

**INTEGRATED NATURAL RESOURCES
MANAGEMENT PLAN
NAVAL STATION GREAT LAKES**

Date Revised: April 2010

**INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
NAVAL STATION GREAT LAKES
2010-2019**

This Integrated Natural Resources Management Plan (INRMP) supersedes the INRMP of 2001. The SIKES Act Improvements Amendments of 1997 require that the proposed INRMP be prepared in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the Illinois Department of Natural Resources (IDNR), and that the management of fish and wildlife in this INRMP reflect mutual agreement of the parties. Mutual agreement is required only with respect to those elements of this Plan that are subject to applicable legal authority (i.e. authority such as the Endangered Species Act derived from a source other than the SIKES Act) which obligates the USFWS and the IDNR to conserve, protect, and manage fish and wildlife resources.

To the extent that resources permit, the USFWS, IDNR and Naval Station Great Lakes (NSGL) by signature of their agency representative, do hereby agree to enter into a cooperative program for the conservation, protection and management of fish and wildlife resources on NSGL. The intent of this INRMP is to develop functioning, sustainable ecological communities at NSGL that integrate the interests and mission of the agencies charged with conservation, protection, and management of national resources in the public interest. This INRMP may be modified and amended in writing signed by authorized representatives of the three agencies. The INRMP will become effective upon the date subscribed by the last signatory and shall continue in full force for a period of ten years from that date unless terminated in whole or in part by written notice to the other parties.

By signature below, the parties grant their concurrence and acceptance of this INRMP.

Approving Officials:

Commanding Officer Naval Station Great Lakes

(Date)

Natural Resources Manager, Naval Station Great Lakes

(Date)

Natural Resources Manager, LANTDIV

(Date)

U.S. Fish and Wildlife Service

(Date)

Illinois Department of Natural Resources

(Date)

EXECUTIVE SUMMARY

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The Sikes Act Improvement Act of 1997 (SAIA) requires the Secretary of each military department to “prepare and implement an integrated natural resources management plan for each military installation in the United States” (16 United States Code 670a through o). Multiple use, protection and enhancement of natural resources, sustainable yield, and maintaining biological integrity are requirements under Department of Defense Instruction (DODI) 4715.3 and the Department of the Navy’s Environmental and Natural Resources Program Manual (OPNAVINST 5090.1B, Change 2). SAIA requires military installations having significant natural resources to prepare an Integrated Natural Resource Management Plan (INRMP) for the conservation and rehabilitation of these resources using an ecosystem management approach. Under SAIA, the INRMP is to reflect cooperation and mutual agreement between the Department of the Navy, the U.S. Fish and Wildlife Service (USFWS), and Illinois Department of Natural Resources (IL-DNR). Agency comments and concurrence with this INRMP can be found in [Appendix F](#) of this Plan. Naval Station Great Lakes (NSGL) has prepared this INRMP in compliance with these laws and regulations.

The purpose of this INRMP is to provide for effective stewardship and management of the land and water resources, and to promote outdoor recreation and education under the requirements of SAIA, while meeting the needs of the military mission of NSGL. This INRMP shows interrelationships between individual components of natural resources management (*e.g.*, vegetation, wetlands, fish and wildlife), mission requirements and other land use activities affecting natural resources.

This INRMP will provide for integrated fish and wildlife management, land and forest management, wetland enhancement and protection, public access and sustainable use of natural resources and enforcement of natural resource laws and regulations without interfering with military readiness or the mission of the Station. This INRMP covers a 10 year period (2010 – 2019), but has the flexibility to accommodate changes in the ecosystem and military mission. Annual updates to the management program and review and revision at five-year intervals will ensure that the INRMP integrates the latest scientific knowledge and evolves to meet the future requirements of the Station’s military mission and natural resources.

The term “Station” used throughout this document refers to Naval Station Great Lakes.

Mission Statement of NSGL and the INRMP

Naval Station Great Lakes is the Navy’s largest training center whose mission is to:

- Exercise command over and coordinate the efforts of assigned subordinate activities in conducting recruit, initial skill, advanced and specialized training.
- Maintain and operate facilities.
- Provide administrative and logistic support to tenant activities.

- Perform other such functions and tasks as assigned by higher authority.

To meet this mission, NSGL is home to three major commands with training responsibilities: Recruit Training Command (RTC), Training Support Center (TSC), and Corps School (U.S. Navy, 2006). When ecosystems are functional and resilient, they are better able to support the military mission of NSGL. Preserving and enhancing those ecosystems that are important to training of personnel and day-to-day operations of the Station is the primary mission of this INRMP, and of all natural resource management actions on NSGL.

Current Conditions on NSGL

NSGL includes approximately 1,202 acres. Willow Glen Golf Course, an 18-hole championship golf course, is separate from the Station and consists of approximately 138 acres. The Station is located in Lake County, Illinois, in the northeastern portion of the state within the municipality of North Chicago. NSGL is approximately 35 miles (56 kilometers [km]) north of the central business district of Chicago, and 65 miles (105 km) south of Milwaukee, Wisconsin. It is bordered by Lake Michigan to the east, industrial areas of North Chicago to the north, residential areas of Lake Bluff and Shore Acres Golf Course to the south, and unincorporated Shields Township to the west.

The previous INRMP (*Integrated Natural Resources Management Plan, Naval Training Center Great Lakes, 2002*) addressed 1,939 acres and **included all Main Station housing** along with Fort Sheridan Housing Annex (FSHA) and Glenview Housing Annex (GHA). In January 2006 NSGL transferred all housing lands and structures to a private developer under the Military Housing Privatization Initiative. The 2002 INRMP identified these areas and the natural resource management issues associated with the housing areas. This INRMP will exclude those areas.

The majority of land on NSGL is developed or improved. Only the ravines and bluffs lack significant amounts of development, although some construction of permanent structures has occurred within Pettibone Ravine and along the beaches of Lake Michigan. Because of the mix in developed and undeveloped lands, natural resources management activities on NSGL are varied. Within the developed and improved areas, management activities are primarily focused on landscaping, urban water quality maintenance and enhancement and control of nuisance wildlife including insect pests. Management activities within the ravines and on the bluffs is oriented towards preventing soil erosion and slumping of the steep slopes to conserve soil resources and protect the physical plant of NSGL as well as protect water quality and wildlife habitat. Soil erosion contributes to a heavy sediment load in Pettibone Creek that has silted in the inner harbor of NSGL and contributes to poor water quality of the creek.

Pettibone Ravine provides habitat for numerous species of birds and some small mammals, as well as food and cover for a transient population of white-tailed deer. Pettibone Creek lacks resident populations of amphibians and persistent population of fish, but is potential habitat for these species. Fish and amphibians appear to be absent from Pettibone Creek because of non-point source pollution entering the creek from a variety of areas and sources; mainly from outside the Station. These pollutants reduce the water quality below that necessary for supporting fish and amphibians, and must be identified and removed if self-sustaining

populations of fish and amphibians are to be returned to Pettibone Creek. Invasive species of plants, especially purple loosestrife and phragmites, present a threat to the native plant communities within NSGL, and will be managed as they are identified on the Station.

No Federal-listed threatened or endangered species are known to continuously inhabit NSGL; however, the Federally Endangered Piping plover (*Charadrius melodus*) has been documented as using NSGL habitat during migratory stopover.

Several State-listed species of animals and plants have been documented as occurring on NSGL. Since the writing of the last INRMP the State Endangered Common tern has been identified as nesting and breeding on a small island (Harbor Island) adjacent to the harbor and beach bluffs. The Illinois Department of Natural Resources (IL-DNR) and the Public Works Department Environmental Division (ENV DIV) as well as numerous special interest groups have been giving special attention to this parcel of land and the development and maintenance of habitat for this species. Numerous management activities and projects that enhance and protect the habitat for this species are discussed throughout this Plan.

INRMP Guidance

This INRMP was prepared in accordance with the guidance “Integrated Natural Resources Management Plan Guidance for Navy Installations 2006 ”*How to Prepare, Implement and Revise Integrated Natural Resource Management Plans*” (Appendix D: DoD INRMP Template).

Organization of the Naval Station Great Lakes INRMP

Overview. This section provides a discussion of the purpose of the INRMP and the policies that drive it, the goals of the INRMP, a brief history of the Installation, and its military mission.

Current Conditions and Use. This section describes the existing physical and biological conditions at NSGL. Included within this section are descriptions of the climate; geology; topography; soils; hydrology; flora; fauna; and rare, threatened, and endangered species of the area. A discussion of the current land use and classifications and natural resources management plans at NSGL are included. Stakeholders of the natural resources on NSGL are identified.

Environmental Management Strategy. This section provides a discussion of the current natural resource management issues relevant to NSGL to aid in identifying natural resource management opportunities, mission sustainability and potential conflicts with the military mission.

Program Elements. This section provides a discussion of the natural resource management projects, listing goals, objectives, projects, and major tasks that will be used to address identified natural resources management issues on NSGL.

Implementation. This section describes how the INRMP will be implemented.

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LIST OF ABBREVIATIONS

BASH	Bird Aircraft Strike Hazard
BRAC	Base Realignment and Closure
C	Celsius
CATEX	Categorical Exclusion
cm	centimeter(s)
CWA	Clean Water Act
DDT	dichloro-diphenyl-trichloroethane
DoD	Department of Defense
DoDI	Department of Defense Instruction
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ENV DIV	Environmental Division
EPA	Environmental Protection Agency
EPR	Environmental Project Request
EQB	Environmental Quality Board
ESA	Endangered Species Act
F	Fahrenheit
FEAD	Facility Engineering and Acquisition Division
FSHA	Fort Sheridan Housing Annex
GHA	Glenview Housing Annex
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare(s)
IBA	Important Bird Area
ICBO	International Council of Building Officials
IL-DNR	Illinois Department of Natural Resources
IESPB	Illinois Endangered Species Protection Board
INRMP	Integrated Natural Resource Management Plan
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan
km	kilometer(s)
LCFPD	Lake County Forest Preserve District
LCSMC	Lake County Stormwater Management Commission
m	meter(s)
MBTA	Migratory Bird Treaty Act
MFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MHPI	Military Housing Privatization Initiative
MILCON	Military Construction
MWR	Morale, Welfare, and Recreation
NAVFAC	Naval Facilities Engineering Command
NAVFAC-MW	Naval Facilities Engineering Command-MidWest

NPDES	National Pollutant Discharge Elimination System
NPS	non-point source
NPV	nucleopolyhedrosis virus
NRM	Natural Resources Manager
NRMPE	Natural Resource Management Program Elements
NSGL	Naval Station Great Lakes
OHS	Oil and Hazardous Substances
O&M(N)	Operations and Maintenance (Naval)
OPNAVINST	Chief of Naval Operations Instruction
PCB	polychlorinated biphenyl
PAH	polynuclear aromatic hydrocarbon
PM	Presidential Memorandum
POL	Petroleum Oils and Lubricants
PWD	Public Works Department
RTC	Recruit Training Command
RT&E	Rare, Threatened and Endangered
SAIA	Sikes Act Improvement Act
SCS	Soil Conservation Service
Spp	species
SVOC	semi-volatile organic compound
S&WC	Soil and Water Conservation
TSC	Training Support Center
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VA	Department of Veterans Affairs
VOC	volatile organic compound
2, 4-D	2, 4-dichlorophenoxyacetic acid
°	Degrees

SECTION 1 OVERVIEW

1.0 OVERVIEW

The Navy believes that military activities generally can be compatible with the conservation of sensitive biological resources. Naval Station Great Lakes (NSGL) will continue its established program of managing and conserving its natural resources in support of the military mission. The DoD and NSGL in particular, recognize that degradation of the land degrades its use for realistic training and thereby degrades readiness.

The INRMP outlines steps required to meet DoD, U.S. Navy, and NSGL legal and moral obligations to provide for the stewardship of the natural resources on NSGL, while supporting the accomplishment of the military mission. The INRMP has been developed through cooperation with appropriate regulatory agencies. As a public document, it will support and perpetuate the military mission while fostering stewardship and goodwill for NSGL. This INRMP will not resolve all existing and/or future environmental issues. It does, however, provide the guiding strategy, personnel, and means to minimize and work toward resolution of such issues.

1.1 PURPOSE

This Integrated Natural Resources Management Plan guides implementation of the natural resources program on NSGL from 2010 through 2019. This INRMP shows interrelationships between individual components of natural resources management (*e.g.*, soils, vegetation, wetlands, fish and wildlife), mission requirements and other land use activities affecting NSGL natural resources. The INRMP integrates current and future land use activities at NSGL with natural resources management and conservation. As such, this INRMP carries forward the multi-species conservation planning commitments from previous natural resources planning actions.

The INRMP summarizes baseline information, which can be used to help ensure compliance with regulatory and planning processes, such as those required by the Sikes Act, National Environmental Policy Act, Endangered Species Act, and Clean Water Act. This INRMP fulfills other responsibilities with regard to Department of Defense (DoD) and Navy policies and legal requirements regarding natural resource planning. The INRMP provides benefits to species for which critical habitat is proposed for designation, thus excluding the need to designate Endangered Species Act (ESA) critical habitat on NSGL, per Section 318, Military Readiness and Conservation of Protected Species, National Defense Authorization Act of 2004.

The INRMP is intended to be a technical document used by persons planning and/or preparing Station (herein Station refers to Naval Station Great Lakes) approvals, management actions, orders, instructions, guidelines, standard operating procedures, and other plans. The INRMP provides technical guidance for the integration of natural resource issues and concerns for facilities and operational planning, in accordance with the NEPA decision-making processes.

This INRMP is not intended to be used by persons operating in the field, other than by natural resources personnel of the Environmental Division. Field personnel are expected to be operating under NSGL guidelines, plans, orders, or other approvals that have been developed using the

INRMP and have already had environmental compliance review and, where applicable, regulatory approvals and/or permitting.

1.2 SCOPE

This INRMP outlines conservation efforts for NSGL and establishes procedures to ensure compliance with related environmental laws and regulations for fiscal years 2010 through 2019. The INRMP considers resources on Station and regional levels.

The INRMP includes input from diverse stakeholders including federal, state and local agency representatives, and conservation organizations. As required under Sikes Act Improvement Act (SAIA), this INRMP reflects mutual agreement of the US Fish and Wildlife Service (USFWS) and the heads of each appropriate state fish and wildlife agency concerning conservation, protection and management of fish and wildlife resources. It does not replace or affect any federal laws, or state responsibility and authority for protecting fish and wildlife resources.

1.3 GOALS AND OBJECTIVES

The implementation of this INRMP is intended to be a dynamic, multidisciplinary process. To provide direction, recognize target management actions, and construct the framework for measuring success of this INRMP, the following goals have been established:

- Provide for the conservation, enhancement, and rehabilitation of land and water resources of the Station while supporting the military mission;
- Maintain or increase the diversity and populations of plants and animals under the stewardship of the Department of the Navy through habitat maintenance, enhancement, or rehabilitation activities on NSGL that do not detract from the military readiness of the Station;
- Enhance the quality of life of Navy personnel by providing high-quality, accessible, outdoor recreational opportunities that do not degrade the natural resources;
- Foster and promote natural resource stewardship among Navy personnel, their dependents, and the public by providing opportunities to participate in natural resource conservation, education, and rehabilitation activities on NSGL.

