biomass. Panfishes, a warmwater group, were predicted to be most abundant in small and large streams across the southern portion of LP, particularly in the southeast. Smallmouth Bass were predicted to be limited to main-stem habitats in larger rivers of the state, where warmer waters predominate. Walleye were predicted to occur at low biomass relative to the other species and to be limited primarily to main-stem rivers of the UP and western LP, but to inhabit smaller tributary systems bordering Saginaw Bay, Lake St. Clair, and Lake Erie.

Maps showing the uncertainty of our predictions enabled us to determine the streams and landscape contexts for which our predictions were least and most precise (Figure 6). The SDs of Brook Trout and Brown Trout biomass estimates were relatively low (<0.5 kg/ha) for coldwater habitats of the northern LP and parts of the UP, whereas SDs were higher in the southern portion of the LP, where trout are generally known to be scarce. The majority of panfish standing crop estimates fell within ±0.25 kg/ha of the predicted value, particularly within main-stem rivers. Smallmouth Bass standing crop estimates tended to have SDs less than 0.5 kg/ha, except for small tributary streams at the margins of their occupied habitats. There was slightly greater variation around the mean predictions of Walleye standing crop, which was expected because the Walleye model was the least precise of the models we examined (Table 2). The low precision of the Walleye model may result from the fact that Walleyes are sampled when they migrate into river habitats to spawn, so their abundances in resident and migratory habitats have a high degree of spatiotemporal variability (Pritt et al. 2013).

DISCUSSION

We used statistical models to map the capacity of riverine habitats in Michigan to support fish biomass. Our models explained a relatively high proportion of variation in training (50–87%) and test (22–56%) data sets; despite their limitations (discussed below), the models may provide a useful tool for spatially extensive fisheries valuation, management planning, or other applications. Maps of reach-specific standing crop predictions for Michigan showed spatially structured patterns of predicted fish biomass that corresponded to spatial patterns in water temperature, land cover, and nutrient availability. Water temperatures are colder in the UP and northern LP, where trout were predicted to have higher standing crops, whereas temperatures are warmer in the southern LP, where Smallmouth Bass and panfishes occurred at high biomass densities.

Our results corroborate the findings of other studies that have examined ecological controls on fishes. Those studies established that stream temperature and hydrology (Fausch

TABLE 4. Summary statistics for the predicted standing crop of game fishes across all stream reaches in Michigan (Min = minimum; Q25 = 25th percentile; Q75 = 75th percentile; Max = maximum). Percentage occupancy is given in parentheses.

		Predicted standing crop (kg/ha)					
Fishery	Occupancy (km)	Min	Q25	Median	Mean	Q75	Max
Brook Trout	30,321 (31)	0.00	0.73	3.25	4.40	6.95	25.42
Brown Trout	39,488 (43)	0.00	0.31	0.73	2.47	2.47	53.91
Panfishes	39,943 (44)	0.03	2.30	5.92	6.28	8.52	30.18
Smallmouth Bass	6,022 (7)	0.00	1.06	2.41	3.34	4.77	25.87
Walleye	10,694 (12)	0.01	0.16	0.22	0.34	0.283	2.22

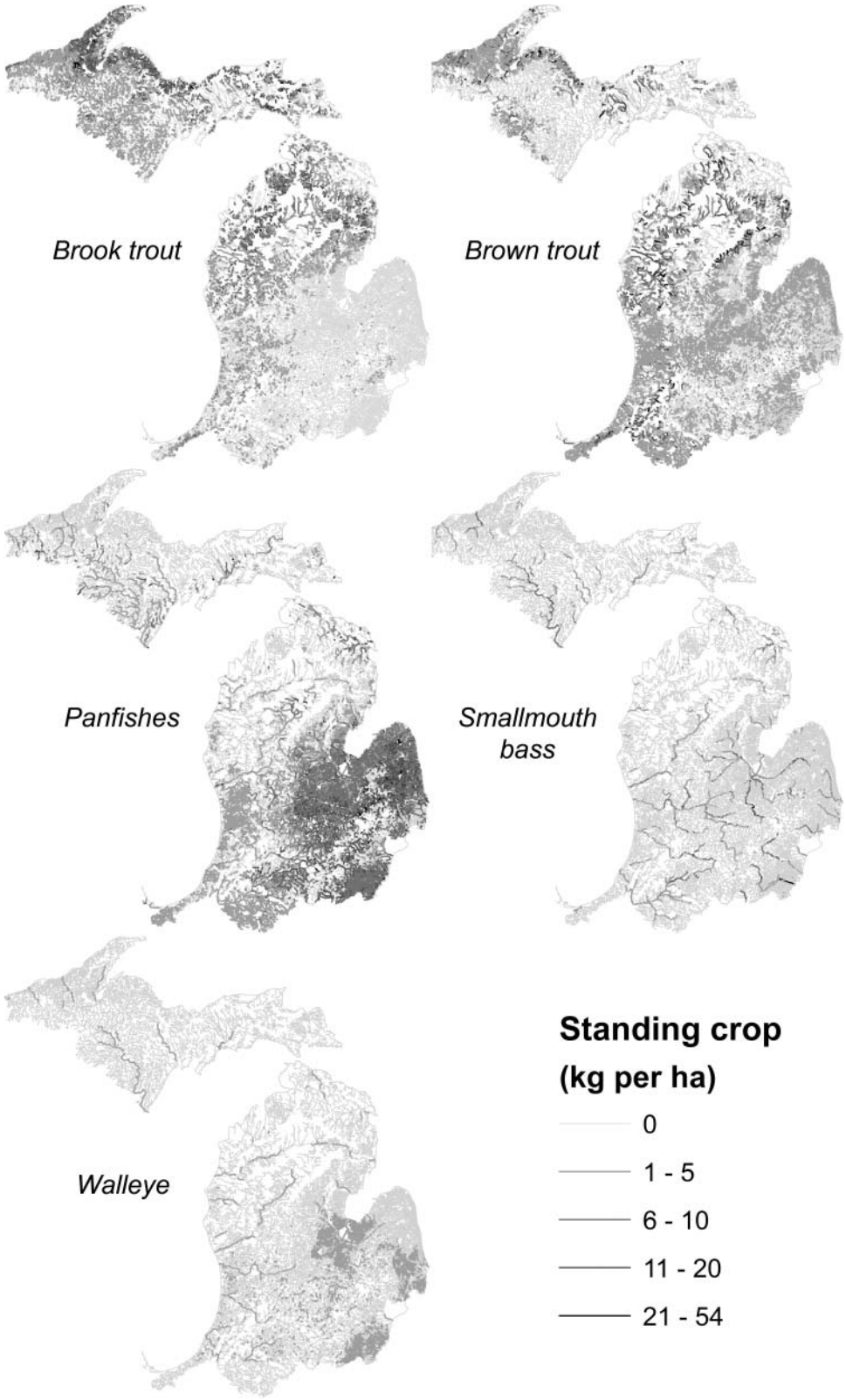

FIGURE 5. Spatial expression of model predictions mapped to individual stream segments in Michigan. Standing crops for each game fish are displayed on a common scale to allow direct comparison of biomass estimates. Reaches with zero predicted biomass and those predicted to be unoccupied by Steen et al. (2008) are not shown.

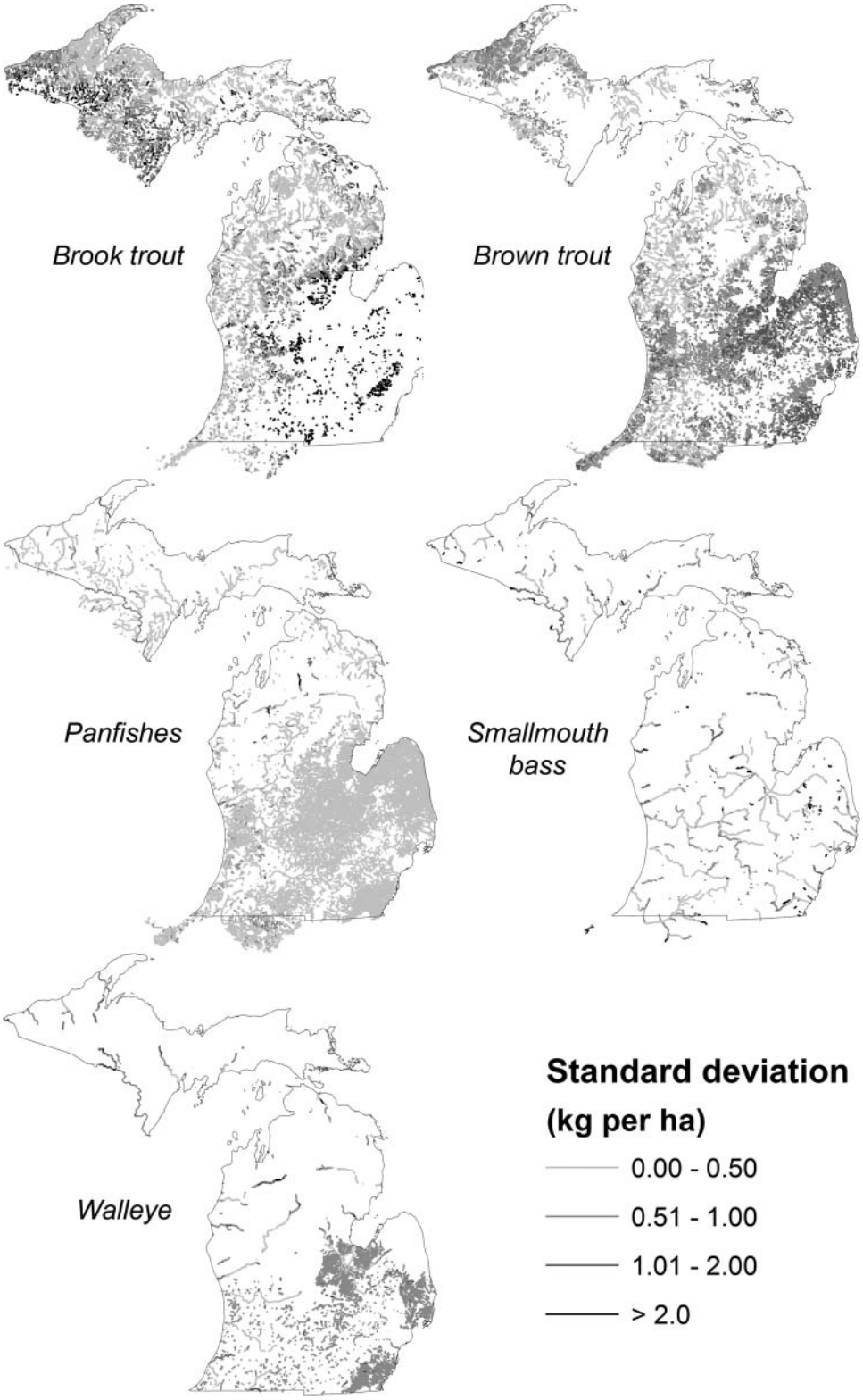

FIGURE 6. Estimated precision of game fish standing crop predictions for individual stream segments in Michigan, calculated as the SD around the mean predicted standing crop from 1,000 bootstrap samples of the training data. Reaches with zero predicted biomass and those predicted to be unoccupied by Steen et al. (2008) are not shown.

et al. 1988; Lyons et al. 1996; Peterson and Kwak 1999; Stoneman and Jones 2000; Zorn et al. 2002; Creque et al. 2005; McRae and Diana 2005; Steen et al. 2008; Brewer and Rabeni 2011) as well as concentrations of limiting nutrients (Johnston et al. 1990; Hoyer and Canfield 1991; Waite and Carpenter 2000) are important influences on fish distributions and biomass across broad spatial extents. The fact that stream temperatures, hydrology, and nutrient concentrations were all modeled as local-scale variables emphasizes an important point made by de Groot et al. (2010): that the supply and management of ecosystem services must be approached as a problem that incorporates drivers across a range of scales. Our results suggest that incorporating reach-specific information—even if the information is modeled—can be advantageous for the accuracy and ecological realism of predictive models.