From these goals, a variety of management objectives and projects specific to the needs of NSGL have been developed. The management objectives are components of the four goals and represent measurable targets to be used to quantify the success of this INRMP. Ecosystems are dynamic systems, and may exhibit responses to management actions different than those expected. A process of adaptive management will be used to compare the responses exhibited by the natural resources to the management projects against the desired response towards reaching the objective for that management project. Modification of the management objectives and projects may be needed to reach the desired goal. For example, a change in management actions may become necessary because of an unforeseeable and largescale disturbance (e.g., fires, large storm events, or droughts) to the natural resources. An adaptive management approach allows

for changes in short and long-term objectives from possible large-scale changes in the conditions of the natural resources to reach the goals of this INRMP. An adaptive management approach has been used throughout this plan.

1.4 RESPONSIBILITIES

1.4.1 INRMP IMPLEMENTATION RESPONSIBILITY

The NSGL Public Works Department Environmental Division (ENV DIV) is primarily responsible for implementing this INRMP. The ENV DIV provides program management for natural resource compliance and management activities on the Station including the following:

- Plan for and accomplish established goals, objectives, and planned actions to support the ongoing military mission of the Station;
- Provide technical guidance regarding vegetation management, soil conservation, management of Special Status Species, wetland conservation, fish and wildlife management, and outdoor recreation;
- Provide technical advice on military and non-military NEPA documents, facility planning, construction plans, maintenance activities, military operations, and other proposed actions that may affect natural resources;
- Use in-house staff, ENV DIV-managed contracts, and cooperative agreements to conduct fieldwork, surveys, and inventories to provide specific information on the flora and fauna on NSGL and proactively maintain up-to-date resource data for activity and project planning, thereby minimizing resource data collection delays;
- Serve as the lead for planning and addressing natural resource compliance issues, such as wetland and endangered species regulatory requirements;
- Provide technical natural resource management support to Station action proponents regarding resource compliance requirements and BMPs involved with their actions; and
- Provide conservation education training to military and civilian personnel to raise awareness and improve community relations with the goal of preventing resource damage.

1.4.2 INRMP IMPLEMENTATION PROFESSIONAL STAFFING

The following staffing (full-time permanent U.S. Navy civilian position) is required within the Environmental Division to implement this INRMP at NSGL:

Environmental Biologist

The NSGL ENV DIV strives to continuously improve the success of natural resources management activities through professional development and information exchange. This is

accomplished through professional training to keep staff knowledge of state of the art management strategies up to date.

The NSGL ENV DIV also endeavors to improve the success of natural resources management activities through the use of modern equipment and technology as well as the regular procurement of supplies needed to support the program. Supplies are necessary to conduct day-to-day operations and provide support to several smaller scale projects.

1.4.3 OTHER STATION ACTIVITIES AND TENANT STAKEHOLDERS THAT SUPPORT INRMP IMPLEMENTATION

Public Works Department/Grounds Maintenance/Pest Management

The ENV DIV maintains a close working relationship with the Public Works Department Operations and Maintenance Division to ensure maintenance and construction activities comply with the guidance in this plan. New construction plans are forwarded to the ENV DIV for review and comment on site development, landscape design and regulatory compliance.

The ENV DIV Environmental Biologist also serves as the Installation Pest Management Coordinator. This individual ensures compliance with pesticide use and storage regulations and updates the Integrated Pest Management Plan.

Grounds maintenance and pest management pesticide applicators are required to practice Integrated Pest Management in their respective programs and through this policy NSGL has met the DoD Measures of Merit for pesticide reduction and has reduced pesticide use on the station by more than 50%.

Moral Welfare and Recreation Department (MWR)

The MWR Department: develops, promotes, and operates recreation programs, athletic programs, Great Lakes harbor/marina/small boat launch, lake side RV campground and beach, library, clubs, and child care facilities; administers the use of all recreation funds; develops financial plans and services to improve the well-being, morale, and welfare of military personnel and their family members; and performs other functions.



Willow Glen Golf Course Native Meadow

MWR also operates Willow Glen Golf Course. Willow Glen Golf Course consists of approximately 138 acres of land. The course has instituted a number of management practices that further the goals of station's natural resources program. The course has converted approximately 10 acres of rough into native meadows. The native meadows are no mow/no spray

areas and are allowed to grow naturally. These native meadow areas reduce pesticide use on the Station

and add diversity to NSGL natural resources.

The golf course is committed to soil testing for nutrient management and only applies nutrients based on the results of soil testing. Integrated Pest Management is practiced in pest control programs and pesticides are only applied based on scouting, surveillance and the presence of documented target pest populations above established threshold levels.

1.4.4 Other Government Agencies

USFWS/IL-DNR

These agencies provide input and review of the INRMP. They also provide guidance and technical expertise on the management, identification and occurrence of federal and state RT&E species on the Station.

1.4.5 Command Support

Command support is essential to implementation of this INRMP. Many projects for natural resources management within the next five years require command support. The Commanding Officer is personally liable for noncompliance with environmental laws, such as those affected by this INRMP. Thus, he has a personal interest in ensuring that this INRMP is properly implemented.

This INRMP has the support of the Commanding Officer and other personnel in command positions who are needed to implement this INRMP. As required by the Sikes Act the Command is dedicated to implementation of this INRMP, and other environmental laws. Just as importantly, the Command is dedicated to maintaining and improving the military mission at NSGL. Implementation of this INRMP is a means to that end.

1.5 Authority

Department of the Navy installations are required to implement and maintain an integrated program to manage natural resources under their administration by Department of Defense Instruction (DODI) 4715.3, the Environmental and Natural Resources Program Manual (OPNAVINST 5090.1B, Change 2), and the Sikes Act Improvement Act (SAIA) (16 United States Code 670a through o). Multiple-use, protection and enhancement of natural resources, sustainable yield, and maintaining biological integrity using an ecosystem management approach are requirements under DODI 4715.3 and OPNAVINST 5090.1B. SAIA requires military installations having significant natural resources to prepare an Integrated Natural Resource Management Plan (INRMP) for the conservation and rehabilitation of these resources. The INRMP is to provide for integrated fish and wildlife management, land and forest management, wetland enhancement and protection, public access and sustainable use of the natural resources and enforcement of natural resource laws and regulations without interfering with the military readiness or mission of the Station. Under SAIA, the INRMP is to reflect cooperation and mutual agreement between the Station, the U.S. Fish and Wildlife Service (USFWS), and State fish and wildlife agencies—in this case, the Illinois Department of Natural Resources (IL-DNR).

Naval Station Great Lakes must prepare and implement an INRMP to facilitate the natural resources management program in compliance with these laws and regulations.

The Sikes Act (16 USC 670 *et seq.*) states, *The Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations. To facilitate the program, the Secretary of each military department shall prepare and implement an integrated natural resources management plan for each military installation. It requires that each INRMP shall, where appropriate and applicable provide for:*

- Fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetland protection, enhancement, and restoration where necessary for support of fish or wildlife;
- Establishment of specific natural resources management objectives and time frames for proposed action;
- Sustained use by the public of natural resources to the extent such use is not inconsistent with the needs of fish and wildlife resources management;
- Public access to the military installation that is necessary or appropriate for sustained use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security;
- Enforcement of natural resource laws and regulations;
- No net loss in the capability of military installation lands to support the military mission of the installation; and
- Such other activities as the Secretary of the military department considers appropriate.

The Sikes Act also requires or provides for:

- Regular review of this INRMP and its effects, not less often than every five years;
- Provisions for spending hunting and fishing permit fees exclusively for the protection, conservation, and management of fish and wildlife, including habitat improvement and related activities in accordance with the INRMP;
- Exemption from procurement of services under Office of Management and Budget Circular A-76 and any of its successor circulars; and

- Priority for contracts involving implementation of this INRMP to state and federal agencies having responsibility for conservation of fish or wildlife.

An installation must prepare an INRMP when it supports federally listed species and/or designated critical habitat; substantial wetland areas; or large areas (*e.g.*, 50 or more acres) used for military readiness purposes, which require care (*e.g.*, actions to prevent soil erosion).

1.6 Military Mission

Naval Station Great Lakes is now the Navy's largest training center whose mission is to:

- Exercise command over and coordinate the efforts of assigned subordinate activities in conducting recruit, initial skill, advanced and specialized training.
- Maintain and operate facilities.
- Provide administrative and logistic support to tenant activities.
- Perform other such functions and tasks as assigned by higher authority.

To meet this mission, NSGL is home to three major commands with training responsibilities: Recruit Training Command (RTC), Training Support Center (TSC) and Corps School (U.S. Navy, 2006).

1.7 Stewardship and Compliance

Previous natural resources stewardship by the Department of the Navy resulted in valuable biological resources remaining on NSGL. These resources include important habitats for many sensitive species of plants and wildlife, as well as regional habitat linkages and wildlife corridors. Unfortunately, important biological resources have not fared as well on civilian holdings throughout the Great Lakes coastal region. Many species and their associated habitats are declining due to greatly increased civilian development. Habitats that remain in the region are becoming increasingly fragmented. As a result, the city, county, state, and federal governments, as well as the general public, have given greater attention to the biological resources on NSGL in the context of regional conservation planning.

The Navy believes that military activities generally can be compatible with the conservation of sensitive biological resources. In considering participation in regional ecosystem approaches to resolving land use conflicts, the Navy considered the following principles:

1. The overriding mission of the DoD is the protection of the national security of the United States, and military activities on departmental lands are vital to fulfillment of that mission.
2. Such agreements, and their projects, will not detract from the DoD national mission, now or in the future.
3. Military lands cannot be used for the mitigation of impacts of non-department actions occurring off the installation that affect the environment.

4. Military lands cannot be set aside as perpetual environmental preserves. While conservation is, and shall be, practiced on Naval installations, the Navy maintains the flexibility to adapt the defense mission to political and technological developments.
5. The DoD's first priority shall be to integrate the management of natural and cultural resources with the military mission within the ecosystem supporting the installation.

The training and natural resources management communities on NSGL share a common goal: a sustainable landscape that can accommodate continued training with minimal restrictions placed upon it. This shared value is attainable only through cooperation and collaboration between the two communities. Open communication and information sharing is crucial to their respective missions. Several forums exist to facilitate coordination. The Installation Environmental Quality Board convenes bi-monthly and provides an opportunity for frank discussion of training deficiencies, emerging natural resources issues and potential resolutions.

1.8 Review and Revision Process

Section 101(b)(2) of SAIA requires that each plan be reviewed "on a regular basis, but not less often than every five years." NSGL recognizes that natural resource management is a dynamic process and that this INRMP will need to be evaluated and revised frequently. Consistent with Navy and DOD guidance, NSGL intends to review the INRMP annually in cooperation with the USFWS, IL-DNR and revise the INRMP when necessary. The continuous involvement of the USFWS, IL-DNR and the public is expected to assist in future reviews and revisions.

Public Works Department, Environmental Division is responsible for conducting the annual reviews and acts as the liaison with cooperating wildlife agencies. During these annual reviews, natural resource management objectives, planned actions, and proposed actions will be reviewed with the appropriate managers to document progress, identify additional actions required or desired, and revise implementation schedules and priorities. As part of these reviews the USFWS and IL-DNR will be involved in the evaluation of processes, results, and implementation of established milestones and timelines for specific projects and programs and a review of ecosystem, species, and habitat goals established in conservation management plans. New projects, data, understanding of natural processes and species, and lessons learned from completed and ongoing projects and practices will be incorporated as appropriate following these INRMP reviews.

1.9 Commitment of U. S. Fish and Wildlife Service (USFWS) and State Fish and Wildlife (IL-DNR)

Under SAIA, the INRMP is to reflect cooperation and mutual agreement between the Station, the U.S. Fish and Wildlife Service (USFWS), and state fish and wildlife agencies—in this case, the Illinois Department of Natural Resources (IL-DNR).

This document was prepared in cooperation with the U.S. Fish and Wildlife Service and the IL-DNR, representing the federal and state Sikes Act cooperating agencies, respectively. Appendix F includes review/concurrence documents from the USFWS and IL-DNR.

Revision of this INRMP, as required by the Sikes Act, has been accomplished in cooperation with the U.S. Fish and Wildlife Service (USFWS) and IL-DNR. This cooperation ensured that the INRMP reflected mutual agreement of these parties concerning conservation, protection, and management of fish and wildlife resources on the Station.

1.10 Management Strategy

Management of Station natural resources will support sustainable military use through the application of an integrated approach to ecosystem management. An ecosystem, by definition, is a dynamic and natural complex of living organisms interacting with each other and with their associated non-living environment.

Ecosystems are dynamic systems, and may exhibit responses to management actions different than those expected. A process of adaptive management will be used to compare the responses exhibited by the natural resources to the management projects against the desired response towards reaching the objective for that management project. Modification of the management objectives and projects may be needed to reach the desired goal. For example, a change in management actions may become necessary because of an unforeseeable and large-scale disturbance (e.g., fires, large storm events, or droughts) to natural resources. An adaptive management approach allows for changes in short and long-term objectives from possible large-scale changes in the conditions of the natural resources to reach the goals of this INRMP. An adaptive management approach has been used throughout this plan.

Ecosystem management is an interdisciplinary planning and management process that focuses on identifying, restoring and maintaining natural communities in support of the military mission and other sustainable activities. The principles of ecosystem management, that have been incorporated into DOD Conservation Instruction 4715.3, adopted in 1994, are as follows:

- **Maintain and improve the sustainability and native biological diversity of ecosystems.** NSGL sustains extraordinary species and community diversity that has been supported by a half century of sound natural resources management.
- **Administer with consideration of ecological units and timeframes.** Impacts of Station activities are considered in terms of spatial and temporal scales that are relevant to natural processes. Natural resources at NSGL are significant on a base level (providing land and resources for Station activities) and on a regional level (the Station is one of many large state and federal landowners in the region and as such plays a key role in regional initiatives). While it is appropriate to consider many actions solely on a Station level (e.g., construction of new buildings, etc.), some activities need to be considered on a larger scale (e.g., impacts of Station management on RT&E species, water quality of Lake Michigan, etc.).
- **Support sustainable human activities.** Ecosystem management recognizes that people are an integral component of ecological systems, and it supports multiple-use of natural resources and sustainable development. Natural resources are managed on NSGL to support the military mission and to provide sustainable environments for training, education, and operations. Within the safety and operational constraints of military training and consistent with the needs of the

NSGL region, the Station works to: (1) provide outdoor recreational opportunities consistent with demand from Base personnel, residents, and military retirees in nearby communities; and (2) promote natural resources management, general welfare, and the local economy by appropriately managing natural resources on an environmentally sustainable basis.