Modeled fish responses to TP and other predictors (water temperature, hydrology, drainage area, and riparian land cover) were frequently nonlinear, exhibiting threshold, asymptotic, and hump-shaped responses (Figures 4, S.1). For instance, hump-shaped responses to TP concentration were evident for both Brook Trout and Smallmouth Bass, suggesting that TP subsidizes productivity to an optimum level after which stress effects become evident. A positive asymptotic relationship between panfishes and nutrient concentrations was apparent, suggesting subsidy effects only and a tolerance of high nutrient conditions (Figure 4). Previous studies have documented significant subsidy effects of growth-limiting nutrients on fishes, but few studies have documented stress effects. Strong experimental (Johnston et al. 1990; Peterson et al. 1993; Slaney et al. 2003), isotopic (deBruyn et al. 2003), and observational (Merron 1982; Askey et al. 2007) evidence supports bottom-up energetic subsidies as the likely mechanism by which nutrient enrichment benefits fish in rivers by increasing available food resources. In a study of Ohio streams, Miltner and Rankin (1998) observed the highest fish abundances at intermediate nutrient concentrations, whereas abundances of sensitive species were reduced at higher concentrations. Smallmouth Bass and Brook Trout have both been shown to be sensitive to habitat degradation (Sowa and Rabeni 1995; Argent and Flebbe 1999; Curry and MacNeill 2004; Stranko et al. 2008; Brewer and Rabeni 2011; Brewer 2013), pointing to one mechanism by which nutrient enrichment could be a stressor on fish. High concentrations of growth-limiting plant nutrients have been linked to an excessive growth of algae, macrophytes, and phytoplankton, which in turn can change habitat structure, flow velocities, dissolved oxygen concentration, and pH (Welch et al. 1992; Dodds and Biggs 2002). Other possible mechanisms for stress responses in Brook Trout and Smallmouth Bass include changes in insect prey availability (Miltner and Rankin 1998) and/or increased abundances of fish pathogens (e.g., *Pseudomonas*, *Aeromonas*, and myxobacteria) in eutrophic waters (Snieszko 1974). Although plausible mechanisms exist to support the subsidy stress responses observed, our findings were not derived from a controlled study but from an observational study, so they must be interpreted with caution due to our inability to account for potentially confounding stressors (e.g., fine sediment and habitat simplification) that co-occur with elevated nutrient concentrations (Carpenter et al. 1998; Smith et al. 2003).

Although not framed from an ecosystem services perspective per se, several other studies have modeled game fish abundances or biomass by using landscape-scale data (Sowa and Rabeni 1995; Zorn et al. 2004; Creque et al. 2005; McKenna et al. 2006; Stanfield et al. 2006; Steen et al. 2008; McKenna and Johnson 2011). Our study differed from these prior studies in terms of methods and response variables as well as the modeling approaches used. Choices of sampling methods and response variables are potentially important because not all methods for quantifying fishes are equally well suited to measure fish productivity as a provisioning service of ecosystems. For instance, Stanfield et al. (2006) used fish numeric densities (number per unit area) from single-pass electrofishing without any corrections for inefficient sampling. Numeric density is known to have higher interannual variation than biomass, and single-pass electrofishing provides a minimal estimate of the total abundance of each species at a site. Incomplete abundance estimates add an element of uncertainty to predictions of fish as a provisioning service and therefore would make maps less reliable. The depletion estimates, mark–recapture, and rotenone sampling used for this study and other studies (Sowa and Rabeni 1995; Zorn et al. 2004; Creque et al. 2005; Steen et al. 2008) provide estimates of total numeric abundance or biomass of the sampled population and thus offer a more objective basis for drawing conclusions about fish availability to anglers. Several authors (Steen et al. 2008; McKenna and Johnson 2011) chose to discretize continuous fish densities into log-scale abundance categories (0, 1–10, 10–100, and >100 fish/unit area). Although this approach may lead to improved goodness of fit by reducing variation in the response variable, modeling of continuous responses provides the potential for a better contrast in biomass between segments (Stanfield et al. 2006).

Our models performed favorably in comparison with other landscape models of abundances for the same game fish species (Sowa and Rabeni 1995; Zorn et al. 2004; Creque et al. 2005; Stanfield et al. 2006). Our Brook Trout model (training $R^2 = 0.68$; cross-validation $R^2 = 0.43$) explained more variation than the models of Creque et al. (2005; adjusted $R^2 = 0.23$) and Stanfield et al. (2006; adjusted $R^2 = 0.30$) and was comparable to the model of Zorn et al. (2004; $R^2 = 0.47$). Like other investigators, we found that Brown Trout were more difficult to model using landscape data than were Brook Trout. The performance of our Brown Trout model (training $R^2 = 0.58$; cross-validation $R^2 = 0.30$) and those of Stanfield et al. (2006; adjusted $R^2 = 0.12$) and Zorn et al. (2004; $R^2 = 0.36$) was low relative to the performance of the other models tested in each of the studies. Brown Trout may be challenging to model because they are nonindigenous fish that are actively

stocked in some, but not all, places. Stocking of Brown Trout could lead to inflated standing crop estimates in some locations and therefore could increase the error variance for landscape models of trout productivity. Without spatially explicit information about where and how many Brown Trout were stocked, it was not possible for us to accommodate this aspect of their distribution and biomass. In contrast to our Brown Trout model, relatively strong Smallmouth Bass models were specified in our study (training $R^2 = 0.87$; cross-validation $R^2 = 0.43$) and in the studies by Zorn et al. (2004; $R^2 = 0.51$) and Sowa and Rabeni (1995; adjusted $R^2 = 0.49$). Neither our study nor the Zorn et al. (2004) study was able to specify a strong model for Walleye distributions.

Although our models compared favorably with other published models, they have several notable biases and weaknesses. For instance, our models tended to overpredict standing crops at sites where sampling yielded zero biomass of game fishes (Figures 2, 3). This problem was also experienced by Zorn et al. (2004), who used a similar response data set. To avoid mapping biomass to unoccupied areas, we masked our predictions to only those reaches predicted to be occupied based on the work of Steen et al. (2008). It is possible that the inclusion of additional fish population stressors in future models could account for some of the observed zero values in the data set. Other models specifically formulated for such zero-inflated data (e.g., zero-inflated Poisson models; Lambert 1992; Wenger and Freeman 2008) may also be useful. However, zero-inflated Poisson models were not appropriate for the current study because of our interest in exploring possible nonlinear subsidy and stress responses to which BRTs are very well suited. For interpretation of our maps, the implication of overpredicting zero values is that low biomass values may in reality represent zero-biomass values and thus should be interpreted conservatively. In contrast, intermediate and high biomass values were relatively accurate for panfishes and Smallmouth Bass and were generally conservative for Brook Trout and Brown Trout. Therefore, intermediate and high values on our maps can be interpreted more reliably as average or conservative estimates of biomass density.

Two issues associated with our predictor and response data sets have implications for model accuracy. First, our response data were collected over a 13-year time span and thus give only a general picture of the capacity of habitats to support fish biomass that is not referenced to a specific time or population year-class. In reality, cohort density of some species (e.g., Smallmouth Bass) can fluctuate as much as 500% between years in relation to environmental conditions during the first year of life (Coble 1975). The fish biomass density in a specific river reach on a specific day may not correspond to our prediction because we could not account for year-class variation or other temporal effects. Second, our use of modeled predictor variables (water temperature, hydrology, and TP) introduces an additional source of error and unexplained variance. For instance, temperature model predictions were generally within 1°C or 2°C of actual weekly mean temperatures (Wehrly et al. 2003), but given the strong nonlinearities observed in response to temperature and several other variables, this amount of error could affect the accuracy of our mapped model predictions.

In addition to issues associated with model specification and data sets, fish life histories and interspecific interactions can create challenges for modeling fish biomass with high precision and accuracy. For example, Brook Trout and Brown Trout are known to make long-distance movements from the Great Lakes to river habitats to spawn in the fall (Horrall 1981). Migratory Brook Trout were likely absent from our samples because their remnant populations are primarily found in Lake Superior, where no samples were gathered. Migratory behavior by Brown Trout would tend to decrease the accuracy of our models, which assume that the fish reside (and are thus available to anglers) at the location where they were sampled. Interspecific competition is potentially important for models of Brook Trout and Brown Trout because competition for space and food between these species has been documented (Fausch and White 1981; McKenna et al. 2013). We did not model this potential biotic interaction for three reasons. First, in order to generalize from a model with biotic interactions included, we would have had to use modeled Brook Trout and Brown Trout abundances, both of which had substantial prediction error. Second, Zorn et al. (2004) found that incorporating Brook Trout into a Brown Trout model or vice versa explained little additional variability in standing stocks. Third, landscape-scale abundances are largely controlled by abiotic gradients that limit the fitness of populations. Incorporating a competitor with a similar niche would have obscured these important relationships and our ability to learn from them. One implication of not accounting for potential competitors is that trout biomass may be overestimated in areas where the species co-occur. The nonuniform distribution of Brown Trout relative to Brook Trout (i.e., due to stocking) may also contribute to model inaccuracies.