- **Develop a vision of ecosystem health.** Ecosystem management depends upon participation by diverse stakeholders (federal, state, local, and tribal governments; nongovernmental organizations; private organizations; and the public) and their ability to develop a shared vision of what constitutes a desirable future condition for the region of concern. At NSGL, this means considering the mission as well as the relationship of the Station to surrounding communities and regional environmental efforts.
- **Develop priorities and reconcile conflicts.** Station objectives are established, prioritized, and revisited on a regular basis. This includes consideration of natural resources management to meet both Station (mission) and regional objectives. If there are any conflicts, they can be resolved through periodic regional workshops and stakeholder discussion.
- **Develop coordinated approaches to work towards ecosystem health.** Because ecosystems do not follow political and social boundaries, a coordinated approach on military installations must: (1) include early and regular participation by military operations personnel and regional stakeholders (to include other state and federal agencies); (2) incorporate ecosystem management goals into strategic, financial, and program planning and design budgets; and (3) seek to prevent duplication of effort and minimize inefficiencies. These efforts are ongoing on NSGL.
- **Rely on the best science and data.** Understanding of ecosystems and natural communities is constantly evolving through science and discussion. NSGL is committed to the collection, maintenance, and use of scientific data required for making sound natural resources and land use management decisions. For example, NSGL uses Geographical Information Systems (GIS) mapping technologies to guide management actions.
- **Use benchmarks to monitor and evaluate outcomes.** The ecosystem management approach depends on “specific and measurable objectives and criteria with which to evaluate activities in the ecosystem.” This revised INRMP will include specific, measurable goals and objectives, and task schedules for NSGL.
- **Use adaptive management.** Ecosystems are constantly changing. Management practices must accommodate changes in both the ecosystem and our understanding of these systems. This revised INRMP will be reviewed again as required in five years. The NSGL Environmental Division will adapt environmental management efforts when new information is available or significant changes to the ecosystem occur.
- **Implement through Station plans and programs.** Ecosystem management activities identified in an INRMP cannot stand alone. Instead, they must be incorporated into other planning and budgeting documents which help direct land management planning at NSGL.

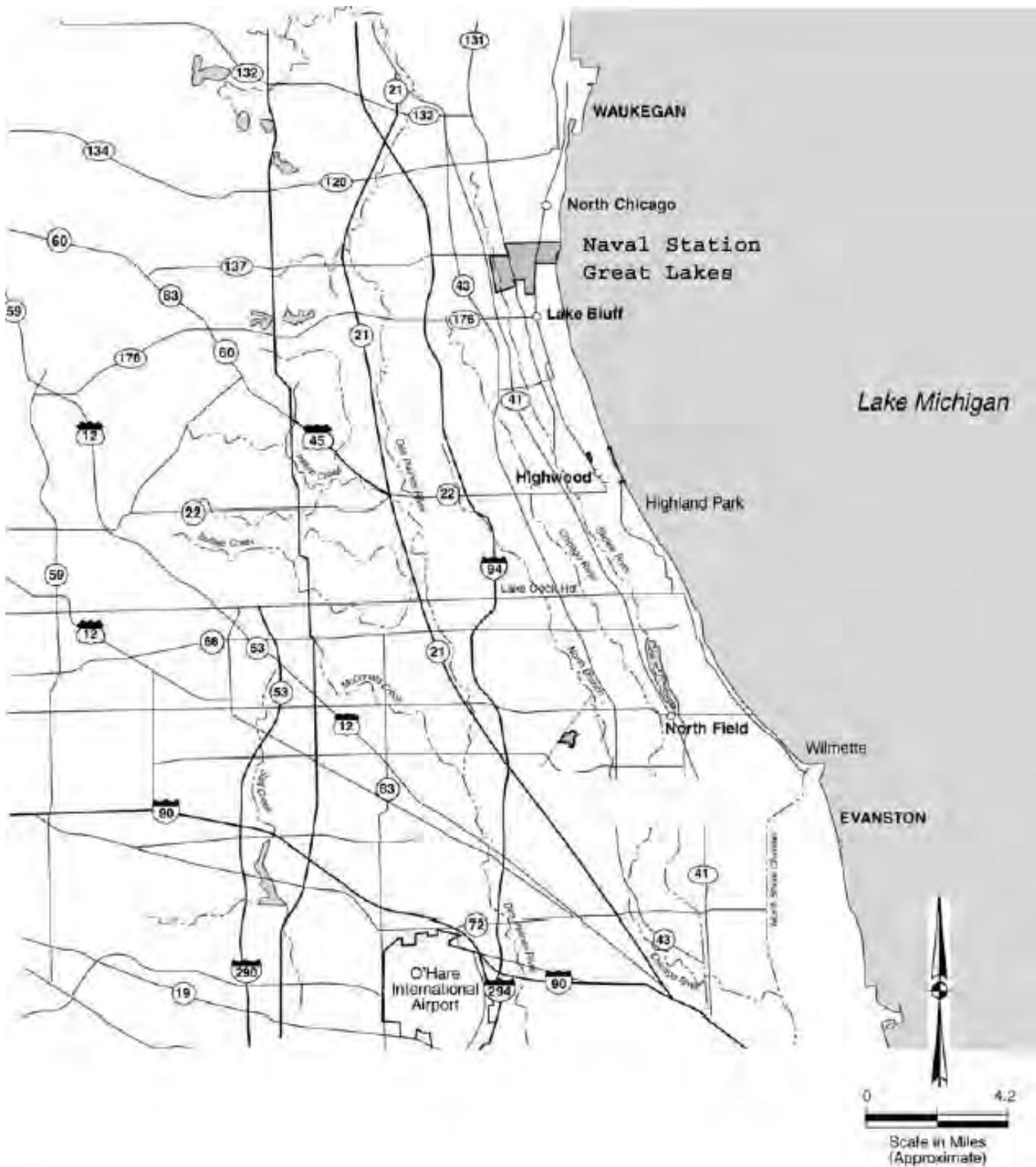
SECTION 2.0 CURRENT CONDITIONS

2.0 Current Conditions and Use

2.1 Station Information

Location

NSGL is located in Lake County, Illinois (*Figure 2-1*), and consists of approximately 1,202 acres. The Station is located in the northeastern portion of the state within the municipality of North Chicago (*Figure 2-2*). The Station is approximately 35 miles (56 kilometers [km]) north of the central business district of Chicago, and 65 miles (105 km) south of Milwaukee, Wisconsin. NSGL is bordered by Lake Michigan to the east, industrial areas of North Chicago to the north, residential areas of Lake Bluff and Shore Acres Golf Course to the south and unincorporated Shields Township to the west.



Note: To convert miles to kilometers, multiply by 1.60935.

Figure 2-1



Figure 2-2

2.2 Constraints

Most restrictions on training will occur in the wetland areas of NSGL (*Figure 2-3*), especially Wetland Area 3 where the state endangered Common tern nests. This area is especially significant due to the rarity of this species. This area has been the only known nesting colony of Common terns in Illinois since 2000. No other site in the state currently supports a nesting population of this species. Although DOD installations are not mandated by law to protect State listed threatened or endangered species they are encouraged to protect and manage these species whenever possible (OPNAVINST 5091,1B, 22-5.2a).

The Pettibone Creek ravine area consists of high slopes that continue to experience erosion problems. The steep slopes of the ravine could offer opportunities for repelling training or climbing however, training is restricted in this area because of continued concern over slope erosion.



Legend



Station Boundary



Wetlands Delineated from
1999 Wetland Survey



0 500 1,000
Meters



Figure 2-3 Constraints

2.3 Opportunities

Most of the remainder of the Station outside the wetland areas is urban, paved or open space (*Figure 2-4*). Training occurs throughout these areas. Most outdoor training of personnel is limited to marching, running, formations, and other general physical activity.

NSGL is located in a highly urban environment. There is heavy residential and industrial development (encroachment) in close proximity to the Station's boundaries with the exception being to the Station's east where the shoreline of Lake Michigan serves as the Station's border. The Station does not engage in flight operations training or ground combat training where encroachment issues may arise that would conflict with training operations.

Advanced training on NSGL consists primarily of indoor classroom training of personnel. There is virtually no field training that would impact on the natural environment or create problems where training would conflict with neighboring land use.

Under authority of the Readiness and Environmental Protection Initiative (within Section 2811, FY 2003 National Defense Authorization Act) installations may now enter into formal agreements with a partnership of various federal, state, and private organizations to protect and manage land around military installations and limit encroachment that would have an adverse impact on training and mission. Usually, a non-governmental organization, such as The Nature Conservancy or The Trust for Public Lands, acquires either the land or easements on the land from willing sellers on behalf of the partnership. If an easement is purchased, the landowner can usually remain on the land and conduct their preferred lifestyle, whether it is forest management, ranching, farming, etc. These lands will be managed in perpetuity in a manner to conserve the ecosystem and limit urbanization along the military installation boundaries.

There have been notable successes with this process at other DoD facilities. The program is being implemented on a large number of other installations, including Camp Pendleton, Camp Lejeune, and MCAS Beaufort. Eighteen of the nation's conservation organizations have requested that Congress increase funding for the Readiness and Environmental Protection Initiative to \$250 million in FY 2006. Given the highly developed nature of the property surrounding NSGL, the high land values and the current mission of the Station it is neither practical nor feasible that NSGL would seek this mechanism of limiting encroachment on the Station's mission.



Opportunities and Constraints on Training

Great Lakes, Illinois

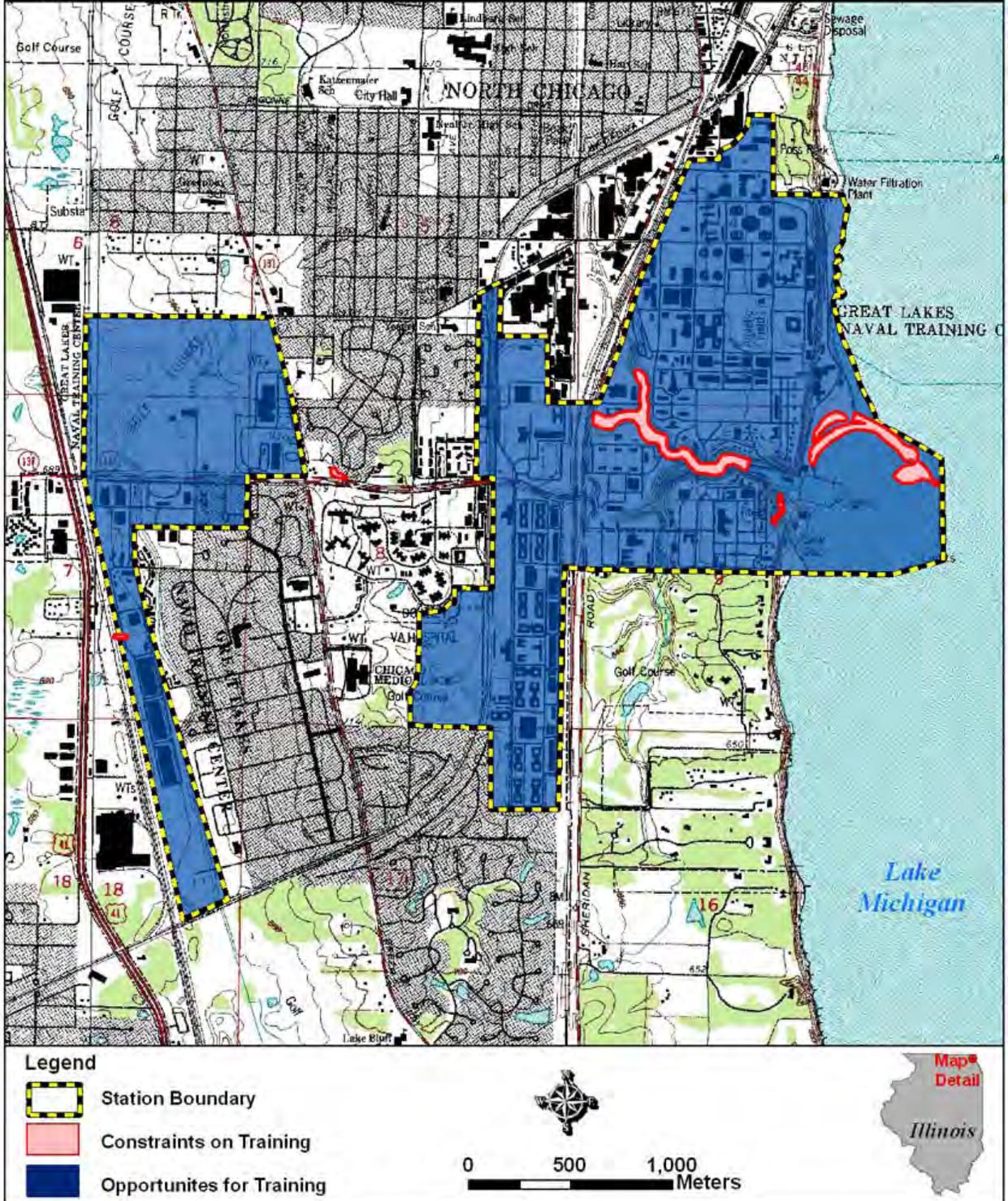


Figure 2-4 Training Opportunities and Constraints

2.4 Operations and Activities

Grounds Maintenance

All grounds maintenance on the Station is performed by contract. Contract administration responsibility falls with the NAVFAC Public Works Department. Maintenance activities consist of:

- Grass cutting and trimming
- Mulching and landscaping
- Pruning, planting and removal of trees
- Restoration and renovation of turf
- Application of nutrients and soil stabilization
- Application of pesticides to ornamental landscaping and turf

Navy policy is to maintain an acceptable level of appearance on all installations using landscaping practices that minimize costs. Navy installations shall support the goals of Executive Order (EO), 13148, *Environmentally and Economically Beneficial Landscaping Practices*, April 26, 1994 on all new or extended landscaped areas and shall consider native plants when replacement or rejuvenation of existing landscaping is required (OPNAVINST 5091.1b ch-3). The EO directed installations to use native vegetation in landscaping as one way to do this. Use of non-native ornamental trees and shrubs can increase grounds maintenance costs because these plants typically are not adapted to local conditions. Non-native ornamentals often are less tolerant of local climate, and replacement of dead or weather-damaged non-native trees and shrubs increases grounds maintenance costs. Applications of chemicals (pesticides and fertilizers) to maintain an acceptable level of appearance of landscaped grounds are other additional costs incurred from using non-native ornamental plants. Pesticide application is relatively expensive because of costs of chemicals, labor to mix and apply, application equipment, and maintaining safe mixing and storage areas. Pesticides are a potential threat to the natural environment from accidental spills, overspray, and impacts to non-target organisms. Reducing amounts of pesticides applied and using the least environmentally harmful chemicals is required (7 U.S.C. 136 et seq.) for proper natural resources management as well as cost reduction.

No formal Station landscape plan exists, however; the ENV DIV maintains a list of approved native shrubs and trees suitable for planting on the Station (*Table 2-5*). NSGL has a Station Master Plan where guidance can be found for planting landscaping around buildings and structures. Landscape plans for new buildings and renovations around existing buildings are designed and reviewed to provide optimum aesthetic appeal and minimum maintenance costs. New landscape plantings and construction of new buildings must adhere to the guidance found in Unified Facilities Criteria [UFC] Department of Defense Minimum Antiterrorism Standards for Buildings, 8 October 2003.

Pest Management

Pest management operations are performed via contract with the exception of Willow Glen Golf Course where in-house personnel are used. All pest management operations performed on the Station conform to the guidance found in the approved Integrated Pest Management Plan. All pesticide applications are based on surveillance, the presence of documented target pests and adhere to the principals of Integrated Pest Management. Outdoor pesticide operations that could impact natural resources consist of:

- Area wide larval and adult mosquito control
- Herbicide/insecticide/fungicide applications to turf
- Insecticide applications to ornamental trees and shrubs

PWD Operations and Maintenance

PWD operations, including maintenance, are performed by in-house government personnel. Supplementary contracts are utilized to help augment the capabilities of the in-house PWD Operations Division. Operations consist of light to heavy industrial maintenance of NSGL buildings and utility systems. PWD maintenance activities consist of:

- Digging for maintenance and repair of utility systems
- Renovation of structures
- Maintenance and repair of infrastructure
- Maintenance of storm water management systems
- Snow removal

The PWD employs the use of numerous types of heavy construction equipment and the possibility of spills of petroleum, oils and lubricants (POL) due to equipment failure always exists. NSGL uses the guidance found in the Spill Prevention, Control and Countermeasures Plan to respond to any spills of POL's

Outdoor Recreation

MWR manages the outdoor recreation areas on NSGL. Many opportunities to interact with the natural environment exist on the Station. However, outdoor recreational opportunities at NSGL are limited by military operational and security needs, safety concerns, limited management staff to administer programs, and the relatively small land area with a finite resource base. Outdoor recreation activities consist of:

- Boating at the marina, harbor and small boat launch
- RV parking at the RV Park
- Lakeside swimming and fishing
- Archery and camping

- Walking in designated nature trails
- Golfing

Military Training

NSGL is the Navy’s largest training center. There are three major commands with training responsibilities located on NSGL: Recruit Training Command (RTC), Training Support Center (TSC), and Corps School (U.S. Navy, 2006).

There is virtually no field training of personnel on NSGL that would affect natural resources. The majority of training consists of indoor classroom training. Outdoor training of personnel is mainly formations, marching, running and other physical activities. Most of these activities occur on hard surfaces and open grassy areas.

2.5 Abbreviated History and Pre-Military Land Use

NSGL is located in Lake County, Illinois. When the previous INRMP (2002) was implemented NSGL consisted of approximately 1,939 acres. Subsequent privatization of all the housing on the Station, GHA and FSHA has reduced the area of NSGL to 1,202 acres.



View of Mainside circa 1940

The original site for NSGL was initially identified in 1902 as one of 37 possible locations for a proposed naval training base. In 1904, the site, which originally included 172 acres, was selected for the Naval Station. Construction of the base was commissioned in 1905, and was finished for dedication in 1911 (U.S.Navy, 2000a). Since 1911, the site grew to accommodate training requirements during the World War I, World War II, the Korean Conflict and the Vietnam War. In 1994, the site became home to the Navy’s only recruit

training command. With the closing of the Naval Air Station Glenview in 1995, the NSGL Housing Office assumed management and maintenance responsibilities for the 260 unit, 85 acre Glenview Housing Annex (GHA). The GHA was integrated as a permanent military housing area within NSGL. GHA has subsequently been privatized and turned over to a private land developer. The Fort Sheridan Housing Annex (FSHA) was obtained for the housing of NSGL personnel in 1993 after the U.S. Army closed the main portion of Fort Sheridan under BRAC. This area consisted of 329 family housing units and compromised 206 acres of the prior Station. FSHA was privatized at the same time as the GHA.

2.6 Regional Land Uses

NSGL is bordered by Lake Michigan to the east, industrial areas of North Chicago to the north, residential areas of Lake Bluff and Shore Acres Golf Course to the south and unincorporated Shields Township to the west.

North Chicago is a mixture of residential and industrial areas and is the manufacturing headquarters of Abbott Laboratories, EMCO Chemical and Jelly Belly.

Lake Bluff, Illinois is located 35 miles north of the City of Chicago. Bordered by the City of Lake Forest to the south, the Village of Green Oaks to the west, NSGL to the north, and Lake Michigan to the east, the Village of Lake Bluff is home to over 6,000 residents.

Shields Township is located on the west shore of Lake Michigan and comprises approximately 18 square miles. It includes all or a portion of the cities of Lake Forest, North Chicago, the Village of Lake Bluff, and unincorporated Lake County.

Geographically, the station separates the affluent North Shore from the more industrial Waukegan/North Chicago area, the latter now announcing numerous redevelopment projects across their span for strip malls and new urban residency communities.

2.7 General Physical Environments

Topography

NSGL is located on the USGS Waukegan, Illinois 7.5-minute topographic quadrangle map (*Figure 2-5*). The site generally consists of level lands bordered by steep bluffs that face Lake Michigan with a network of interior ravines. The eastern boundaries of the Station are beaches located on the western shore of Lake Michigan at an elevation of 580 feet (177 meters [m]) above sea level. The steep bluffs immediately behind the beaches reach elevations of approximately 650 feet (198 m) above sea level.

The elevation of the plateau above the bluff ranges from approximately 650 to 700 feet (198 to 213 m) above sea level. Slopes in this area range from 1.0 and 1.5 percent. The plateau is rather flat except for dissection by the branching ravine system of Pettibone Creek and its tributaries. The ravine system defines the boundaries between different areas of NSGL. The Pettibone Creek system consists of a north and south fork that merge and flow east into Lake Michigan via the Boat Basin. The creek has a moderate to steep gradient and varies from 15 to 30 feet (5 to 9 m) in width and from 3.0 inches (7.6 centimeters [cm]) to over 6.0 feet (1.8 m) in depth. The ravine is between 50 to 100 feet (15 to 30 m) in height with slopes of approximately 30 to 70 degrees. The major drainage divide of this region is found approximately 4 miles (6.4 km) inland from Lake Michigan along Green Bay Road at an elevation of 710 feet (216 m) above sea level. The Station west of Green Bay Road is located within the Skokie Drainage Basin, part of the Mississippi River Watershed.

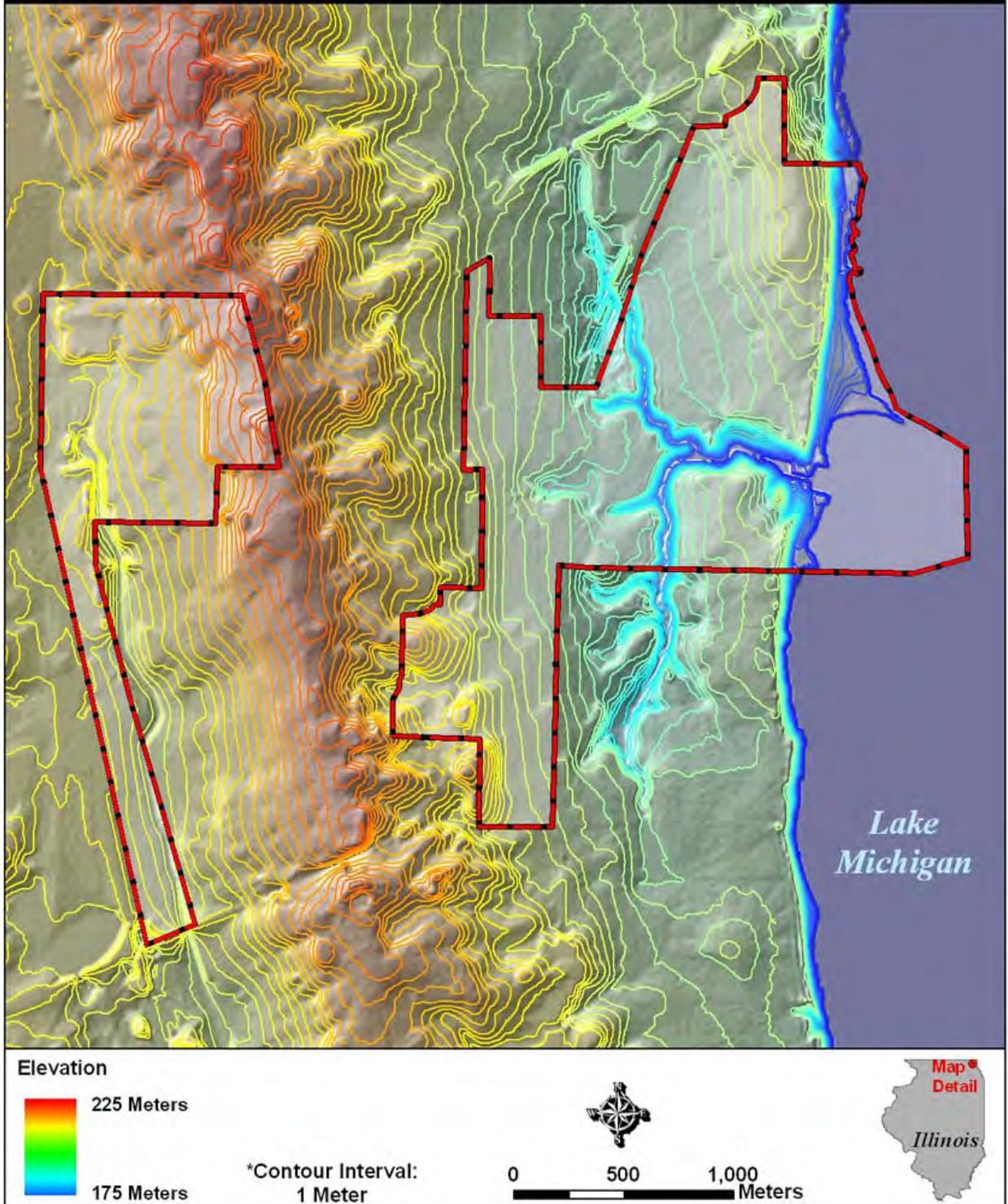


Figure 2-5 Elevation

Geology

NSGL is located on the Wheaton Morainal Complex of the Great Lakes Section of the Central Lowland Province (U.S. Navy, 1998a). The geology of this region is described as unconsolidated glacial till of the Equality Formation overlying Silurian Age dolomite. A general geologic description from ground surface to bedrock is 100 to 150 feet (30 to 46 m) of fine-grained till underlain by 10 to 50 feet (3 to 15 m) of sand and gravel. The sand and gravel is underlain by 10 to 50 feet (3 to 15 m) of fine-grained till that overlays Silurian Age dolomitic bedrock. The most recent period of glaciation is primarily responsible for present-day landforms (Soil Conservation Service [SCS], 1970). The unconsolidated glacial deposits range in thickness from 100 to 300 feet (30 to 91 m).

Northeastern Illinois is located within a region of minimal seismic activity. The seismic zone defined by the Universal Building Code for the Station is 0 (on a scale from 0 to 4). This designation indicates that the probability of a property-damaging earthquake is low.

Soils

The predominant soil type at NSGL is classified as Made Land (*Figure 2-6*). Made Land consists of areas of manmade cuts and fills and areas covered almost entirely with roads and buildings. The cuts are made to a number of unspecified depths, and the fill consists of various materials, including materials that are not classified as “soil”. Some of these areas have been filled with coal fines or cinders from the former on-site coal-fueled power plant (U.S. Navy, 1998a). The remaining soil series on the Station east of Sheridan Road include Hennepin loam (30 to 60 percent slopes) in the ravines and the bluffs, Beecher silt loam (0.0 to 2.0 percent, and 2.0 to 4.0 percent slopes), and beach sand along Lake Michigan. The soil on the steep slopes is best suited for providing wildlife habitat and forestry opportunities. Beecher silt loam is found on level to gently sloping terrain that is somewhat poorly drained. Clayey subsoil limits water movement and maintains a seasonal high water table. This soil is best suited for farming when it occurs in agricultural areas.

Construction of infrastructure in support of the military mission has also disturbed soils and native vegetation within Pettibone Ravine. This infrastructure includes a service road located along the north bank of Pettibone Creek at the toe of the ravine slopes, several now abandoned ammunitions bunkers built into the ravine, steam delivery pipes, bridges, and storm sewers. These structures are contributing to increased rates of soil erosion observed within the ravine. The soil erosion has the potential to cause structural damage to infrastructure and interfere with the military mission. A survey within Pettibone Ravine showed numerous storm sewers and bridge foundations that are now exposed and contributing to rapid soil erosion around these structures (*Figure 2-7*). Broken concrete rubble was placed on slope faces near buildings and a variety of other sites in an effort to stabilize the area, but this effort has failed.

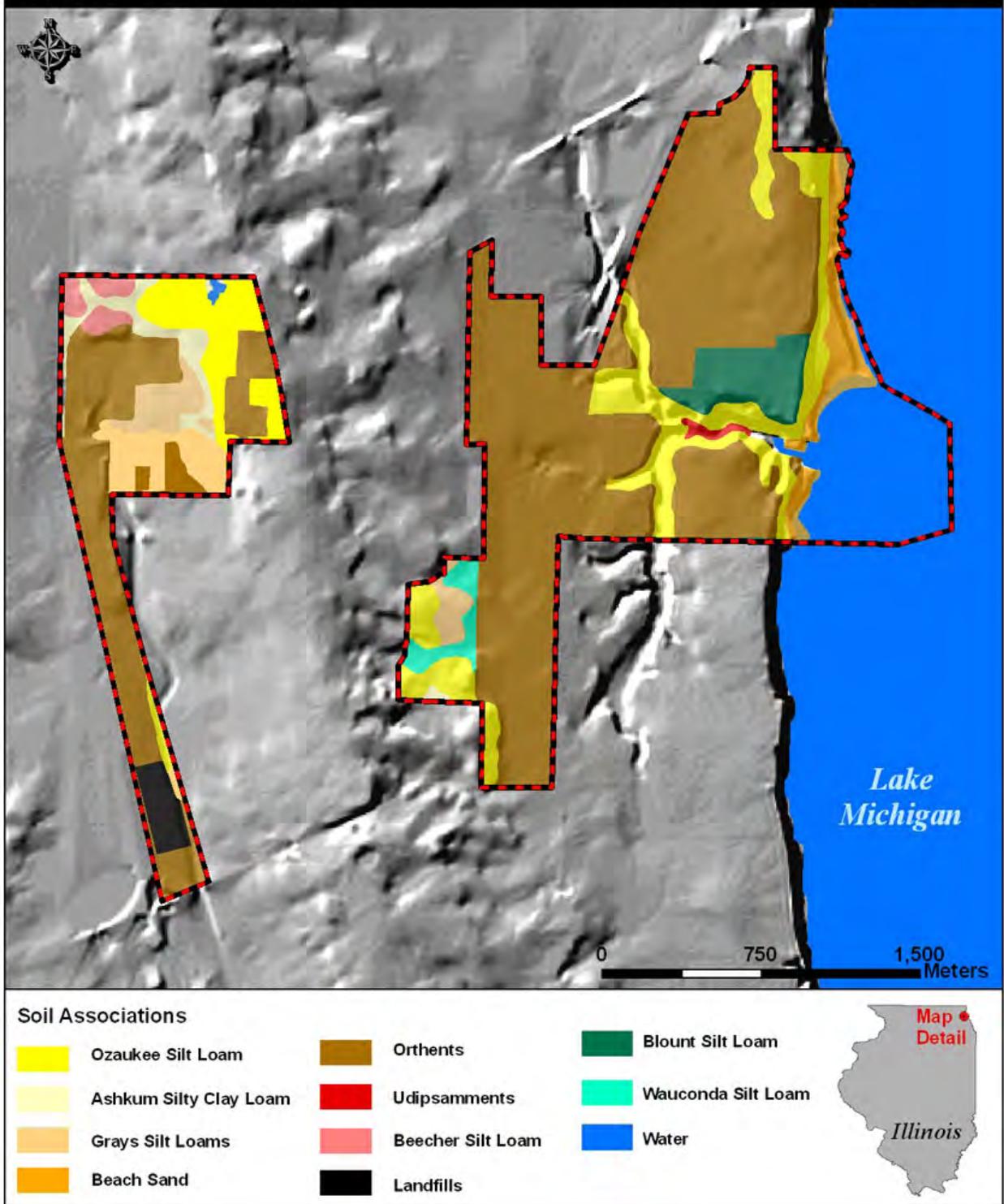


Figure 2-6 Soils

Erosion is also occurring along the lakefront bluffs and beaches at the Station, threatening damage to the structures and infrastructure on the tops and slopes of the bluffs. These problems are a result of man's development in the area that has disturbed the natural vegetation cover, drainage, and littoral drift and beach formation process.