Although there has been much focus on mapping the biophysical supply of ecosystem services (Chan et al. 2006; Gimona and van der Horst 2007; Egoh et al. 2008; Meyer and Grabaum 2008; Kienast et al. 2009) and/or service value (Naidoo and Ricketts 2006; Nelson et al. 2009), relatively few studies in the ecosystem services literature have used robust field data, subjected their models to validation, quantified the uncertainty in their biophysical or ecosystem service estimates, or provided "a sound basis for the conclusions they draw" (Seppelt et al. 2011). Our study did use robust field data with reliable population estimates, thus providing a snapshot of the system over time. We mapped model uncertainty in a spatially explicit way (Figure 6) that can help managers to determine where our model predictions are highly precise and where additional sampling may be needed to strengthen the model results. Maps of uncertainty suggested that our model predictions were most precise for habitats that were most suitable to fisheries.

This result further reinforces the notion that our moderate to high biomass estimates are reliable, whereas our low estimates should be interpreted conservatively, particularly for the trout species. The internal cross-validation procedure that we used could be improved (1) if independent field data become available or (2) through targeted sampling for the express purpose of model validation (sensu McKenna and Johnson 2011). Notwithstanding future improvements, our models are transparent and, more importantly, do not rely on overly simplified relationships, assumed production functions, or indirect proxies for the service of interest, as is common in the ecosystem services literature (Chan et al. 2006; Naidoo and Ricketts 2006; Troy and Wilson 2006; Egoh et al. 2008).

Our models and maps have numerous potential uses for fisheries managers to examine the productive potential of streams, describe geographic patterns of fisheries, and identify habitats that are candidates for stocking or restoration of locally extirpated stocks (Brewer et al. 2007). Our models also have utility for landscape nutrient management. Excessive anthropogenic nutrients in surface waters are a water quality management priority throughout the world because they are a primary source of impairment to freshwater ecosystems (Plessis and Veelen 1991; USEPA 1996; Smith et al. 1999; Davies and Jackson 2006). In North America, nutrient levels are regulated under the Clean Water Act of 1972 to be protective of designated stream uses such as "fish, shellfish, and wildlife" (USEPA 2000). Nutrient management targets are often set for streams according to the effects they have on aquatic life, and these targets must be quantitatively justified (Dodds and Welch 2000; USEPA 2000). Our results suggest that the biomasses of Brook Trout and Smallmouth Bass in Michigan streams may be maximized at TP concentrations of 13 and 34 μg/L, respectively, and that higher concentrations may have detrimental effects on biomass. Our models also suggest that panfish biomass is maximized at about 45 μg/L, whereas higher concentrations confer no additional production benefit upon the fishery. These concentrations could potentially serve as benchmarks that provide some level of desired protection to streams in support of fisheries management and management for ecosystem services (Davies and Jackson 2006; Stevenson et al. 2008). Future efforts will be necessary to distinguish among the indirect effects of phosphorus and covarying factors (e.g., fine sediment) as causal mechanisms for the game fish declines associated with higher nutrient concentrations in our study.

Developing a predictive understanding of landscape controls on spatial variability in game fish productivity is a critical research endeavor that can support economic valuation, examination of tradeoffs between ecosystem services, and spatial planning for efficient species conservation and exploitation (Heal et al. 2005). We trained BRT models for defining ecological production functions that predict an output of ecosystem services produced by Michigan rivers. However, societal benefits of fish biomass availability in Michigan rivers can only be determined by considering human demand for the service (Tallis and Polasky 2009). Until our fish standing crop estimates are connected to beneficiaries, we cannot draw detailed conclusions about the benefit or value of this ecosystem service to society. Thus, the essential next step for this research is to quantify angler behaviors relative to fish biomass availability and to assign values to biomass in the rivers where it is produced (see companion paper by Melstrom et al. 2015). With biophysical and economic information in hand, sport fishery managers should be able to utilize new spatial knowledge to improve fisheries management to the benefit of anglers.

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REFERENCES

Argent, D. G., and P. A. Flebbe. 1999. Fine sediment effects on Brook Trout eggs in laboratory streams. Fisheries Research 39:253–262.

Askey, P. J., L. K. Hogberg, J. R. Post, L. J. Jackson, T. Rhodes, and M. S. Thompson. 2007. Spatial patterns in fish biomass and relative trophic level abundance in a wastewater enriched river. Ecology of Freshwater Fish 16:343–353.

Boyd, J., and S. Banzhaf. 2007. What are ecosystem services? The need for standardized environmental accounting units. Ecological Economics 63:616–626.

Brenden, T., and coauthors. 2006. A GIS framework for collecting, managing, and analyzing multiscale landscape variables across large regions for river conservation and management. Pages 49–74 *in* R. M. Hughes, L. Wang, and P. W. Seelbach, editors. Landscape influences on stream habitats and biological assemblages. American Fisheries Society, Symposium 48, Bethesda, Maryland.

Brewer, S. K. 2013. Channel unit use by Smallmouth Bass: do land-use constraints or quantity of habitat matter? North American Journal of Fisheries Management 33:351–358.

Brewer, S. K., and C. F. Rabeni. 2011. Interactions between natural-occurring landscape conditions and land use influencing the abundance of riverine Smallmouth Bass, *Micropterus dolomieu*. Canadian Journal of Fisheries and Aquatic Sciences 68:1922–1933.

Brewer, S. K., C. F. Rabeni, S. P. Sowa, and G. Annis. 2007. Natural landscape and stream segment attributes influencing the distribution and relative abundance of riverine Smallmouth Bass in Missouri. North American Journal of Fisheries Management 27:326–341.

Carpenter, S. R., N. F. Caraco, D. L. Correll, R. W. Howarth, A. N. Sharpley, and V. H. Smith. 1998. Nonpoint pollution of surface waters with phosphorus and nitrogen. Ecological Applications 8:559–568.

Chan, K. M. A., M. R. Shaw, D. R. Cameron, E. C. Underwood, and G. C. Daily. 2006. Conservation planning for ecosystem services. PloS (Public Library of Science) Biology [online serial] 4(11):2138–2152.

Coble, D. W. 1975. Smallmouth Bass. Pages 21–33 *in* H. Clepper, editor. Black bass biology and management. Sport Fishing Institute, Washington, D.C.

Cooper, G. P., and J. R. Ryckman. 1981. Population estimates by mark-and-recapture. Appendix *in* J. W. Merna, J. C. Schneider, G. R. Alexander, W. D. Alward, and R. L. Eshenroder, editors. Manual of fisheries survey methods. Michigan Department of Natural Resources, Fisheries Management Report 9, Ann Arbor.

Creque, S. M., E. S. Rutherford, and T. G. Zorn. 2005. Use of GIS-derived landscape-scale habitat features to explain spatial patterns of fish density in Michigan rivers. North American Journal of Fisheries Management 25:1411–1425.

Curry, R. A., and W. S. MacNeill. 2004. Population-level responses to sediment during early life in Brook Trout. Journal of the North American Benthological Society 23:140–150.

Davies, S. P., and S. K. Jackson. 2006. The biological condition gradient: a descriptive model for interpreting change in aquatic ecosystems. Ecological Applications 16:1251–1266.

de Groot, R. S., R. Alkemade, L. Braat, L. Hein, and L. Willemen. 2010. Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. Ecological Complexity 7:260–272.

deBruyn, A. M. H., D. J. Marcogliese, and J. B. Rasmussen. 2003. The role of sewage in a large river food web. Canadian Journal of Fisheries and Aquatic Sciences 60:1332–1344.

Diana, J. S. 2004. Biology and ecology of fishes, 2nd edition. Cooper Publishing Group, Traverse City, Michigan.

Dodds, W. K., and B. J. F. Biggs. 2002. Water velocity attenuation by stream periphyton and macrophytes in relatino to growth form and architecture. Journal of the North American Benthological Society 21:2–15.

Dodds, W. K., and E. B. Welch. 2000. Establishing nutrient criteria in streams. Journal of the North American Benthological Society 19:186–196.

Egoh, B., B. Reyers, M. Rouget, D. M. Richardson, D. C. Le Maitre, and A. S. van Jaarsveld. 2008. Mapping ecosystem services for planning and management. Agriculture Ecosystems and Environment 127:135–140.

Elith, J., J. R. Leathwick, and T. Hastie. 2008. A working guide to boosted regression trees. Journal of Animal Ecology 77:802–813.

Fausch, K. D., C. L. Hawkes, and M. G. Parsons. 1988. Models that predict standing crop of stream fish from habitat variables: 1950-85. U.S. Forest Service General Technical Report PNW-GTR-213.

Fausch, K. D., and R. J. White. 1981. Competition between Brook Trout (*Salvelinus fontinalis*) and Brown Trout (*Salmo trutta*) for positions in a Michigan stream. Canadian Journal of Fisheries and Aquatic Sciences 38:1220–1227.

Friedman, J. H. 2001. Greedy function approximation: a gradient boosting machine. Annals of Statistics 29:1189–1232.

Friedman, J. H., and J. J. Meulman. 2003. Multiple additive regression trees with application in epidemiology. Statistics in Medicine 22:1365–1381.

Frissell, C. A., W. J. Liss, C. E. Warren, and M. D. Hurley. 1986. A hierarchical framework for stream habitat classification: viewing streams in a watershed context. Environmental Management 10:199–214.

Gido, K. B., J. A. Falke, R. M. Oakes, and K. J. Hase. 2006. Fish-habitat relations across spatial scales in prairie streams. Pages 265–285 *in* R. M. Hughes, L. Wang, and P. W. Seelbach, editors. Landscape influences on stream habitats and biological assemblages. American Fisheries Society, Symposium 48, Bethesda, Maryland.

Gimona, A., and D. van der Horst. 2007. Mapping hotspots of multiple landscape functions: a case study on farmland afforestation in Scotland. Landscape Ecology 22:1255–1264.

GLSC (Great Lakes Science Center). 2006. The Great Lakes aquatic GAP project. U.S. Geological Survey, Ann Arbor, Michigan.

Hart, D. D., and C. T. Robinson. 1990. Resource limitation in a stream community: phosphorus enrichment effects on periphyton and grazers. Ecology 71:1494–1502.

Heal, G. M., E. B. Barbier, K. J. Boyle, A. P. Covich, S. P. Gloss, C. H. Hershner, J. P. Hoehn, C. P. Pringle, S. Polasky, and K. Segerson. 2005. Valuing ecosystem services: toward better environmental decision-making. National Academies Press, Washington, D.C.

Hokanson, K. E. F. 1977. Temperature requirements of some percids and adaptations to seasonal temperature cycle. Journal of the Fisheries Research Board of Canada 34:1524–1550.

Horrall, R. M. 1981. Behavioral stock-isolating mechanisms in Great Lakes fishes with special reference to homing and site imprinting. Canadian Journal of Fisheries and Aquatic Sciences 38:1481–1496.

Hoyer, M. V., and D. E. Canfield Jr. 1991. A phosphorus-fish standing crop relationship for streams? Lake and Reservoir Management 7:25–32.

Johnson, B. L., D. L. Smith, and F. R. Carline. 1988. Habitat preferences, survival, growth, foods, and harvests of Walleye and Walleye × Sauger hybrids. North American Journal of Fisheries Management 8:292–304.

Johnston, N. T., C. J. Perrin, P. A. Slaney, and B. R. Ward. 1990. Increased juvenile salmonid growth by whole-river fertilization. Canadian Journal of Fisheries and Aquatic Sciences 47:862–872.

Jones, D. R., J. W. Kiceniuk, and O. S. Bamford. 1974. Evaluation of swimming performance of several fish species from Mackenzie River. Journal of the Fisheries Research Board of Canada 31:1641–1647.

Kienast, F., J. Bolliger, M. Potschin, R. S. de Groot, P. H. Verburg, I. Heller, D. Wascher, and R. Haines-Young. 2009. Assessing landscape functions with broad-scale environmental data: insights gained from a prototype development for Europe. Environmental Management 44:1099–1120.

Kleiman, R. 1995. Modeling water quality in Michigan rivers from landscape variables. Master's thesis. University of Michigan, Ann Arbor.

Kotchen, M., M. Moore, F. Lupi, and E. Rutherford. 2006. Environmental constraints on hydropower: an ex-post benefit-cost analysis of dam relicensing in Michigan. Land Economics 82:384–403.

Lambert, D. 1992. Zero-inflated poisson regression, with an application to defects in manufacturing. Technometrics 34:1–14.

Lyons, J., L. Wang, and T. D. Simonson. 1996. Development and validation of an index of biotic integrity for coldwater streams in Wisconsin. North American Journal of Fisheries Management 16:241–256.

McKenna, J. E. Jr., and J. H. Johnson. 2011. Landscape models of Brook Trout abundance and distribution in lotic habitat with field validation. North American Journal of Fisheries Management 31:742–756.

McKenna, J. E. Jr., R. P. McDonald, C. Castiglione, S. S. Morrison, K. P. Kowalski, and D. R. Passino-Reader. 2006. A broadscale fish–habitat model development process: Genesee basin, New York. Pages 533–554 *in* R. M. Hughes, L. Wang, and P. W. Seelbach, editors. Landscape influences on stream habitats and biological assemblages. American Fisheries Society, Symposium 48, Bethesda, Maryland.

McKenna, J. E. Jr., M. T. Slattery, and K. M. Clifford. 2013. Broad-scale patterns of Brook Trout responses to introduced Brown Trout in New York. North American Journal of Fisheries Management 33:1221–1235.

McRae, B. J., and J. S. Diana. 2005. Factors influencing density of age-0 Brown Trout and Brook Trout in the Au Sable River, Michigan. Transactions of the American Fisheries Society 134:132–140.

MDNR (Michigan Department of Natural Resources). 2010. Michigan trout lakes and streams 2008. MDNR, Institute for Fisheries Research, Ann Arbor.

Melstrom, R. T., and F. Lupi. 2013. Valuing recreational fishing in the Great Lakes. North American Journal of Fisheries Management 33:1184–1193.

Melstrom, R. T., F. Lupi, P. C. Esselman, and R. J. Stevenson. 2015. Valuing recreational fishing quality at rivers and streams. Water Resources Research 51:140–150.

Merron, G. S. 1982. Growth rate of Brown Trout (*Salmo trutta*) in areas of the Au Sable River, Michigan, before and after domestic sewage diversion. Michigan Department of Natural Resources, Fisheries Research Report 1900, Ann Arbor.

Meyer, B. C., and R. Grabaum. 2008. MULBO: model framework for multicriteria landscape assessment and optimisation, a support system for spatial land use decisions. Landscape Research 33:155–179.

Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: synthesis. Island Press, Washington, D.C.

Miltner, R. J., and E. T. Rankin. 1998. Primary nutrients and the biotic integrity of rivers and streams. Freshwater Biology 40:145–158.

Naidoo, R., and T. H. Ricketts. 2006. Mapping the economic costs and benefits of conservation. PloS (Public Library of Science) Biology [online serial] 4 (11):2153–2164.

Nelson, E., G. Mendoza, J. Regetz, S. Polasky, H. Tallis, D. R. Cameron, K. M. A. Chan, G. C. Daily, J. Goldstein, P. M. Kareiva, E. Lonsdorf, R. Naidoo, T. H. Ricketts, and M. R. Shaw. 2009. Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. Frontiers in Ecology and the Environment 7:4–11.

Olcott, P. G. 1992. Groundwater atlas of the United States: Iowa, Michigan, Minnesota, Wisconsin. U.S. Geological Survey, Reston, Virginia.

Page, L. M., and B. M. Burr. 1991. A field guide to freshwater fishes: North America north of Mexico. Houghton Mifflin, New York.

Peterson, B. J., L Deegan, J. Helfrich, J. E. Hobbie, M. Hullar, B. Moller, T. E. Ford, A. Hershey, A. Hiltner, G. Kipphut, M. A. Lock, D. M. Fiebig, V. McKinley, M. C. Miller, J. R. Vestal, R. Ventullo, and G. Volk. 1993. Biological responses of a tundra river to fertilization. Ecology 74:653–672.

Peterson, J. T., and T. J. Kwak. 1999. Modeling the effects of land use and climate change on riverine Smallmouth Bass. Ecological Applications 9:1391–1404.

Plessis, H., and M. Veelen. 1991. Water quality: salinization and eutrophication time series trends in South Africa. South African Journal of Science 87:11–16.

Poff, N. L. 1997. Landscape filters and species traits: towards mechanistic understanding and prediction in stream ecology. Journal of the North American Benthological Society 16:391–409.

Pritt, J. J., M. R. DuFour, C. M. Mayer, P. M. Kocovsky, J. T. Tyson, E. J. Weimer, C. S. Vandergoot. 2013. Including independent estimates and uncertainty to quantify total abundance of fish migrating in a large river system: Walleye (*Sander vitreus*) in the Maumee River, Ohio. Canadian Journal of Fisheries and Aquatic Sciences 70:803–814.

R Development Core Team. 2013. R: a language and environment for statistical computing. R Foundation for Statistical Computing, Vienna.

Rahel, F. J., and W. A. Hubert. 1991. Fish assemblages and habitat gradients in a RockyMountain–Great Plains stream: biotic zonation and additive patterns of community change. Transactions of the American Fisheries Society 120:319–332.

Randall, R. G., J. R. M. Kelso, and C. K. Minns. 1995. Fish production in fresh waters: are rivers more productive than lakes? Canadian Journal of Fisheries and Aquatic Sciences 52:631–643.

Seelbach, P. W., and M. J. Wiley. 1997. Overview of the Michigan rivers inventory (MRI) project. Michigan Department of Natural Resources, Fisheries Technical Report 97-3, Ann Arbor.

Seppelt, R., C. F. Dormann, F. V. Eppink, S. Lautenbach, and S. Schmidt. 2011. A quantitative review of ecosystem service studies: approaches, shortcomings and the road ahead. Journal of Applied Ecology 48:630–636.

Slaney, P. A., B. R. Ward, and J. C. Wightman. 2003. Experimental nutrient addition to the Keogh River and application to the Salmon River in coastal British Columbia. Pages 111–126 *in* J. G. Stockner, editor. Nutrients in salmonid ecosystems: sustaining production and biodiversity. American Fisheries Society, Symposium 34, Bethesda, Maryland.

Slavik, K., B. J. Peterson, L. A. Deegan, W. B. Bowden, A. E. Hershey, and J. E. Hobbie. 2004. Long-term responses of the Kuparuk River ecosystem to phosphorus fertilization. Ecology 85:939–954.

Smith, R. A., R. B. Alexander, and G. E. Schwarz. 2003. Natural background concentrations of nutrients in streams and rivers of the conterminous United States. Environmental Science and Technology 37:3039–3047.

Smith, V. H., G. D. Tilman, and J. C. Nekola. 1999. Eutrophication: impacts of excess nutrient inputs on freshwater, marine, and terrestrial ecosystems. Environmental Pollution 100:179–196.

Snieszko, S. F. 1974. Effects of environmental stress on outbreaks of infectious diseases of fishes. Journal of Fish Biology 6:197–208.

Southwick Associates. 2007. Sportfishing in America: an economic engine and conservation powerhouse. American Sportfishing Association, Alexandria, Virginia.

Sowa, S. P., and C. F. Rabeni. 1995. Regional evaluation of the relation of habitat to distribution and abundance of Smallmouth Bass in Missouri streams. Transactions of the American Fisheries Society 124:240–251.

Stanfield, L. W., S. F. Gibson, and J. A. Borwick. 2006. Using a landscape approach to identify the distribution and density patterns of salmonids in Lake Ontario tributaries. Pages 601–621 *in* R. M. Hughes, L. Wang, and P. W. Seelbach, editors. Landscape influences on stream habitats and biological assemblages. American Fisheries Society, Symposium 48, Bethesda, Maryland.

Steen, P. J., T. G. Zorn, P. W. Seelbach, and J. S. Schaeffer. 2008. Classification tree models for predicting distributions of Michigan stream fish from landscape variables. Transactions of the American Fisheries Society 137:976–996.

Stevenson, R. J., B. H. Hill, A. T. Herlihy, L. L. Yuan, and S. B. Norton. 2008. Algae-P relationships, thresholds, and frequency distributions guide nutrient criterion development. Journal of the North American Benthological Society 27:783–799.

Stoneman, C. L., and M. L. Jones. 2000. The influence of habitat features on the biomass and distribution of three species of southern Ontario stream salmonines. Transactions of the American Fisheries Society 129:639–657.

Stranko, S. A., R. H. Hilderbrand, R. P. Morgan II, M. W. Staley, A. J. Becker, A. Roseberry-Lincoln, E. S. Perry, and P. T. Jacobson. 2008. Brook Trout declines with land cover and temperature changes in Maryland. North American Journal of Fisheries Management 28:1223–1232.

Stuber, R. J., G. Gebhart, and O. E. Maughan. 1982a. Habitat suitability index models: Bluegill. U.S. Fish and Wildlife Service FWS/OBS-82/10.8.

Stuber, R. J., G. Gebhart, and O. E. Maughan. 1982b. Habitat suitability index models: Largemouth Bass. U.S. Fish and Wildlife Service FWS/OBS-82/10.16.

Tallis, H., and S. Polasky. 2009. Mapping and valuing ecosystem services as an approach for conservation and natural resource management. Annals of the New York Academy of Sciences 1162:265–283.