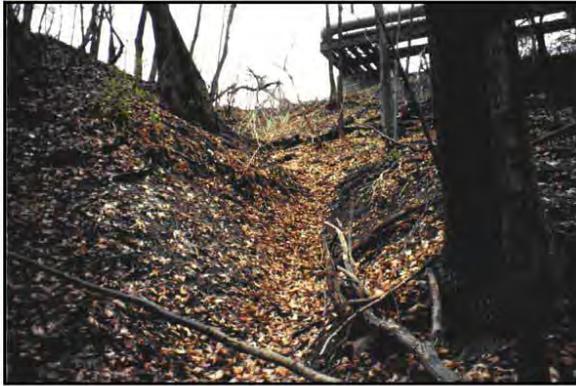


Photo A - Erosion in Pettibone Ravine resulting from storm water runoff being direct into the ravine instead of a storm sewer.



Photo B - Large section of storm sewer undercut and exposed by erosion and slope failure.



Photo C - Concrete debris near Bunker 24D that was placed on the slope in an effort to stabilize the area.

Figure 2-7 Pettibone Erosion

Watersheds

NSGL west of Green Bay Road, including the Willow Glen Golf Course, is located within the Skokie Drainage Basin, part of the Mississippi River Watershed. The western side of the Station is drained by the Skokie River, also known as Skokie Ditch, which in turn drains into the Des Plaines River to the south of the Station. The Station east of Green Bay Road is within the Lake Michigan Drainage Basin. Surface waters in this drainage basin flow into Lake Michigan directly through a system of creeks, or ravines, along the edge of the lake. The major surface water bodies of significance in the eastern portion of NSGL consist of Pettibone Creek and Lake Michigan.

Floodplains

There are two types of floodplains at NSGL, riverine and coastal (lakefront) floodplains. Flooding of riverine areas is caused by rainstorm runoff that exceeds the natural carrying capacity of the channel. Flooding of the Lake Michigan coastal areas, results from excessive high water levels, wave run-up from high winds, and storms.

The majority of NSGL is outside of the 100-year floodplain. Historically, localized flooding has occurred along Pettibone Creek and the Skokie River, in isolated upland depressed areas, and during major storm events, in the streets and building areas within the developed areas of the Station. Flooding from high lake levels or storm surges outside of the beach areas at the Station is unlikely because they are 45 to 70 feet (14 to 21 m) higher in elevation than normal lake levels.

Surface Water

The Pettibone Creek system consists of a north and south fork that merge and flow east into Lake Michigan via the Boat Basin. The north branch of Pettibone Creek originates outside of NSGL in an urbanized area zoned for light industry and is the discharge point for storm sewers within the City of North Chicago. The south branch originates in a residential area south of the Department of Veteran's Affairs (VA) Hospital, and flows to the east and then to the north through a private golf course before entering the Station site near the Naval Health Clinic. Pettibone Creek is considered moderately impaired, by the Illinois Environmental Protection Agency (IEPA), with respect to designated uses, supporting aquatic life and recreational swimming (IEPA, 1998). The causes of impairment include the presence of elevated concentrations of heavy metals and alterations in habitat. Sources of impairment include industrial point sources, urban runoff and storm water, channelization, atmospheric deposition of pollutants, and the presence of contaminated sediments. Results of sampling conducted in 1990 indicated that Pettibone Creek has levels of phosphorous, copper, mercury, cadmium, lead, chemical oxygen demand, and strontium in excess of state water quality standards (IEPA, 1990).

The construction and operation of the Boat Basin, Inner Harbor, and Outer Harbor during the 1940s at NSGL has altered the lower reach of Pettibone Creek and a portion of Lake Michigan. Pettibone Creek was widened landward of the shoreline to create the 2.6-acre (1.1-ha) elongation of the creek's mouth, known as the Boat Basin. Silt has filled most of this area, reducing surface

water depth from less than 1.0 foot (0.3-m) to about 5.0 feet (1.5-m) when Lake Michigan is at normal levels. During 1989 to 1992, as a part of a proposed harbor-dredging project, investigators sampled and tested sediments and water in the Boat Basin and Inner Harbor (U.S. Navy, 1993a). Sediment analyses showed moderate to high levels of PCB, semi-volatile compounds, dichloro-diphenyl-trichloroethane (DDT), arsenic, copper, lead, zinc, mercury, and ammonia nitrogen when compared to water quality standards or Lake Michigan background levels. Ambient water quality readings in the harbor and Lake Michigan showed pollutant concentrations below Illinois water quality standards, suggesting that contaminants have settled into the harbor bottom. By comparing relative pollutant concentrations along Pettibone Creek, in the harbor, and in Lake Michigan near the harbor, the investigators concluded that the harbor contamination appeared to be via Pettibone Creek.

For Lake Michigan, point and non-point source pollutant discharges have historically caused both poor water quality and poor sediment quality. In recent years, water quality control programs have greatly reduced point sources; however, non-point sources and legacy sources (contaminated groundwater and sediments) are still substantial (U.S. EPA, 2000). Backflows induced by combined sewer overflows, direct storm water runoff, and industrial discharges are the leading sources of diminished water quality in the heavily populated and industrial southern part of the basin. In Lake Michigan's open waters, phosphorus and chlorophyll concentrations have decreased significantly since the late 1970s. Chloride concentrations continue to increase at an accelerating rate and the presence of toxic chemicals in the water and sediment continues to affect the health of fish and bird populations (U.S. EPA, 2000).

The Skokie River receives storm water discharges at several locations along its course within NSGL and typically flows year round. The Skokie River generally has fair water quality (IEPA, 1998). The 1998 update to the Illinois Water Quality Report states the overall use and aquatic life functions of the Skokie River have partial support/minor impairment. Stream channelization, storm water runoff, and point-source pollutant discharges reduce water quality and suitability of the Skokie River as fish habitat.

Groundwater

Glacial deposits that are up to 300 feet (91 m) thick underlie NSGL. This material is poorly sorted and is a possible source of area groundwater. Sand and gravel lenses located throughout the deposited glacial till may serve as localized aquifers, while fine-grained till deposits may serve as aquitards. Groundwater is the source of potable water for Illinois communities without access to Lake Michigan surface water. Regionally, there are five water-bearing hydrogeologic units located beneath the Station. These aquifers are, in order of increasing depth below surface, the Glacial Drift, the Silurian Dolomite, the Glenwood-St. Peter Sandstone, the Ironton-Galesville Sandstone, and the Mt. Simeon Sandstone. At NSGL potable water is supplied from Lake Michigan (U.S. Navy, 1998a).

The water table is typically within 10 feet (3 m) of the ground surface in most parts of the Station, and may intersect the surface in low-lying areas. The shallow water table intersects Pettibone Creek, and may intersect the Skokie River after periods of heavy rainfall. Groundwater movement is primarily horizontal through the till, and rates of movement are slow

due to low hydraulic conductivities. With depth, pore spaces are filled with calcareous cement that isolates the overlying till from the deeper aquifers.

2.8 General Biotic Environment

2.8.1 Threatened and Endangered Species and Species of Concern

The USFWS lists six species of animals and seven species of plants in Lake County as threatened or endangered (USFWS, 2006). Lack of suitable habitat for most of these species and urbanization surrounding the Station greatly reduce the possibility of finding any Federal-listed threatened or endangered species on these locations. A county-by-county listing of Federal-listed threatened and endangered species in Illinois is available at: <http://www.fws.gov/endangered/wildlife.html> - Species

The Illinois Endangered Species Protection Board (IESPB) listed 299 species of plants as endangered and 58 as threatened in Illinois. In addition, 21 species of fish are listed as endangered and nine species as threatened. Nine species of amphibians and reptiles are listed as endangered, with the same number listed as threatened. Thirty-two species of birds are listed as endangered and nine species are listed as threatened. Six species of mammals are listed as endangered, and three are listed as threatened. The latest lists of State-listed threatened and endangered species can be found on the World Wide Web at <http://dnr.state.il.us/espb/>

Birds

No Federal-listed threatened or endangered species of bird are known to routinely occur in Lake County. The piping plover (*Charadrius melodus*) and bald eagle (*Haliaeetus leucocephalus*) are potential transient migrants along the shores of Lake Michigan (U.S. Navy, 1998a), though none nest on NSGL. The piping plover prefers nesting on undisturbed sandy beaches in proximity to water bodies. Harbor Island may have suitable habitat for the piping plover but to date there is no indication of the species nesting on the island. Beaches on the Station are easily accessible to foot traffic, which creates a relatively low but constant level of disturbance. This disturbance makes the beaches unsuitable as nesting habitat for piping plovers. The areas on and surrounding the NSGL are too urbanized and lack sufficient nesting trees for the bald eagle.



Harbor Island

NSGL is used as a feeding and resting site by migrant birds and is important to the conservation of State-listed threatened and endangered species (*Table 2-1*) (U.S. Navy, 1995; IL-DNR, 2001). The Piping plover has been documented on Harbor Island. An investigator conducting the 1995 bird survey classified them as migrants, not breeding birds. The investigator believed that these species were using the Station as a feeding and loafing site during migration.

A nesting colony of the state endangered Common tern (*Sterna hirundo*) was first documented on NSGL Harbor

Island during the summer of 2000 (IL-DNR, 2000). This colony appeared to be a colony that was displaced from a location north of the Station. The colony did not successfully breed during the summer of 2000. Human disturbance and mammalian predators prevented the colony from successfully raising young during the first year. Bird surveys of Harbor Island in the following years have shown the Common tern returning to the site and nesting.



Common tern nest Harbor Island

Subsequently the ENV DIV in cooperation with the IL-DNR has designated Harbor Island as a protected bird sanctuary and has constructed an electric fence around a portion of the island in order to manage nesting habitat. The protected habitat has attracted a diversity of rare and unusual birds. Large numbers of migratory shorebirds use this protected site during their long migration to and from their nesting sites in the arctic tundra to Central and South America where they overwinter.

The significance of NSGL Harbor Island for nesting Common terns is vital for the perpetuation of the species in Illinois. This has been the only known nesting colony of Common terns in Illinois from 2000 through

2004 (IL-DNR, 2004). No other site in the state supports a nesting population of this species: the entire state population resides on this site. Since records have been kept on nesting terns in Illinois (1936), a total of only 228 young have been successfully fledged. Of these 228 young, 107 have originated from this colony: nearly 50% of all terns hatched in Illinois since 1936 have fledged from this colony (IL-DNR, 2004).



Harbor Island Electric Fencing

TABLE 2-1 SPECIES OF STATE-LISTED BIRDS AS THREATENED OR ENDANGERED DOCUMENTED TO OCCUR ON NSGL

Common name	Scientific name	Status *	NSGL
Black-crowned night heron	<i>Nycticorax nycticorax</i>	T	X
Bald eagle	<i>Haliaeetus leucocephalus</i>	T, FT	**P
Peregrine Falcon	<i>Falco peregrinus</i>	E	X
Osprey	<i>Pandion haliaetus</i>	E	**P
Common snipe	<i>Gallinago gallinago</i>	WL	**P
Forster's tern	<i>Sterna forsteri</i>	E	X
Common tern	<i>Sterna hirundo</i>	E	X
Least flycatcher	<i>Empidonax minimus</i>	WL	**P
Wood thrush	<i>Hylocichla mustelina</i>	WL	**P
Piping plover	<i>Charadrius melodus</i>	FT	**P
Ovenbird	<i>Seiurus aurocapillus</i>	WL	**P
Cerulean warbler	<i>Dendroica cerulea</i>	T	X

*T = State listed threatened, E = State listed endangered, FT = Federal listed threatened, WL = State watch list **P= possible transient migrant X=Present at this location
 Source: U.S. Navy, 1995; IL-DNR, 2001

Plants

Three species of plants, the Eastern prairie fringed orchid (*Platanthera leucophaea*), prairie bush-clover (*Lespedeza leptostachya*), and Pitcher's thistle (*Cirsium pitcheri*), are Federal-listed as threatened in Lake county (USFWS, 1999). None of these species were documented in a past floral survey of NSGL. The eastern prairie fringed orchid requires mesic to wet prairies, and the prairie bush-clover requires dry to mesic prairies with gravelly soils, conditions that do not exist on the Station. Potentially suitable conditions for Pitcher's thistle (lakeshore dunes) do exist on the Station, however, and this plant eventually may colonize the dune areas. This species has been introduced to Lake County (USFWS, 1999).

The 1995 floral survey found five species of plants on the state threatened and endangered species lists within NSGL. (Table 2-2). Most of these species were found on the lake bluffs and the dune community along the shore of Lake Michigan. Forked aster was found only in Pettibone Ravine at NSGL during the floral survey.

TABLE 2-2 PLANTS STATE-LISTED AS THREATENED OR ENDANGERED DOCUMENTED TO OCCUR ON NSGL

Common name	Scientific name	Status *	NSGL
Marram grass	<i>Ammophila breviligulata</i>	E	X
Sea rocket	<i>Cakile edentula</i>	T	X
Seaside spurge	<i>Chamaesyce polygonifolia</i>	E	X
Forked aster	<i>Aster furcatus</i>	T	X
Green yellow sedge	<i>Carex viridula</i>	T	X

*T = threatened, E = endangered, X = present at this location.

Source: U.S. Navy, 1995; IL-DNR, 2001

Invertebrates

The USFWS currently lists the Karner blue butterfly (*Lycaeides melissa samuelis*) as extirpated in Lake County (USFWS, 1999), but also states that the potential for this butterfly to inhabit the county remains. The loss of oak savannahs and pine barrens to urbanization, and suppression of naturally occurring fires in Lake County are the main reasons for the loss of the Karner blue butterfly within Lake County. Because NSGL lacks these types of plant communities, the presence of the Karner blue butterfly is unlikely.