Theil, H. 1961. Economic forecasts and policy. North-Holland, Amsterdam.

Troy, A., and M. A. Wilson. 2006. Mapping ecosystem services: practical challenges and opportunities in linking GIS and value transfer. Ecological Economics 60:435–449.

USEPA (U.S. Environmental Protection Agency). 1996. National nutrient assessment workshop proceedings. USEPA, Office of Water, Washington, D.C.

USEPA (U.S. Environmental Protection Agency). 2000. Nutrient criteria technical guidance manual: rivers and streams. USEPA, Office of Water, Washington, D.C.

USEPA (U.S. Environmental Protection Agency) and USGS (U.S. Geological Survey). 2005. National Hydrography Dataset Plus (NHDPlus) version 1.0. USEPA, Washington, D.C. Available: http://www.horizon-systems.com/nhdplus/. (February 2015).

Vannote, R. L., G. W. Minshall, K. W. Cummins, J. R. Sedell, and C. E. Cushing. 1980. River continuum concept. Canadian Journal of Fisheries and Aquatic Sciences 37:130–137.

Waite, I. R., and K. D. Carpenter. 2000. Associations among fish assemblage structure and environmental variables in Willamette basin streams, Oregon. Transactions of the American Fisheries Society 129:754–770.

Wehrly, K. E., M. J. Wiley, and P. W. Seelbach. 2003. Classifying regional variation in thermal regime based on stream fish community patterns. Transactions of the American Fisheries Society 132:18–38.

Welch, E. B., J. M. Quinn, and C. W. Hickey. 1992. Periphyton biomass related to point-source nutrient enrichment in seven New Zealand streams. Water Resources 26:669–675.

Wenger, S. J., and M. C. Freeman. 2008. Estimating species occurrence, abundance, and detection probability using zero-inflated distributions. Ecology 89:2953–2959.

Wiley, M. J., S. L. Kohler, and P. W. Seelbach. 1997. Reconciling landscape and local views of aquatic communities: lessons from Michigan trout streams. Freshwater Biology 37:133–148.

Wiley, M. J., L. L. Osborne, and R. W. Larimore. 1990. Longitudinal structure of an agricultural prairie river system and its relationship to current stream ecosystem theory. Canadian Journal of Fisheries and Aquatic Sciences 47:373–384.

Zippin, C. 1958. The removal method of population estimation. Journal of Wildlife Management 22:82–90.

Zorn, T., P. W. Seelbach, and M. J. Wiley. 1998. Patterns in the distributions of stream fishes in Michigan's Lower Peninsula. Michigan Department of Natural Resources, Fisheries Research Report 2035, Ann Arbor.

Zorn, T., and M. J. Wiley. 2004. Untangling relationships between river habitat and fishes in Michigan's Lower Peninsula with covariance structure analysis. Michigan Department of Natural Resources, Fisheries Research Report 2073, Ann Arbor.

Zorn, T. G., P. W. Seelbach, and M. J. Wiley. 2002. Distributions of stream fishes and their relationship to stream size and hydrology in Michigan's Lower Peninsula. Transactions of the American Fisheries Society 131: 70–85.

Zorn, T. G., P. W. Seelbach, and M. J. Wiley. 2004. Utility of species-specific, multiple linear regression models for prediction of fish assemblages in rivers of Michigan's Lower Peninsula. Michigan Department of Natural Resources, Fisheries Division, Research Report 2072, Lansing.

Zorn, T. G., P. W. Seelbach, and M. J. Wiley. 2009. Relationships between habitat and fish density in Michigan streams. Michigan Department of Natural Resources, Fisheries Research Report 2091, Ann Arbor.

Zorn, T. G., and M. J. Wiley. 2006. Influence of landscape characteristics on local habitat and fish biomass in streams of Michigan's Lower Peninsula. Pages 375–393 *in* R. M. Hughes, L. Wang, and P. W. Seelbach, editors. Landscap influences on stream habitats and biological assemblages. American Fisheries Society, Symposium 48, Bethesda, Maryland.

Northern Michigan Property Values:

The Significance of Riverfront Properties

August 2013

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Introduction and Background

Given the number of lakes and rivers and the expansive Great Lakes shoreline in Michigan, waterfront property is abundant throughout the state and region. The property values of these waterfront parcels are often higher than similar non-waterfront properties in the same region, and the location, availability, and quality of the waterbody associated with the property greatly affects its value. Contrary to popular belief, waterfront properties are assessed at the same level as every other type of property located within a municipality. In spite of a dip during the housing crisis that began in 2008, waterfront property values in Michigan have increased at a significantly higher rate than properties in other local city and town locations over the last 15 to 20 years, due to a relatively smaller supply and an ever-increasing demand. This increase in market value comes about as a result of a higher assessed value. In Michigan, taxing authorities capture additional tax revenue based on these increased valuations when a parcel is sold and changes hands. Otherwise, there is a limit on annual tax increases in Michigan because of Proposal A that passed in 1994.

The Anglers of the Au Sable, a 600-member, 501(c)(3) environmental conservation organization, hired Public Sector Consultants (PSC) to conduct an analysis of the local tax revenue and significance of riverfront parcels in the northern Michigan counties of Crawford, Kalkaska, Lake, Manistee, Roscommon, Ogemaw and Otsego. These counties were selected primarily because of high-quality angling and other water recreation activities (e.g., canoeing) on rivers within those counties.

The Anglers club is interested in determining the equalized property value and the property taxes levied on riverfront properties compared to all properties within each of the respective counties in order to highlight the significance of riverfront property tax revenue to local government operations.

Crawford, Kalkaska, Lake, Manistee, and Roscommon counties were able to provide necessary data to complete the analysis. Otsego County was able to provide limited information. Ogemaw County does not have parcel data available in an electronic format that would enable the analysis to be conducted.

Methodology

PSC coordinated with staff from each of the counties included in the analysis to collect relevant data. Each county maintains property information slightly differently but the following process was generally applied in each county:

1. Riverfront parcels were identified by the county equalization or GIS department.
2. The State Equalized Value (SEV) was identified by the equalization department for each parcel in the county. Some of the county equalization departments were able to parse out the SEV for riverfront parcels and non-riverfront parcels. The SEV was selected for use in this analysis rather than Taxable Value or Assessed Value because the SEV is more standardized among counties to allow for better comparison.
3. Levied taxes were identified by the treasurer's office or the equalization department.
4. Some counties provided separate datasets for riverfront properties, SEV for all parcels, and the levied taxes for all parcels. For these counties PSC compiled the information using database software to synthesize the figures for each parcel based on the parcel identification number, which is unique to each property.
5. The SEV and levied taxes for riverfront properties and all properties within each county were totaled and compared.

Results

Riverfront property information provided by Crawford, Kalkaska, Lake, Manistee, Otsego, and Roscommon counties is summarized in Exhibits 1 and 2.

EXHIBIT 1. Riverfront Property Information, by County

	Riverfront Properties			County Wide (all parcels)			Riverfront/County (%)		
County	**Parcels**	**Total SEV**	**Taxes** (2012)	**Parcels**	**SEV**	**Taxes** (2012)	**Parcels along a river**	**SEV from riverfront properties**	**Taxes from riverfront properties**
Crawford	1,926	$137,421,300	$3,332,256	17,145	$535,296,087	$14,828,850	11.2%	25.7%	22.5%
Kalkaska	555	$37,524,275	$907,061	20,310	$841,476,315	$24,921,426	2.7%	4.5%	3.6%
Lake	1,330	$82,529,050	$2,076,249	32,949	$720,586,056	$24,136,783	4.0%	11.5%	8.6%
Manistee	492	$31,898,000	$789,523	25,383	$1,292,570,037	$37,539,629	1.9%	2.5%	2.1%
Otsego	225	$28,585,500	NA	NA	$1,315,512,485	NA	NA	2.2%	NA
Roscommon	266	$10,856,800	$280,021	35,751	$1,368,730,016	$40,813,572	0.7%	0.8%	0.7%

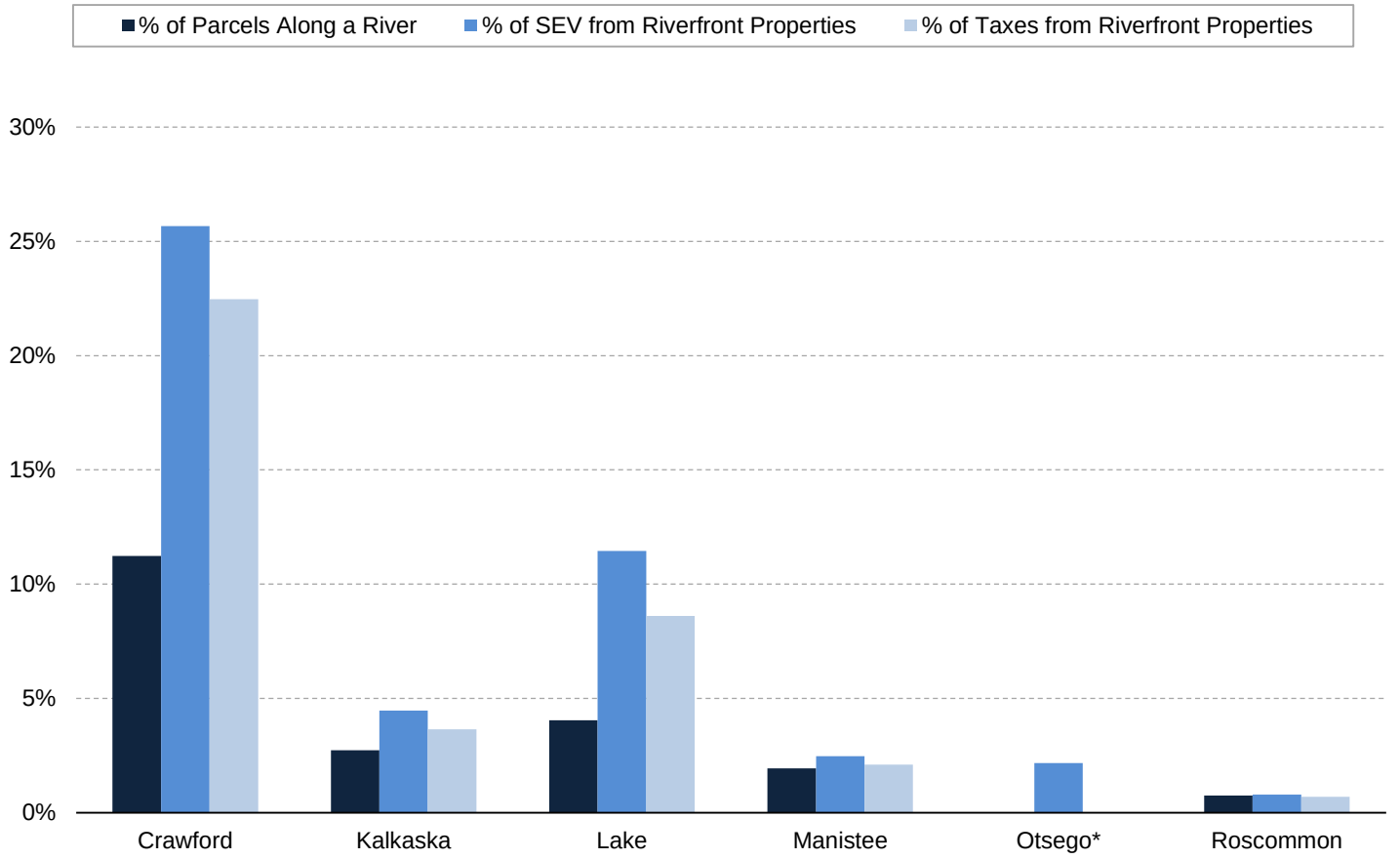
NOTE: All figures are rounded to the nearest dollar.
NA = Not Available
SOURCE: PSC using data from Crawford, Kalkaska, Lake, Manistee, Otsego, and Roscommon Counties.

About the Analysis

A few factors should be considered when interpreting this analysis:

- The percentage of riverfront parcels represents the total number of riverfront parcels as a proportion of all parcels within each county and does not consider the length of frontage along a river or the acreage of the parcel.
- The analysis is focused on the main stems of rivers within the counties and only includes real property. Personal property was excluded from the analysis.
- Many of the counties included in this analysis have a relatively high proportion of properties held in public ownership by the state and federal government. These parcels are not subject to local property taxes, which may affect the results.
- The analysis does not draw a distinction between lakefront properties and other non-riverfront parcels.
- The analysis compares riverfront parcels to all parcels within the county. The figures could change somewhat if riverfront parcels were compared to non-riverfront parcels.
- The analysis is based on parcel data provided by the counties. If there were errors in this data or missing information it may be reflected in this analysis.

EXHIBIT 2. Riverfront Property Value Proportions, by County



*Otsego County was unable to provide all requested information necessary to calculate the percentage of riverfront properties and percentage of levied taxies on riverfront properties.
SOURCE: PSC using data from Crawford, Kalkaska, Lake, Manistee, Otsego, and Roscommon counties.

Northern Michigan County Property Information

The counties included in this study provided property information that enabled PSC to determine the relative significance of riverfront properties to the local tax base and total equalized property value in the counties. Property value information for Crawford, Kalkaska, Lake, Manistee, Otsego, and Roscommon counties is summarized by county below.

Crawford County

Located in the central northern Lower Peninsula, Crawford County contains the headwaters to the Au Sable River and portions of the headwaters to the Big Manistee River.

Information provided by the county indicates that of the 17,145 parcels within the entire county, about 11 percent (1,926) are along a river. The property taxes levied on riverfront parcels in 2012 total $3,332,256 which represents approximately 23 percent of the $14,828,850 of total property taxes levied within the county. Similarly, the SEV of riverfront parcels totals $137,421,300, or 26 percent of the $535,296,087 SEV of all parcels in the county (see Exhibit 3).

EXHIBIT 3. Crawford County Equalized Property Values

Parcels	Riverfront	1,926
	All	17,145
	Percentage riverfront	11.2%
Taxes	Riverfront property (2012)	$3,332,256
	All property (2012)	$14,828,850
	Percentage riverfront	22.5%
SEV	Riverfront	$137,421,300
	All parcels	$535,296,087
	Percentage riverfront	25.7%

SOURCE: PSC using data from Crawford County.

Kalkaska County

Located in the northwestern Lower Peninsula, Kalkaska County contains the headwaters of the Boardman River and a portion of the Big Manistee River.

Information provided by the county indicates that of the 20,310 parcels within the entire county, about 3 percent (555) are along a river. The property taxes levied on riverfront parcels in 2012 total $907,061 which represents approximately 4 percent of the $24,921,426 of total property taxes levied within the county. Similarly, the SEV of riverfront parcels totals $37,524,275, or 5 percent of the $841,476,315 SEV of all parcels in the county (see Exhibit 4).

EXHIBIT 4. Kalkaska County Equalized Property Values

Parcels	Riverfront	555
	All	20,310
	Percentage riverfront	2.7%
Taxes	Riverfront property (2012)	$907,061
	All property (2012)	$24,921,426
	Percentage riverfront	3.6%
SEV	Riverfront	$37,524,275
	All parcels	$841,476,315
	Percentage riverfront	4.5%

SOURCE: PSC using data from Kalkaska County.

Lake County

Located in the northwest portion of Michigan's Lower Peninsula, Lake County contains portions of the Pere Marquette River, Little Manistee River, the Pine River, and the Baldwin River.

Information provided by the county indicates that of the 32,949 parcels within the entire county, 4 percent (1,330) are along a river. The property taxes levied on riverfront parcels in 2012 total $2,076,249 which represents about 9 percent of the $24,136,783 of total property taxes levied within the county. Similarly, the SEV of riverfront parcels totals $82,529,050, or 12 percent of the $720,586,056 SEV of all parcels in the county (see Exhibit 5).

EXHIBIT 5. Lake County Equalized Property Values

Parcels	Riverfront	1,330
	All	32,949
	Percentage riverfront	4.0%
Taxes	Riverfront property (2012)	$2,076,249
	All property (2012)	$24,136,783
	Percentage riverfront	8.6%
SEV	Riverfront	$82,529,050
	All parcels	$720,586,056
	Percentage riverfront	11.5%

SOURCE: PSC using data from Lake County.

Manistee County

Located in the northwestern portion of Michigan's Lower Peninsula, Manistee County contains portions of the Pine River, the Big Manistee, the Little Manistee, and the entirety of Bear Creek.

Information provided by the county indicates that of the 25,383 parcels within the entire county, about 2 percent (492) are along a river. The property taxes levied on riverfront parcels in 2012 total $789,523 which represents approximately 2 percent of the $37,539,629 of total property taxes levied within the county. Similarly, the SEV of riverfront parcels totals $31,898,000, or about 3 percent of the $1,292,570,037 SEV of all parcels in the county (see Exhibit 6).

EXHIBIT 6. Manistee County Equalized Property Values

Parcels	Riverfront	492
	All	25,383
	Percentage riverfront	1.9%
Taxes	Riverfront property (2012)	$789,523
	All property (2012)	$37,539,629
	Percentage riverfront	2.1%
SEV	Riverfront	$31,898,000
	All parcels	$1,292,570,037
	Percentage riverfront	2.5%

SOURCE: PSC using data from Manistee County.

Otsego County

Located in the central northern Lower Peninsula, Otsego County contains portions of the Au Sable, Black, Sturgeon, and Pigeon rivers.

Partial information was provided by the county regarding property values. Information provided indicates that there are 225 riverfront parcels which have an SEV of $28,585,500, which represents about 2 percent of the SEV of all parcels in the county which totaled $1,315,512,485 (see Exhibit 7). The county was unable to provide requested property tax information or the total number of parcels at the time of this writing.

EXHIBIT 7. Otsego County Equalized Property Values

Parcels	Riverfront	225
	All	NA
	Percentage riverfront	NA
Taxes	Riverfront property (2012)	NA
	All property (2012)	NA
	Percentage riverfront	NA
SEV	Riverfront	$28,585,500
	All parcels	$1,315,512,485
	Percentage riverfront	2.2%

SOURCE: PSC using data from Otsego County.

Roscommon County

Located in the central portion of the northern Lower Peninsula, Roscommon County contains portions of the South Branch of the Au Sable River.

Information provided by the county indicates that of the 35,751 parcels within the entire county, less than 1 percent (266) are along a river. The property taxes levied on riverfront parcels in 2012 total $280,021 which represents less than 1 percent of the $40,813,572 of total property taxes levied within the county. Similarly, the SEV of riverfront parcels totals $10,856,800, or less than 1 percent of the $1,368,730,016 SEV of all parcels in the county (see Exhibit 8).

EXHIBIT 8. Roscommon County Equalized Property Values

Parcels	Riverfront	266
	All	35,751
	Percentage riverfront	0.7%
Taxes	Riverfront property (2012)	$280,021
	All property (2012)	$40,813,572
	Percentage riverfront	0.7%
SEV	Riverfront	$10,856,800
	All parcels	$1,368,730,016
	Percentage riverfront	0.8%

SOURCE: PSC using data from Roscommon County.

Summary of Results

Perhaps not surprisingly, this analysis confirms that riverfront properties, on a relative basis, are valued higher than non-riverfront parcels and pay a proportionally higher amount of taxes than non-riverfront parcels. In addition, in four of five counties included in the analysis (Crawford, Kalkaska, Lake, and Manistee) riverfront parcels contribute a higher proportion to the tax base with fewer parcels than non-riverfront parcels.

The relative difference is most pronounced in the two counties with the lowest total SEV (Crawford and Lake). In Crawford County riverfront parcels comprise about 11 percent of all parcels but contribute approximately 23 percent of property taxes and 26 percent of the SEV for the entire county. In Lake County riverfront parcels comprise about 4 percent of all parcels but contribute approximately 9 percent of the property taxes and 12 percent of the SEV for the entire county. The relative difference is least pronounced in the two counties with the highest total SEV. In Roscommon County riverfront parcels comprise less than 1 percent of the parcels within the county and contribute less than 1 percent of property taxes and less than 1 percent of the SEV for the entire county. In Manistee County riverfront parcels comprise about 2 percent of parcels within the county and contribute approximately 2 percent of property taxes and 3 percent of the SEV for the entire county. This analysis confirms the importance of riverfront parcels and their relative contribution to the local tax base compared to non-riverfront parcels.

Act No. 288
Public Acts of 2016
Approved by the Governor
September 28, 2016
Filed with the Secretary of State
September 28, 2016
EFFECTIVE DATE: September 28, 2016

STATE OF MICHIGAN
98TH LEGISLATURE
REGULAR SESSION OF 2016

Introduced by Reps. Cole, Glenn, Chatfield, Aaron Miller, Kelly, Canfield, Smiley, Pettalia, Hughes and McBroom

ENROLLED HOUSE BILL No. 5275

AN ACT to amend 1994 PA 451, entitled "An act to protect the environment and natural resources of the state; to codify, revise, consolidate, and classify laws relating to the environment and natural resources of the state; to regulate the discharge of certain substances into the environment; to regulate the use of certain lands, waters, and other natural resources of the state; to protect the people's right to hunt and fish; to prescribe the powers and duties of certain state and local agencies and officials; to provide for certain charges, fees, assessments, and donations; to provide certain appropriations; to prescribe penalties and provide remedies; and to repeal acts and parts of acts," by amending sections 72101, 72115, 81127, and 81133 (MCL 324.72101, 324.72115, 324.81127, and 324.81133), section 72101 as amended by 2014 PA 211, section 72115 as amended by 2014 PA 213, section 81127 as amended by 1998 PA 86, and section 81133 as amended by 2014 PA 147, and by adding section 72118; and to repeal acts and parts of acts.