No comprehensive survey for invertebrates has been conducted on the Station and the presence of any of the State-listed species on NSGL is unknown.

Mammals

The Indiana bat (*Myotis sodalis*) is considered to be endangered in all counties of Illinois (USFWS, 1999). The normal hibernation habitat (caves and abandoned mines) is not found on the Station. This bat requires riparian and floodplain forests to form successful maternity colonies and as foraging habitat. Because this type of habitat is not found on NSGL, the presence of this bat is highly unlikely.

The Gray Wolf, (*Canis lupus*) is federally-listed as "endangered" in all counties of Illinois, and is listed by Illinois as "threatened." On February 18, 2005, a Gray Wolf was road-killed in Lake County on Rt. 173 at the Fox River, within 20 miles of NSGL (IL-DNR 2006). This was an adult male wolf dispersing from Wisconsin origins. Wisconsin wolf numbers have increased by about 10% per year over the last few years, and at any given time 10-15% are thought to be individual dispersing animals, so occasional dispersing wolves can be expected to occur in Lake County from time to time. Lack of suitable habitat and the highly developed nature of the area around NSGL would make it extremely unlikely that the wolf would occur in the area.

The most recent faunal survey did not document the presence of any State-listed threatened or endangered mammals on the Station (U.S. Navy 2000b; 1995). The river otter (*Lontra canadensis*) is no longer state listed but has been observed in Lake County north of NSGL.

Rivers, streams and lakes are key habitats for the otter. Those with wooded shorelines and nearby wetlands are best. Water quality isn't a major concern unless it's devoid of fish. Some types of contaminants can cause problems, but tests show that otters from Illinois have little or no accumulation of these compounds in their bodies. Their presence on NSGL would more than likely be a transient presence because Pettibone Creek, Skokie Creek and the harbor do not offer a suitable habitat to sustain a population of the species.

Aquatic Species/Reptiles

The pallid sturgeon (*Scaphirhynchus albus*) is the only Federal-listed endangered species of fish in Illinois (USFWS, 1999). This fish is an inhabitant of large river systems with silty bottoms and having a diversity of depths and velocities formed by braided channels, sand bars, sand flats, and gravel bars. These conditions do not exist on NSGL. Seventeen species of fish are State-listed as endangered, and eight as threatened, within Illinois. Pettibone Creek in its current condition is unsuitable for permanent or self-sustaining populations of fish, and the presence of any of these species in this stream is unlikely. Some of these species may occur in Skokie River, but none were documented on the Station during the 1995 faunal survey.

Blanding's turtle (*Emydoidea blandingii*) is listed as threatened in Illinois. The turtle is found in shallow, weedy ponds, marshes, river backwaters and sloughs. Blanding's turtle is mostly aquatic, but will often travel over land to find nest sites, mates, or new habitat. The turtle has not been documented as occurring on NSGL but suitable habitat exists in the Willow Glen Golf Course pond.

2.8.2 Wetlands



Wetland Area 3

Clayton Environmental Consultants was contracted to perform a jurisdictional determination and delineation of the boundaries of "waters of the United States," including wetlands, which occur within 11 pre-defined areas of NSGL and adjacent properties in Great Lakes, Illinois (Figure 2-8). J.F. New & Associates (JFNA) was subcontracted by Clayton to conduct the fieldwork. The 11 investigated areas were defined in the May 1994 report prepared by EEU-NAVFAC Naval Reserve Center in Pensacola, Florida, and include the following:

- Area 1: Lakefront Northeast corner of mainside at fenceline
- Area 2: Lakefront Jetty or panne at lakefront
- Area 3: Lakefront Boat basin, inner harbor shoreline
- Area 4: Mainside Pettibone Creek and adjacent banks
- Area 5: Lakefront Ravine south of boat basin

- Area 12: Supply/Forrestal Skokie Creek, south of Buckley Road
- Area 13: Supply Property line west of buildings 3501 and 3405
- Area 14: Landfill/Supply Southwest corner of closed landfill area

Eleven areas were initially inspected during the site survey however, NSGL no longer has three of the areas in inventory, hence the discrepancy between the initial wetland survey and this INRMP. The wetland areas on those lands are now under the purview of a private land developer.

The contractor inspected the 11 “areas of concern” in the field on September 23 and 25, 1999, and November 17, 1999. Based on data collected in the field for all 11 areas it was determined that Areas 2, 3, 5, and 13 contain jurisdictional wetland (*Table 2-3*). The areas containing jurisdictional wetlands were delineated. Each of the five areas was surveyed. Area 2 was found to contain approximately 1.25 acres of emergent and scrub/shrub wetland; Area 3 contains approximately 12.3 acres of emergent wetland; Area 5 contains approximately 0.27 acres of forested wetland; Area 13 contains approximately 0.012 acres of shrubby emergent wetland on the Station property, and extends offsite to the west. In addition, Pettibone Creek in Area 4 and Skokie Creek in Area 12 are jurisdictional “waters of the United States” below the ordinary high water mark.

TABLE 2-3 WETLAND SITES FOUND ON NSGL

SITE #	BASE AREA	SITE DESCRIPTION	SIZE/ ACRES	*TYPE
2	Center of Lake Front	Panne & sand dune area	1.25	Palustrine (Vernal Pool)
3	South of Lake Front	Outer harbor shoreline jetty & Harbor Island	12.3	Palustrine (Vernal Pool)
*4	Pettibone Ravine	Pettibone Creek - Water of the U.S.	N/A	N/A
5	South of Boat Basin	Lower Ravine area	0.27	Palustrine (Wet Meadow)
*12	S. of Buckley Road	Skokie Creek - Water of the U.S.	N/A	N/A
13	NSGL Supply	Fenceline W. of Bldgs. 3501 to 3405	0.012	Palustrine (Prairie Pothole)
NSGL - TOTAL:			[13.832]	

Note: Palustrine - Wetlands which include - marshes, swamps and floodplains. Palustrine systems include any inland wetland which lacks flowing water and contains ocean derived salts of less than 0.05%.

Additionally 4.9 acres of wetlands were delineated on Willow Glen Golf Course during a wetland survey in July, 2001 (*Table 2-4*). Nine wetland areas were identified on the golf course.

Earlier investigations performed by PRC Environmental Management in 1996 and by Beling Consultants in 1997 identified ten wetlands, however, one of the wetlands no longer exists, due to changes made in the layout of the golf course and drainage improvements. The current wetlands were identified, delineated using red flags, and photographed as part of this identification and delineation. Procedures in the U.S. Army Corps of Engineers (USACE) *Wetlands Delineation Manual* published in 1987 were followed.

TABLE 2-4 WILLOW GLEN WETLANDS

SITE #	BASE AREA	SITE DESCRIPTION	SIZE/ ACRE	*TYPE
17	Golf Course	SW corner of Golf Course	0.24	Palustrine (Prairie Pothole)
18	Golf Course	Buckley Rd N. along Skokie Creek	2.27	Palustrine (Wet Meadow)
19	Golf Course	N. end of Skokie Creek	0.15	Palustrine (Prairie Pothole)
20	Golf Course	Center of Course	0.48	Palustrine (Wet Meadow)
21	Golf Course	Former Site / Eliminated		
22	Golf Course	SE adjacent to propertyline	0.02	Palustrine (Wet Meadow)
23	Golf Course	E. center - adjacent to fenceline	0.01	Palustrine (Wet Meadow)
24	Golf Course	E. center - adjacent to fenceline	0.03	Palustrine (Wet Meadow)
25	Golf Course	E. center - adjacent to fenceline	0.02	Palustrine (Wet Meadow)
26	Golf Course	N. pond(s) - adjacent to fenceline	1.68	Palustrine (Wet Meadow)
		<i>Willow Glen Golf Course - TOTAL:</i>	<i>[4.9]</i>	



Figure 2-8 NSGL Wetland Areas

2.8.3 Ecosystems

The Wetland Ecosystem

There are approximately 19 acres of wetlands on NSGL. "Wetlands" describes land where the water table is at or near the surface and the soils are hydric (wet and low in oxygen) and occupied by hydrophytes (plant species adapted to life in water or in saturated soils.) That definition encompasses bogs, marshes, sedge meadows, wet prairies, fens, swamps, bottomland forest, ponds, sloughs, mudflats, and areas having frequent river overflows. Wetlands in Illinois may be fed by runoff, rainfall, seepage from groundwater, or a combination of all of these sources.



The value of wetlands to the environment has only recently been widely recognized. For example, wetlands filter and purify water that flows through them. They also store water during flood events and trap sediments that otherwise would enter streams. Wetlands are thought to provide natural flood control by slowing the movement of rainfall and snowmelt into streams and by storing excess water that streams cannot accommodate during high flows. They are also thought to contribute to increased low flows in streams, in part because they help recharge shallow aquifers that feed streams during low-rainfall periods. Wetlands provide habitat to an impressive diversity of plants and animals.

Harbor Island

Urban Forests

NSGL lands are primarily urban and are largely developed. The largest stands of trees on the Station occur in the Pettibone Creek Wildlife Area.



Trees in an urban or landscaped area, when placed properly, provide oxygen; remove odors and pollutants; absorb dust, noise and heat; prevent strong sheetflow of stormwater; prevent soil erosion; provide windbreaks and noise barriers; act to moderate heating and cooling costs; create urban wildlife habitat; provide aesthetic appeal and urban landscape buffers; and enhance outdoor activities (Lipkis, 1990). Large trees along sidewalks, roads, and open

areas provide shade and ultraviolet light protection to pedestrians as well as aesthetic appeal, and help to connect the landscaped area to natural surroundings. Trees provide “urban habitat” for many species, including songbirds and squirrels, and provide opportunities for non-consumptive wildlife recreation (photography, wildlife watching, etc.). The presence of birds and squirrels enhances aesthetic appeal of the urban area. Properly selected and placed trees will draw potentially nuisance wildlife away from inhabited buildings, thus decreasing potential for human-wildlife conflict. For these reasons, having healthy trees in an urban environment is important to any Navy installation.

Trees on developed and landscaped areas of the Station are limited compared to the number that could be planted. Planting small woodlots in areas without buildings on the Station is not possible because all potential areas are reserved to support the military mission. Planting trees in such areas would be a poor investment if an area in which a woodlot was planted became necessary to support the military mission shortly after planting occurred. Mission needs, new utility and other construction, and changes in land use that occur often result in the unavoidable loss of trees on NSGL. Effective management of urban trees requires a plan to avoid, minimize, and mitigate for lost trees on NSGL. Such a plan needs to have current information about trees found in the urban environment, including their species, location, and general condition. A management plan for urban trees also can help locate non-native trees or those species that have characteristics, such as weak wood, that detract from their overall utility and aesthetics and increase grounds maintenance costs. Currently, no formal and comprehensive plan is in place and regularly funded to monitor and replace trees in developed and landscaped areas at the NSGL. NSGL does have an ongoing urban tree replacement and landscaping program that address the ongoing maintenance of trees (pruning/trimming) and nutrient management of landscaping. A list of trees approved for planting can be found in Table 2-5.

Pettibone Ravine



White-tailed Deer Pettibone Ravine

Pettibone Ravine is a forested ravine located directly north of the boat basin. The ravine is the only forested area remaining on the Station. Pettibone Ravine is utilized as a walking nature trail and wildlife observation area. Visitors to the area are likely to observe various songbirds, squirrels and white tail deer when walking the area.

The vegetation at the bottom of the ravine is dominated by wood nettle (*Laportea canadensis*), wild golden glow (*Rudbeckia laciniata*, FACW+), orange jewelweed (*Impatiens capensis*), great blue lobelia (*Lobelia siphilitica*), and reed canary grass (*Phalaris arundinacea*) and common reed

(*Phragmites australis*). A narrow seep spring located on the west slope of the ravine is dominated by skunk cabbage (*Symplocarpus foetidus*) and blue fruited dogwood (*Cornus obliqua*).

Upland from the boat basin the forest is defined by a slope and transition to vegetation dominated by sugar maple (*Acer saccharum*), basswood (*Tilia americana*), yellow rocket (*Barbarea vulgaris*, FAC), white snakeroot (*Eupatorium rugosum*), Virginia creeper (*Parthenocissus quinquefolia*), garlic mustard (*Alliaria petiolata*) and box elder (*Acer negundo*). In general, the banks of the ravine are wooded and dominated by mesic overstory species. Understory vegetation includes honeysuckle (*Lonicera tatarica*), garlic mustard, curly dock (*Rumex crispus*) and purple loosestrife (*Lythrum salicaria*).

TABLE 2-5 LIST OF APPROVED TREES FOR NSGL IN THE URBAN ECOSYSTEM

COMMON NAME	SCIENTIFIC NAME	FORM	HEIGHT	SPREAD	MOISTURE	*SALT	PROBLEMS	COMMENTS
American Hornbeam	<i>Carpinus caroliniana</i>	R, B	20-30	20-30	M			
American Beech	<i>Fagus grandifolia</i>	R	50-90	40-60	M		i	
Buckeye, Yellow	<i>Aesculus flava</i>	O, I	50-75	30-50	M	M	f, n	
Coffeetree, Kentucky	<i>Gymnocladus dioicus</i>	O, I	60-90	30-50	M		n	Large shade tree
Elm, Accolade	<i>Ulmus jaopnica x wilsoniana</i>							
Honeylocus,								
Common thornless	<i>Gleditsia triacanthos inermis</i>	R	50-75	50-75	M,D,P	T	f, n	Large shade tree
<u>Linden</u>								
American	<i>Tilia ameriicana</i>	P, O	60-100	25-50	M, D		f	Large shade tree
Bigleaf	<i>Tilia platyphyllos</i>	P, O	60-90	40-50	M		a	Large shade tree
Crimean	<i>Tilia x euchlora</i>	P, O	60-90	40-50	M, D		f	
Littleleaf	<i>Tilia cordata</i>	P, O	60-90	40-50	M, D		f	Med. shade tree
Silver	<i>Tilia tomentosa</i>	O, R	50-90	30-60	M, D		f	
<u>Maple</u>								
Autumn Blaze	<i>Acer</i>							
Red	<i>Acer rubrum</i>	O	40-60	30-45	M, P		h	Med. Shade tree
Sugar	<i>Acer saccharum</i>	R, O	60-75	50-75	M		i	Large shade tree
<u>Oak</u>								
Bur	<i>Quercus macrocarpa</i>	R, B	70-100	70-100	M, D, P	M	n	Large shade tree
English	<i>Quercus robur</i>	R, B	50-75	50-75	M		f, n	

The Panne

The panne ecosystem on NSGL (*Figure 2-9*) is a rare and unique community within the region, and is highly valuable to the regional biota and the natural heritage of the Great Lakes and northeastern Illinois. Panne in this context refers to a freshwater inter dunewetland that receives regular inundation and saturation from a large body of water, and supports emergent, herbaceous wetland plants. Pannes enrich the regional biodiversity that is in decline because of urbanization, human disturbances, and alterations to the natural disturbance cycles by supporting a large number of plant and animal species. The panne on the Station holds several State-listed threatened and endangered species, adding to the importance of this community in conservation of regional biodiversity and natural heritage. In addition to the importance pannes have for plants, they are important in providing habitat for shorebirds and other avifauna, small mammals, and insects. At least two species State-listed as endangered, the Forster's and Common terns, make use of freshwater marshes during its breeding cycle, and may use the panne for breeding. The panne also provides feeding and nesting habitat for birds such as the redwinged blackbird, spotted sandpiper, and ducks. Thus, the panne is important to the conservation and management of common as well as threatened and endangered species in Illinois. Pannes have also been identified as imperiled on a global scale and have a global ranking of two (G2). Pannes also have a global context of one,

which means they are located entirely within the Great Lakes Basin.