The People of the State of Michigan enact:

Sec. 72101. As used in this part:

(a) "Advisory council" means the Michigan trails advisory council created in section 72110.

(b) "Council" means a trail management council established pursuant to section 72106.

(c) "Department" means the department of natural resources.

(d) "Director" means the director of the department or his or her designee.

(e) "Equine access locations" means open access roads, management roads, forestry access roads, 2-track and single-track trails that are not wildlife paths, staging areas for pack and saddle animals to be dropped off or picked up, and associated wilderness campsites.

(f) "Forest road" means that term as defined in section 81101.

(g) "Fund" means the Pure Michigan Trails fund created in section 72109.

(h) "Governmental agency" means the federal government, a county, city, village, or township, or a combination of any of these entities.

(i) "Pack and saddle trails" means trails and equine access locations that may be used by pack and saddle animals.

(j) "Pure Michigan Trail" means a trail designated as a "Pure Michigan Trail" under section 72103.

(k) "Pure Michigan Water Trail" means a water trail designated as a "Pure Michigan Water Trail" under section 72103.

(*l*) "Pure Michigan Trail Town" means a "Pure Michigan Trail Town" designated under section 72104.

(m) "Rail-trail" means a former railroad bed that is in public ownership and used as a trail.

(n) "Statewide trail network" means the statewide trail network established in section 72114.

(o) "Trail" means a right-of-way adapted to foot, horseback, motorized, or other nonmotorized travel. Trail also includes a water trail.

(p) "Water trail" means a designated route on a body of water.

Sec. 72115. (1) Subject to subsections (2) and (3), pack and saddle animals shall be allowed to access pack and saddle trails on public land managed by the department as follows:

(a) Access on land of the state forest system is allowed unless restricted by statute, deed restriction, land use order, or other legal mechanism, in effect on April 2, 2010.

(b) Access on land of the state park system or state game area system is prohibited unless authorized by land use order or other legal mechanism in effect on April 2, 2010.

(c) Access on other land managed by the department is allowed according to the specific authorization or restriction applicable to the land.

(2) Access by pack and saddle animals may only be restricted on lands described in subsection (1) after April 2, 2010 if conditions are not suitable for pack and saddle animals because of public safety concerns, necessary maintenance, or for reasons related to the mission of the department. Restrictions related to the mission of the department shall be supported, to the greatest extent practicable, by a written science-based rationale that is supported with documentation that is made available to the public. Prior to determining that access by pack and saddle animals be restricted, the department shall make every effort to resolve any public safety or maintenance concerns. Subject to subsection (3), the department shall not restrict pack and saddle animals from lands described in subsection (1) unless all of the following conditions are met:

(a) The department holds a public meeting on a proposal to restrict access by pack and saddle animals on pack and saddle trails to receive testimony from the general public. The department shall invite the advisory council and the equine trails subcommittee created in section 72110a to attend the meeting.

(b) The department, after considering testimony at the meeting under subdivision (a), provides a specific rationale for its determination to restrict access by pack and saddle animals.

(c) Any decision by the department to restrict access by pack and saddle animals shall not take effect for a period of time set by the department, but not less than 60 days. However, if the director determines that a restriction must be imposed because of user conflicts or due to an imminent threat to public health, safety, welfare, or to natural resources or the environment, the director may issue a temporary order restricting access by pack and saddle animals for 30 days or until the threat or user conflict is abated. A temporary order under this subdivision may be reissued if the threat or user conflict persists.

(d) A written statement shall be posted at the trailhead in which the restriction is imposed stating the cause and estimated duration of the closure.

(e) A list of pack and saddle trails on which the department has restricted access for pack and saddle animals, including temporary orders, shall be posted on the department's website and notification shall be provided to the equine trails subcommittee created in section 72110a.

(3) Any restrictions described in subsection (1) on access by pack and saddle animals that were in effect on April 2, 2010 shall remain in effect until those restrictions are reviewed using the process under subsection (2).

(4) An individual shall not use pack and saddle animals on state-owned land except on pack and saddle trails that are open for access by pack and saddle animals. However, an individual may use a pack and saddle animal in an area in which public hunting is permitted to retrieve legally harvested deer, bear, or elk using the most direct route that does not enter a stream, river, or wetland except over a bridge, culvert, or similar structure.

Sec. 72118. (1) The department shall make a comprehensive inventory of forest roads that are state roads. The department shall divide the state into 5 regions and complete the inventory in regional phases. The Upper Peninsula shall be a separate region or regions. The department shall inventory the 2 most northerly regions in the Lower Peninsula by December 31, 2017. The department shall inventory the remaining regions by December 31, 2018. The inventory shall meet both of the following requirements:

(a) Identify the location, condition, and development level of the forest roads.

(b) Determine types of motorized and nonmotorized use currently restricted on each forest road segment and the seasons during which those uses are currently restricted.

(2) Beginning when the inventory for a region is completed or required to be completed, whichever occurs first, all of the following apply:

(a) The forest roads within that region shall be open to motorized use by the public unless designated otherwise by the department pursuant to section 504(7). However, beginning on the effective date of the amendatory act that added this section, forest roads in the Upper Peninsula shall be open to motorized use by the public unless designated otherwise pursuant to section 504(7).

(b) If a timber harvest is planned for a particular area in that region, the department shall evaluate whether the timber harvest activity offers the opportunity to connect existing forest roads and trails in that area.

(c) The department shall not newly restrict a road or trail in that region from being used to access public land unless the department has provided each local unit of government in which the public land is located written notice that includes the reason for the restriction. This subdivision does not apply to a restriction imposed to protect public health or safety in an emergency situation.

(3) The department shall annually post to its website the total miles of forest roads open to motorized use in all inventoried regions and a map or maps of those forest roads.

Sec. 81127. (1) Under the comprehensive system previously approved and implemented under former section 16d of 1975 PA 319, all forest roads shall be open to ORV use as provided in section 72118. All other state owned land under the jurisdiction of the department shall be closed to ORV use except the following:

(a) Designated roads that are not forest roads.

(b) Designated trails.

(c) Designated areas.

(2) The commission shall approve any subsequent revisions to the system and shall establish an effective date for the revisions. The department shall submit the revisions approved by the commission to the secretary of the senate and the clerk of the house of representatives at least 20 session days before the effective date determined by the commission.

(3) In developing the system, the department shall consider the needs of hunters, senior citizens, and individuals with disabilities.

Sec. 81133. (1) An individual shall not operate an ORV:

(a) At a rate of speed greater than is reasonable and proper, or in a careless manner, having due regard for conditions then existing.

(b) During the hours of 1/2 hour after sunset to 1/2 hour before sunrise without displaying a lighted headlight and lighted taillight. The requirements of this subdivision are in addition to any applicable requirements of section 81131(12).

(c) Unless the vehicle is equipped with a braking system that may be operated by hand or foot, capable of producing deceleration at 14 feet per second on level ground at a speed of 20 miles per hour; a brake light, brighter than the taillight, visible from behind the vehicle when the brake is activated, if the vehicle is operated during the hours of 1/2 hour after sunset and 1/2 hour before sunrise; and a throttle so designed that when the pressure used to advance the throttle is removed, the engine speed will immediately and automatically return to idle.

(d) In a state game area or state park or recreation area, except on roads, trails, or areas designated for this purpose, notwithstanding section 72118; on other state-owned lands under the control of the department where the operation would be in violation of rules promulgated by the department; in a forest nursery or planting area; on public lands posted or reasonably identifiable as an area of forest reproduction, and when growing stock may be damaged; in a dedicated natural area of the department; or in any area in such a manner as to create an erosive condition, or to injure, damage, or destroy trees or growing crops. However, the department may permit an owner and guests of the owner to use an ORV within the boundaries of a state forest in order to access the owner's property.

(e) On the frozen surface of public waters within 100 feet of an individual not in or upon a vehicle, or within 100 feet of a fishing shanty or shelter or an area that is cleared of snow for skating purposes, except at the minimum speed required to maintain controlled forward movement of the vehicle, or as may be authorized by permit in special events.

(f) Unless the vehicle is equipped with a spark arrester type United States Forest Service approved muffler, in good working order and in constant operation. Exhaust noise emission shall not exceed 86 Db(A) or 82 Db(A) on a vehicle manufactured after January 1, 1986, when the vehicle is under full throttle, traveling in second gear, and measured 50 feet at right angles from the vehicle path with a sound level meter that meets the requirement of ANSI S1.4 1983, using procedure and ancillary equipment therein described; or 99 Db(A) or 94 Db(A) on a vehicle manufactured after January 1, 1986, or that level comparable to the current sound level as provided for by the United States Environmental Protection Agency when tested according to the provisions of the current SAE J1287, June 86 test procedure for exhaust levels of stationary motorcycles, using sound level meters and ancillary equipment therein described. A vehicle subject to this part, manufactured or assembled after December 31, 1972 and used, sold, or offered for sale in this state, shall conform to the noise emission levels established by the United States Environmental Protection Agency under the noise control act of 1972, 42 USC 4901 to 4918.

(g) Within 100 feet of a dwelling at a speed greater than the minimum required to maintain controlled forward movement of the vehicle, except under any of the following circumstances:

(*i*) On property owned by or under the operator's control or on which the operator is an invited guest.

(*ii*) On a forest road or forest trail if the forest road or forest trail is maintained by or under the jurisdiction of the department.

(*iii*) On a street, county road, or highway on which ORV use is authorized pursuant to section 81131(2), (3), (5), or (6).

(h) In or upon the lands of another without the written consent of the owner, the owner's agent, or a lessee, when required by part 731. The operator of the vehicle is liable for damage to private property caused by operation of the vehicle, including, but not limited to, damage to trees, shrubs, or growing crops, injury to other living creatures, or erosive or other ecological damage. The owner of the private property may recover from the individual responsible nominal damages of not less than the amount of damage or injury. Failure to post private property or fence or otherwise enclose in a manner to exclude intruders or of the private property owner or other authorized person to personally communicate against trespass does not imply consent to ORV use.

(i) In an area on which public hunting is permitted during the regular November firearm deer season, from 7 a.m. to 11 a.m. and from 2 p.m. to 5 p.m., except as follows:

(*i*) During an emergency.

(*ii*) For law enforcement purposes.

(*iii*) To go to and from a permanent residence or a hunting camp otherwise inaccessible by a conventional wheeled vehicle.

(*iv*) To remove legally harvested deer, bear, or elk from public land. An individual shall operate an ORV under this subparagraph at a speed not exceeding 5 miles per hour, using the most direct route that complies with subdivision (n).

(*v*) To conduct necessary work functions involving land and timber survey, communication and transmission line patrol, or timber harvest operations.

(*vi*) On property owned or under control of the operator or on which the operator is an invited guest.

(*vii*) While operating a vehicle registered under the code on a private road capable of sustaining automobile traffic or a street, county road, or highway.

(*viii*) If the individual holds a valid permit to hunt from a standing vehicle issued under part 401 or is a person with a disability using an ORV to access public lands for purposes of hunting or fishing through use of a designated trail or forest road. An individual holding a valid permit to hunt from a standing vehicle issued under part 401, or a person with a disability using an ORV to access public lands for purposes of hunting or fishing, may display a flag, the color of which the department shall determine, to identify himself or herself as a person with a disability or an individual holding a permit to hunt from a standing vehicle under part 401.

(j) Except as otherwise provided in section 40111, while transporting on the vehicle a bow unless unstrung or encased, or a firearm unless unloaded and securely encased, or equipped with and made inoperative by a manufactured keylocked trigger housing mechanism.

(k) On or across a cemetery or burial ground, or land used as an airport.

(*l*) Within 100 feet of a slide, ski, or skating area, unless the vehicle is being used for the purpose of servicing the area or is being operated pursuant to section 81131(2), (3), (5), or (6).

(m) On an operating or nonabandoned railroad or railroad right-of-way, or public utility right-of-way, other than for the purpose of crossing at a clearly established site intended for vehicular traffic, except railroad, public utility, or law enforcement personnel while in performance of their duties, and except if the right-of-way is designated as provided for in section 81127.

(n) In or upon the waters of any stream, river, bog, wetland, swamp, marsh, or quagmire except over a bridge, culvert, or similar structure.

(o) To hunt, pursue, worry, kill, or attempt to hunt, pursue, worry, or kill an animal, whether wild or domesticated.

(p) In a manner so as to leave behind litter or other debris.

(q) On public land, in a manner contrary to operating regulations.

(r) While transporting or possessing, in or on the vehicle, alcoholic liquor in a container that is open or uncapped or upon which the seal is broken, except under either of the following circumstances:

(*i*) The container is in a trunk or compartment separate from the passenger compartment of the vehicle.

(*ii*) If the vehicle does not have a trunk or compartment separate from the passenger compartment, the container is encased or enclosed.

(s) While transporting any passenger in or upon an ORV unless the manufacturing standards for the vehicle make provisions for transporting passengers.

(t) On adjacent private land, in an area zoned residential, within 300 feet of a dwelling at a speed greater than the minimum required to maintain controlled forward movement of the vehicle except under any of the following circumstances:

(*i*) On a forest road or forest trail if the forest road or forest trail is maintained by or under the jurisdiction of the department.

(*ii*) On a street, county road, or highway on which ORV use is authorized under section 81131(2), (3), (5), or (6).

(u) On a forest trail if the ORV is greater than 50 inches in width.

(2) An individual who is operating or is a passenger on an ORV shall wear a crash helmet and protective eyewear that are approved by the United States Department of Transportation. This subsection does not apply to any of the following:

(a) An individual who owns the property on which the ORV is operating, is a family member of the owner and resides at that property, or is an invited guest of an individual who owns the property. An exception under this subdivision does not apply to any of the following:

(*i*) An individual less than 16 years of age.

(*ii*) An individual 16 or 17 years of age, unless the individual has consent from his or her parent or guardian to ride without a crash helmet.

(*iii*) An individual participating in an organized ORV riding or racing event if an individual who owns the property receives consideration for use of the property for operating ORVs.

(b) An individual wearing a properly adjusted and fastened safety belt if the ORV is equipped with a roof that meets or exceeds United States Department of Transportation standards for a crash helmet.

(c) An ORV operated on a state-licensed game bird hunting preserve at a speed of not greater than 10 miles per hour.

(3) Each person who participates in the sport of ORV riding accepts the risks associated with that sport insofar as the dangers are inherent. Those risks include, but are not limited to, injuries to persons or property that can result from variations in terrain; defects in traffic lanes; surface or subsurface snow or ice conditions; bare spots; rocks, trees, and other forms of natural growth or debris; and collisions with fill material, decks, bridges, signs, fences, trail maintenance equipment, or other ORVs. Those risks do not include injuries to persons or property that result from the use of an ORV by another person in a careless or negligent manner likely to endanger person or property. When an ORV is operated in the vicinity of a railroad right-of-way, each person who participates in the sport of ORV riding additionally assumes risks including, but not limited to, entanglement with railroad tracks, switches, and ties and collisions with trains and train-related equipment and facilities.

Enacting section 1. Section 81126 of the natural resources and environmental protection act, 1994 PA 451, MCL 324.81126, is repealed.

This act is ordered to take immediate effect.

Clerk of the House of Representatives

Secretary of the Senate

Approved ----------

Governor

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overlay zone research and analysis

F.1 Down Zoning

How do you limit someone's ability to use their property without it being considered a taking? Is a taking justified in these cases due to safety concerns? Could the property owner demand just compensation?

At the core of these questions is the question of legality as it relates to down zoning a property without it being considered a taking. In the situation of the JLUS, it is recommended to limit development in areas within APZs/airport approach areas and within noise contours near the military installations. Ideally, the mechanism to achieve this goal would be to implement a zone that limits development in these areas of conflict or potential conflict. Provided below is background on case law regarding to down zoning and the possible repercussions.

Both the United States Constitution and the Michigan Constitution prohibit the government from taking private land for public use without providing just compensation to the landowner. A taking can be either the physical taking of a landowner's property by the government or it can be a regulatory taking. A regulatory taking is when a government regulation restricts the use of private property to the point that the property no longer has any real value.

There are two situations in which a regulatory taking can occur:

- when a regulation leaves the landowner with no economically viable use of the land, known as a categorical taking
- based on the balancing test established in Penn Central Transportation Co. v. New York City, 438 U.S. 104 (1978)

For the first situation, a categorical taking only occurs when a regulation abnegates land of all economic vitality. For example, the Supreme Court held that a law in South Carolina prohibiting beachfront landowners from erecting any permanent structures on their property rendered the property valueless, and therefore constituted a categorical taking under the Fifth Amendment. The court recognized that law restricted all viable economic uses of the land and rendered the land valueless, thus the court decided a categorical taking had occurred. With this ruling in place, the state ultimately ended up purchasing the land to enable the plans for the coastal area to move forward.

For the second situation, if the regulation does not deny the property of all economic value, courts will utilize the Penn Central balancing test to determine if a regulatory taking has occurred. Penn Central involved a challenge to New York City's Landmark Preservations Law, which prevented the Penn Central Transportation Company from constructing a skyscraper on top of Grand Central Station. The court held that the application of the law did not constitute a taking based on a three-part balancing test. This test requires courts to consider the character of the state action, the economic impact of the regulation, and the extent to which the regulation has interfered with a distinct investment-backed expectation.

The three-part test has some weak points. For example, it was not established by the courts how many prongs need to be ruled in favor of the plaintiff (the property owner) in order to establish a taking. Each of the three parts is explained in more detail below.

1. **CHARACTER OF THE STATE ACTION:** The plaintiff needs to argue that the there is no legitimate government interest being advanced by the zoning classification. This is difficult for the plaintiff because courts have stated that zoning ordinances are generally permissible and that local governments may enact zoning restrictions to promote the general welfare, even if they adversely affect a landowner's property interests.
2. **ECONOMIC IMPACT OF THE REGULATION:** The plaintiff needs to show that the regulation deprives the land of all economically beneficial uses. There is significant nuance to this piece, as the splitting of property rights makes this potentially complicated for the plaintiff. Just because surface rights may be limited by a regulation (e.g., building a house when zoned residential but not being allowed to in a lower intensity zone) does not mean that the property is diminished of its value. Subsurface, mining, or water rights, or any other property rights may still be viable.
3. **THE EXTENT TO WHICH THE REGULATION HAS INTERFERED WITH DISTINCT INVESTMENT-BACKED EXPECTATIONS:** The plaintiff needs to prove that investment-backed expectations has occurred on the property and that further investment is no longer legal because of the regulation. For example, the property owner bought land and planned to build 200 homes. They build and then sell them in increments of 25. After building 50 homes, the property is down zoned to no longer allow residential development. The plaintiff in this scenario could make the argument that the regulation interfered with distinct investment-backed expectations. This part of the test veers into the world of vested rights, as well.

Applying a zone for the sake of contributing to the health, safety and general welfare of the population is generally allowable. An overlay zone can be a more effective way to achieve this than simply changing zoning.

F.2 Overlay Zones

Information about overlay zones from the American Planning Association is presented below, followed by recommendations for this specific area.

BASICS: An overlay zone is a zoning district that is applied over one or more previously established zoning districts, establishing additional or stricter standards and criteria for covered properties in addition to the standards and criteria of the underlying zoning district. Communities often use overlay zones to protect specific features such as historic buildings, wetlands, steep slopes, and waterfronts. Overlay zones can also be used to promote specific development projects, such as mixed-used developments, waterfront developments, housing along transit corridors, or affordable housing.

HISTORICAL AND LEGAL IMPLICATIONS: As with traditional zoning, uses that can be justified as contributing to the health, safety, and welfare of the population are generally allowed to be regulated via overlay zoning. Common regulations include those for historic districts, natural resource protection, and economic development, though local governments are given broad authority to determine what regulation is in their community's best interest. As with zoning, however, communities must be careful not to violate the "uniformity clause" of the Standard State Zoning Enabling Act by ensuring that all comparable properties are treated similarly. For further court opinions on the legality of overlay zoning, see Jachimek v. Superior Court, 169 Ariz. 317 and A-S-P Associates v. City of Raleigh, 258 S.E.2d 444.

F.2.1 Discussion

Overlay zones have the potential to be very effective governmental regulatory tools. Since they tailor regulations to specific properties and districts to meet specific community goals, they can be more politically feasible to implement and can help communities meet stated goals or address specific inequities. On the other hand, they can create inefficiencies and inequities by applying regulations and restrictions to some properties and not others. Moreover, additional regulations may increase time and expense both for developers and for the public bodies involved in the development approval process.

F.2.2 Recommendations

See Chapter 4 for final JLUS strategies related to zoning.

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