The Panne

Pannes are disturbance-adapted communities that are sensitive to external and internal conditions. Generally, primary threats to pannes include reeds (*Phragmites spp.*), cottonwood, vehicular/pedestrian traffic, and purple loosestrife. They need regular cycles of disturbance to maintain open sandy areas to perpetuate or expand in distribution. However, the open sandy areas cannot be under constant and severe disturbance, such as from frequent human activity, because native plants

may not establish while invasive exotics may become entrenched and displace native plants. If the native plant community is lost, recolonization of the area by native plants would be difficult. The panne on NSGL is isolated from similar communities along Lake Michigan. This isolation reduces the chance that colonizing individuals of native species will become established on the site and re-establish a panne community, and in extreme instances can mean potentially permanent loss of this community.

Invasive exotics, especially purple loosestrife and *Phragmites*, are the primary threat to the panne community located at the Station. Purple loosestrife and *Phragmites* are

aggressive weeds introduced from Europe that quickly invade wetlands and other open areas, forming a monoculture that displaces native flora. Monocultures of invasive exotics rarely are able to support more than a few species of generalist animals, leading to a further reduction in regional biological diversity. The State of Illinois has declared both these species to be exotic weeds, and sale of the plants are controlled under the Illinois Exotic Weed Act of 1987. This act does not require efforts to control invasive weeds by private citizens on private property. However, Federal agencies are required to control noxious and exotic weeds by the Federal Noxious Weed Act and Navy policy (DODI 4715.3 2c, 2h). Purple loosestrife and Phragmites both threaten to displace native species of plants and animals in the panne, and will be controlled to the maximum practicable extent as part of natural resources management on NSGL.

Sand Dune Communities

Sand dune communities (*Figure 2-9*) have value as wildlife habitat in maintaining regional biological diversity. Of particular conservation note is suitability of sand dune communities for the Federal-listed Pitcher's thistle. Sand dune communities also are valuable foraging habitat and refuges for songbirds and shorebirds, and may be used by small mammals and reptiles in the area. For these reasons, management of sand dune communities on NSGL is needed for proper stewardship of natural resources, and will be done to the maximum extent that does not conflict with the military mission and operations.

The major threats to the sand dune communities are human disturbance, and beach erosion. While some disturbance within these communities is needed to allow dispersal and establishment of herbaceous plants, too much disturbance will cause the loss of the community. Proper management requires limiting human disturbances to these communities and preventing their loss from beach erosion. These management activities will be the main focus of managing sand dune communities on NSGL.



Photo A - Aerial view of the panne and sand dune community on Main Installation.

Photo B - View of panne showing the encroachment of woody vegetation.



Photo C -View of sand dune community showing encroachment of woody vegetation.

Figure 2-9 Panne and Sand Dunes

2.8.4 Fish and Wildlife

Birds

Many species of resident and migratory birds make use of NSGL. Recent bird surveys documented 34 species of breeding birds and 100 species of migratory birds within the Station. The majority of the breeding birds are extremely common in the Chicago area, tolerant of human activities, and able to survive in the edge-dominated landscape found on NSGL. The highly developed nature of the Station limits the number of bird species able to make use of it, with the greatest concentration and diversity of species found in Pettibone Ravine and along the lake bluffs and beach areas where human impacts are least. Some of the species listed as migratory may in fact be resident year-round on the Station, but the majority appears to use the ravines, lake bluffs, and beach areas as a resting and feeding area during migrations. A colony of the State-listed endangered common tern (*Sterna hirunda*) is documented as breeding and nesting on the Station on Harbor Island. A more complete discussion of this species and its use of NSGL can be found in section 2.2, Rare, Threatened and Endangered Species.



Common tern

NSGL is used as feeding and resting site by migrant birds and is important to the conservation of State-listed threatened and endangered species (*Table 2-5*) (U.S. Navy, 1995; IL-DNR, 2001). NSGL has taken steps to protect migratory bird resting and nesting sites and has partnered with the IL-DNR and has made special provisions to provide access to staff Natural Heritage personnel from the IL-DNR and the Illinois Natural History Survey to actively assist in

managing and monitoring migratory birds on the Station.

Fishes

Historically, Lake Michigan had the highest commercial fishery yield of all the Great Lakes. The sea lamprey and alewife invasion, heavy fishing pressure, and habitat degradation drastically altered the indigenous fish community that supported the commercial fishery (U.S. Department of Interior, 1998). Resource agencies have made significant progress in fish community rehabilitation in the last 30-35 years. Regulation of chemical inputs to the lake and increased fish habitat conservation and management

have improved conditions for commercial game fish such as the Coregonines (whitefish [*Coregonus clupeaformis*], chubs and bloaters [*Coregonus hoyi*]), lake trout (*Salvelinus namaycush*), and coho (*Oncorhynchus kisutch*) and chinook salmon (*Oncorhynchus tshawytscha*). In the 1980s, chubs rebounded to high abundance levels and yellow perch (*Perca flavescens*) rebounded to abundance levels that produced near record total harvest. An intensive hatchery program to develop Pacific salmon (*Oncorhynchus* spp.) and trout populations created an excellent trout and salmon sport fishery (U.S. Department of Interior, 1998).

During fish surveys conducted in 1983, 1984, and 1986, twenty species of fish were documented within the Station Harbor (Table 2-9). The presence of these commercial and sport fish makes the harbor an important resource to be managed for the benefit of the lake fisheries and recreational fishing on NSGL.

TABLE 2-6 FISHES DOCUMENTED FROM LAKE MICHIGAN IN AND NEAR NSGL HARBORS DURING SURVEYS CONDUCTED IN 1983, 1984, AND 1986

Common Name	Scientific Name
Coho Salmon	<i>Oncorhynchus kisutch</i>
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>
Lake Trout	<i>Salvelinus namaycush</i>
Brown Trout	<i>Salmo trutta</i>
Rainbow Trout	<i>Oncorhynchus mykiss</i>
Carp	<i>Cyprinus carpio</i>
Carp x Goldfish	<i>Cyprinus carpio x Carassius auratus</i>
Gizzard Shad	<i>Dorosoma cepedianum</i>
Lake Whitefish	<i>Coregonus clupeaformis</i>
Alewife	<i>Alosa pseudoharengus</i>
Black Bullhead	<i>Ameiurus melas</i>
Bluntnose Shiner	<i>Pimephales notatus</i>
Golden Shiner	<i>Notemigonus crysoleucas</i>
Emerald Shiner	<i>Notropis atherinoides</i>
Rainbow Smelt	<i>Osmerus mordax</i>
Rock Bass	<i>Ambloplites rupestris</i>
White Sucker	<i>Catostomus commersoni</i>
Yellow Perch	<i>Perca flavescens</i>
Northern Pike	<i>Esox lucius</i>
White Crappie	<i>Pomoxis annularis</i>

Pettibone Creek provides potential habitat for fish, as do the Inner and Outer Harbors of the Station. However, recent fauna surveys have not documented any significant fish populations within Pettibone Creek, although a few individual fish are reported well upstream from the mouth of the creek. A 1989 investigation of Pettibone Creek found

low species diversity in the indigenous fish community (U.S. Navy, 1990). Creek chubs (*Semotilus atromaculatus*), fathead minnows (*Pimephales promelas*), green sunfish (*Lepomis cyanellus*), and white suckers (*Catostomus commersoni*) were the dominant species in this community. NSGL personnel have observed salmon congregating upstream from the mouth of Pettibone Creek (U.S. Navy, 1990). The reported salmon are most likely transient individuals not part of permanent or self-sustaining populations in the creek. The report concluded that water quality, stream size, and gradient limit the fisheries diversity. Currently, fish advisories are posted for Pettibone Creek and adjoining lake areas, and state that certain species may possess elevated toxin levels in their tissues and pose a health risk if consumed. Skokie River, in the area of the Station, does not have any reported populations of fish, and is not likely to be suitable for such populations in its current condition.

Amphibians and Reptiles

Recent fauna surveys of NSGL have not documented the presence of amphibians or reptiles within Pettibone Ravine, the bluffs, or along the beaches, although potential habitat for these species is present. Based on known distributions and vegetation types, species of amphibians and reptiles that may occur on the Station include snapping turtles (*Chelydras serpentina*), musk turtle (*Sternotherus odoratus*), Eastern plains garter snake (*Thamnophis radix*), fox snake (*Elaphe vulpina*), Eastern hognose snake (*Heterodon platyrhinos*), Eastern tiger salamander (*Ambystoma tigrinum tigrinum*), Fowler's toad (*Bufo woodhousei fowleri*), Western chorus frog (*Pseudacris triseriata triseriata*), and green frog (*Rana clamitans melanota*) (U.S. Navy, 2000b, 1995).

Mammals

The mammalian community on NSGL is dominated by species that are adapted to edge habitats and human-impacted environments typical in the area. Because of the limited amount of available habitat, most populations of mammals, especially for the larger species listed, are small and transient on the Station. Smaller mammals, such as the gray squirrel (*Sciurus carolinensis*), Eastern chipmunk (*Tamias striatus*), and white-footed mouse (*Peromyscus leucopus*), that require less space than larger species can have relatively large populations (U.S. Navy, 2000b; 1995).



White-tailed Deer Mainside

Populations of White-tailed Deer (*Odocoileus virginianus*) have steadily been on the rise at NSGL mainly due to the animal's increased tolerance to urban environments. They range throughout Illinois and are a game animal in this state. As a species, they extend from the southern edge of the arctic prairies in Canada, all the way to the northern bank of the Amazon River.

The Coyote (*Canis latrans*) is found in Lake County. The Village of Lincolnshire in Lake County recently let a contract for nuisance control of coyotes due to concerns generated by attacks on household pets (IL-DNR 2006). There may be small transient animals moving through NSGL from time to time but current population levels of the species pose no immediate problem.

Raccoons (*Procyon lotor*), Striped Skunks (*Mephitis mephitis*), Grey Fox (*Urocyon cinereoargenteus*) and Opossum (*Didelphis virginiana*) are also found on the Station. None of these species in and of themselves are problematic however; most of these animals are known to prey on bird eggs and fledglings and could possibly prey on the Common tern nesting sites on Harbor Island. The constructed electric fence on the island will help discourage these animals from disturbing the tern nesting sites. The populations and habits of these animals will be monitored in order to keep them from becoming a threat to the tern colony in the future.

2.8.5 Vegetation

Pre-settlement vegetation away from the shore of Lake Michigan in Lake County consisted of a hardwood forest of oaks, hickory, maple, and other hardwood trees (U.S. Navy, 1994). Along the shore of Lake Michigan, the plant communities consisted of mostly herbaceous plants adapted to the beaches, dunes, sandy prairies, and wetlands found between open water and the lake bluffs. Most of the native forest areas have been cleared for development with the remaining native vegetation restricted to the lake bluffs, ravine side slopes and creek bottoms.

NSGL no longer has large communities of native vegetation outside of the ravines, lake bluffs, and beach areas. Vegetation in the developed areas consists of ornamental grass, trees, and shrubs with a few scattered remnants of native vegetation. Plants found in open areas that are maintained as lawns include Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*Poa compressa*), creeping red fescue (*Festuca rubra*), tall fescue (*Festuca arundinacea*), and clover (*Melilotus* spp.). Native and introduced trees found in developed areas include cottonwood (*Populus deltoides*), white oak (*Quercus alba*), red oak (*Quercus rubra*), honey locust (*Gledistia triancanthos*), black cherry (*Prunus serotina*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), bitternut (*Juglans cinerea*), common (*Rhamnus cathartica*) and European (*Rhamnus fragula*) buckthorn, hawthorn (*Crataegus* spp.), cranberry viburnum (*Viburnum trilobum*), Norway spruce (*Picea abies*), and blue spruce (*Picea pungens*). Two areas within the developed areas of the Station retain native vegetation. An area parallel to the lake starting north of Building 616 south to the inner boat harbor; and extending south of the boat harbor to the south property line contain native trees and herbaceous plants. Within the ravines and on the bluffs, the vegetation consists of elm (*Ulmus* spp.), mixed oaks (*Quercus* spp.), sugar maple (*Acer saccharum*), silver maple (*Acer saccharinum*), boxelder (*Acer negundo*) and ash (*Fraxinus* spp.). Shrubs include blueberry (*Vaccinium* spp.), huckleberry (*Gaylussacia* spp.), blackberry (*Rubus* spp.), and immature trees of the overstory as well as willow (*Salix* spp.), red osier dogwood (*Cornus stolonifera*), sassafras (*Sassafras albidum*), and black oak (*Quercus velutina*).

Sensitive communities of vegetation can be found primarily in three areas of the Station: Wetlands, the panne and the costal dunes. A complete discussion of these sensitive plant communities can be found in Section 2.3, Ecosystems.

Twenty-two species of invasive, non-indigenous species of plants were identified on the undeveloped areas of the NSGL during the floral survey (Table 2-7) (U.S. Navy, 1995). Information on the presence and distribution of invasive species from January 2000 (NRMP, 1995 with updates) lists twenty-three species of invasive plants, not including the dandelion (*Taraxacum officinale*). The extent of the invasions ranges from 7.0 acres (2.8 ha) to over 1,200 acres (486 ha), depending on the invasiveness and amount of suitable habitat for the species. At this time, control efforts are limited to a few species, mostly those that are not found in inaccessible areas or sensitive habitats. Priority for control and eradication efforts currently are highest for those present across a large portion of the Station or that are encroaching on threatened and endangered species habitat.

TABLE 2-7 INVASIVE EXOTIC SPECIES OF PLANTS IDENTIFIED ON NSGL

Common name	Scientific name	NSGL
Amur maple	<i>Acer ginnala</i>	X
Norway maple	<i>Acer platanoides</i>	X
Garlic mustard	<i>Allaria petiolata</i>	X
Japanese barberry	<i>Berberis thunbergii</i>	X
Common reed	<i>Phragmites australis</i>	X
Smooth brome	<i>Bromus inermis</i>	X
Oriental bittersweet	<i>Celastrus orbiculatus</i>	X
Western catalpa	<i>Catalpa speciosa</i>	X
Canada thistle	<i>Cirsium arvensae</i>	X
Tatarian honeysuckle	<i>Lonicera tatarica</i>	X
Purple loosestrife	<i>Lythrum salicaria</i>	X
White sweet clover	<i>Melilotus alba</i>	X
White mulberry	<i>Morus alba</i>	X
Wild parsnip	<i>Pastinaca sativa</i>	X
White poplar	<i>Populus alba</i>	X
Common buckthorn	<i>Rhamnus cathartica</i>	X
Glossy buckthorn	<i>Rhamnus frangula</i>	X
Black locust	<i>Robinia pseudoacacia</i>	X
Weeping willow	<i>Salix babylonica</i>	X
Brittle willow	<i>Salix fragilis</i>	X
Dandelion	<i>Taraxicum officianale</i>	X
Siberian elm	<i>Ulmus purmila</i>	X

X=found on site

Source: U.S. Navy, 1995.

Federal laws and regulations prohibit introducing exotic species into any natural ecosystem, and require control or eradication of exotic species and noxious weeds from federal lands (7 U.S.C. 2814 et seq., 7 USC 7701, EO 11987, OPNAVINST 5090.1B). Under EO 13112, all alien or exotic species are to be controlled on Federal land to the maximum practicable extent. Several species of exotic plants are found on the NSGL that degrade the remaining natural vegetation communities. Purple loosestrife (*Lythrum salicaria*), garlic mustard (*Alliaria petiolata*), common (*Rhamnus cathartica*), and glossy (*Rhamnus frangula*) buckthorns and Common reed (*Phragmites australis*) are aggressive, invasive, non-indigenous species found on Station. These species can form expansive monocultures when left uncontrolled that in extreme cases will lead to complete loss of sensitive plant communities and reduction in regional biodiversity.

Purple loosestrife and Common reed (*Phragmites*) pose the greatest threat to native vegetation of all exotic species on NSGL at this time. Both species have the potential to completely displace native plants in the panne along the shore of Lake Michigan. Purple loosestrife is classified as a noxious weed by the State of Illinois, and the Federal Noxious Weed Act (7 U.S.C. 2814 et seq.) mandates control or eradication of this species from federally managed ecosystems.

Because purple loosestrife can cause severe damage to native plant and animal communities, research has been conducted into effective ways to control and eventually eradicate this weed (Illinois Nature Preserves Commission, 1990b). Throughout most of the 1990's, the most effective control method available was applying herbicide to individual plants in small, lightly infested areas, or broadcast spraying in large, heavily infested areas. Glyphosate (Roundup or Rodeo) applied to individual plants is moderately effective in controlling light infestations in small areas. The amount of chemicals used, labor-intensive application method, and requirement of treatment for several years make this method cost prohibitive for large areas or heavy infestations. Pulling plants by hand is effective when infested areas and numbers of plants are small. Mowing, burning, and flooding are largely ineffective, especially since mowing and flooding can spread seeds of purple loosestrife over broad areas. Research into use of biological control agents and experimental releases of two species of leaf-feeding beetles hold promise in controlling purple loosestrife. The beetles *Galerucella californiensis* and *Galerucella pusilla* preferentially or exclusively feed on purple loosestrife throughout their life cycles, and have reduced numbers of living and flowering plants by as much as 97 percent in some locations (Illinois Nature Preserves Commission, 1990b). Three to five years are required for these biological control agents to effectively reduce purple loosestrife numbers. Once established, the beetles keep the population of purple loosestrife low enough to allow native plants to re-form self-sustaining communities.

Control of purple loosestrife on NSGL is required by the Federal Noxious Weed Act and needed for good stewardship of natural resources. However, use of herbicides alone to control this exotic weed is not the preferred method. Exclusive herbicide use has limited effectiveness, can lead to loss of native plants, and increases costs of natural resources management. A better alternative is to integrate available biological agents with limited

herbicide applications to effect control of purple loosestrife. During spring 2001, 1,500 beetles were released on NSGL by IL-DNR (IL-DNR, 2001).

Phragmites stands are increasing at a rapid rate on the Station and are spreading while other species typical of the native plant community are diminishing. Disturbances or stresses such as pollution, alteration of the natural hydrologic regime, dredging, and increased sedimentation favor invasion and continued spread of Phragmites. Phragmites stands also increase the potential for marsh fires during the winter when the above ground portions of the plant die and dry out. Dense congregations of redwing blackbirds, which nest in Phragmites stands preferentially, increase chances of bird aircraft strike hazards (BASH) nearby. The monitoring and control of mosquito breeding is nearly impossible in dense Phragmites stands. In addition, Phragmites invasions can also have adverse aesthetic impacts by obscuring shoreline vistas.

Areas that have been invaded by Phragmites have excellent potential for recovery. Management programs have proven that Phragmites can be controlled, and natural vegetation will return. However, monitoring is imperative because Phragmites tends to reinvade and control techniques may need to be applied several times or, perhaps, in perpetuity. It is also important to note that some areas have been so heavily manipulated and degraded that it may be impossible to eliminate Phragmites from these areas.

Invasive populations of Phragmites on NSGL must be managed in order to protect rare plants that it might out compete, protect valuable migratory bird and RT&E species habitat it might dominate and degrade, and healthy ecosystems that it might greatly alter.

Cultural, mechanical and/or chemical methods can be used to control Phragmites. Biological control does not appear to be an option at this time. No biological organisms are known that can significantly damage Phragmites but do not feed on other plant species have been identified. Naturally occurring parasites have not proven to be successful controls methods either.



Prescribed burning does not reduce the growing ability of Phragmites unless root burn occurs. Root burn seldom occurs, however, because the rhizomes are usually covered by a layer of soil, mud and/or water. Fires in Phragmites stands are dangerous because this species can cause spot-fires over 100 feet away. Burning does remove accumulated Phragmites

Phragmites Harbor Island Area

leaf litter, giving the seeds of other species area a chance to germinate. Prescribed burning has been used with success after chemical treatment for this purpose at other military installations. Occasional burning has been used in conjunction with intensive spraying and water level management. This helps remove old canes and allows other vegetation to grow. Special attention should be given to the time of year before undertaking prescribed burning. Late summer burns may be most effective, but winter and spring burning may in fact increase the densities of spring crops. Shoot biomass is usually greater in spring-burned and fall-burned areas but less on summer-burned stands. Below-ground production of rhizomes tends to increase following spring and fall burns but not following summer burns. The increase in light availability following burns generally appears to benefit Phragmites. There are typically a variety of under story responses to burns. For example, summer burns may increase species diversity, richness, and evenness.

Chemical control in conjunction with burning is the preferred method for controlling Phragmites. Rodeo, a water solution of the isopropylamine salt of glyphosate is commonly used for Phragmites control. This herbicide is not, however, selective and will kill grasses and broadleaved plants alike. Toxicity tests indicate that it is virtually non-toxic to all aquatic animals tested.

Bioconcentration values for glyphosate in fish tissues are insignificant. Glyphosate biodegrades quickly and completely in the environment into natural products including carbon dioxide, nitrogen, phosphate and water. Finally, since glyphosate does not volatilize, it will not vaporize from a treated site and move to a non-target area. Application of Rodeo must take place after the tasseling stage (usually mid to late August in Illinois) when the plant is supplying nutrients to the rhizome. At this time, when Rodeo is sprayed onto the foliage of aquatic weeds, it translocates into the roots. Rodeo interferes with essential plant growth processes, causing gradual wilting, yellowing, browning and deterioration of the plant. Prescribed burning should take place late winter the year following the herbicide application (usually late February to mid March in Illinois). The controlled areas should be surveyed the following summer and any regrowth should again be treated chemically.

Garlic mustard is native to Europe but has successfully invaded over 41 counties in Illinois alone. Garlic mustard occurs most frequently in upland and floodplain forests, and invades shaded areas, especially disturbed sites, and open woodlands. Once garlic mustard is established in an area, it displaces native species of plants and eventually creates a monotypic stand with low habitat value in the understory. The State of Illinois does not declare garlic mustard a noxious weed; thus, the Federal Noxious Weed Act does not mandate control of this plant. Because of its severe impacts to native vegetation, however, garlic mustard will be controlled as part of the natural resources management plan of NSGL.

Control of garlic mustard is possible using repeated burns of sufficient intensity to completely cover a site. However, controlled burns on ravine slopes are inconsistent with NSGL policies and are not a viable natural resource management option at this time.

Also, open burning requires permits from the Illinois EPA and local government agencies. Alternative control means are required to eradicate garlic mustard from remaining natural communities. Cutting flowering stems at ground level has caused 99 percent mortality rates; cutting flowering stems at 4 inches (10 cm) above ground level has caused 71 percent mortality and as much as a 98 percent reduction in seed production (Illinois Nature Preserves Commission, 1990). Cutting flowering stems appears to be a viable control method for garlic mustard, although in areas with heavy infestations this option may be too labor-intensive and costly. Application of glyphosate or 2,4-dichlorophenoxyacetic acid (2,4-D) is effective in eradicating garlic mustard, but can be labor-intensive and can affect non-target plants through overspray or dripping from target plants onto non-target plants. Application of herbicides is undesirable because of potential for affecting non-target plants and animals, and potential for surface and ground water contamination. Herbicide application, however, may not be completely unavoidable in controlling or eradicating garlic mustard. IL-DNR indicates that application of 2-percent glyphosphate (Roundup® herbicide) is the most widely accepted control measure. Application very early in the year (February, March) to first year rosettes before the native flora emerge is the least destructive and most effective control (IL-DNR, 2001).

Common and glossy buckthorns are non-native shrubs or small trees originally imported as ornamental plants. These shrubs have escaped cultivation in some areas and have aggressively invaded woodlands, savannahs, and fields. Once established, non-native buckthorns quickly replace native shrubs and herbaceous plants by crowding or shading. The State of Illinois and the Federal government do not classify non-native buckthorns as noxious weeds, and Federal law does not mandate control or eradication of these plants. Damage that these plants can do to native plant communities and ecosystems, however, makes control efforts important in natural resources management. For proper stewardship of native vegetation and ecosystems, NSGL will make reasonable efforts to eradicate common and glossy buckthorns on the Station and replace these buckthorns with native trees or shrubs if required. Fire is the most effective control agent for non-native buckthorns growing across large areas, but is impracticable for small infestations in urban areas. Cutting or girdling of larger individuals is effective; however, suckers that sprout after cutting or girdling must be cut as they occur. Treating cut stumps with Trimec, a solution of 2,4-D, diethanolamine 2-(2-methyl-4-chlorophenoxy) proprionate, and 3,6-dichloro-2-methoxybenzoic acid (Dicamba), or glyphosate will prevent new sprouts and provide effective control of non-native buckthorns; however, IL-DNR discourages the use of volatile 2,4-D. IL-DNR indicates the most widely accepted practice for controlling buckthorns in natural areas is the use of Garlon-4® and diluent oil at a 20 percent concentration for basal bark application (IL-DNR, 2001). Cutting and herbicide treatments are best done in autumn, when most native vegetation is dormant and risks to native plants from overspray or accidental treatment is lowest.

The State of Illinois classifies Canada thistle (*Cirsium arvense*) as a noxious weed. The Federal Noxious Weed Act directs Federal agencies to control plants defined as noxious weeds pursuant to state or federal law. NSGL will conduct activities to control Canada thistle on the Station to the maximum practicable extent. Canada thistle spreads by

rootstock and seeds, making control of this plant difficult. Root reserves must be depleted and seed production must be prevented to affect control of this plant. Repeated treatment (either mechanical or chemical) is needed to prevent new growth and remove the root system. Repeated mowing when plants are no taller than six inches (15 cm) is effective in areas of heavy infestation. Foliar herbicides also are effective, but require repeated application (two to three times a year) as aboveground portions grow back from rootstock. Mowing to control Canada thistle is not practical on ravine and bluff slopes, where most Canada thistle is located. This limits control options to use of herbicides.

Common ragweed (*Ambrosia artemisiifolia*) and Giant ragweed (*Ambrosia trifida*) are also classified as noxious weeds in Illinois. These plants can be found in disturbed areas of moist to mesic black soil prairies, especially along the margins near woodlands or fields. Other native habitats include disturbed areas of moist clay prairies, meadows in woodland areas or near rivers, thickets, and woodland borders. In more developed areas, it occurs in vacant lots, cropland, abandoned fields, poorly drained waste areas, areas along roadsides and railroads, and fence rows. Ragweed distribution on NSGL is spotty and currently not problematic however; NSGL will conduct activities to control ragweed on the Station to the maximum extent possible.

2.9 Invasive Impacts

The Urban Forest

Asian longhorned beetles (*Anoplophora glabripennis*) and gypsy moths (*Lymantria dispar*) are serious threats to native vegetation. These species can be contained and eradicated when infestations are small and localized. Large infestations make eradication or control difficult to practically impossible. Even when dealing with localized infestations, eradication methods can be traumatic to local vegetation and non-target animals because of heavy applications of chemical pesticides, or removal of significant amounts of native vegetation. The best way to control these invasive insects and prevent the need for highly traumatic control methods is to find Asian longhorned beetles and gypsy moths early during an infestation, before an outbreak occurs and when control or eradication with minimal damage to native vegetation is possible.

As of the writing of this Plan the Asian longhorned beetle is not considered to be a threat to trees on NSGL. However, it may become a threat to the urban ecosystem at some future date. The latest information on the Asian longhorned beetle can be obtained by visiting the [National Invasive Species Management Center](#).

Burrowing by larval Asian longhorned beetles causes extensive mechanical and physiological injury to trees, and may kill mature trees after several years of infestation. The U.S. Department of Agriculture (USDA) has a monitoring and control program in place in the Chicago area, and is the agency responsible for monitoring for the presence of Asian longhorned beetles on the Station. NSGL cooperates with USDA by granting access for monitoring activities, and if an infestation is found, USDA will be given necessary access to contain and eradicate the infestation. This arrangement is sufficient

at this time, and NSGL will continue to follow this arrangement until such time that additional efforts by the NSGL natural resources manager are required. Additional monitoring by NSGL natural resources personnel can assist USDA in their efforts, and will be included in other natural resources management activities, although a formal, scheduled monitoring program will not be implemented at this time.

Gypsy moths are highly destructive exotic insects that are an increasing threat to native ecosystems in the Great Lakes Region. Larvae of this insect, during heavy infestations, can defoliate trees and quickly devastate local native vegetation. Defoliations seriously weaken trees, and repeated defoliations over several years can contribute to deaths of mature trees and saplings. Heavy infestations of gypsy moths increase costs for natural resources management through additional costs to eradicate the infestation, clean up after treatment, and remove or replace damaged vegetation. Heavy infestations also detract from aesthetic qualities of landscaped and natural areas. Gypsy moths are not a significant threat on the Station as this INRMP is written (2006), but may become so during the lifespan of this INRMP. Plans to control or eradicate infestations of gypsy moths are important, and will be developed before gypsy moths become a major threat to the vegetation on NSGL.

Several biological means of control of gypsy moths are available. Pheromone flakes saturate an area with female pheromones, making males unable to find a mate and successfully breed. A viral pesticide (nucleopolyhedrosis virus, or NPV) is specific to gypsy moths and is highly effective in eradicating large infestations under natural conditions. When gypsy moth larvae are present in moderate or low density, spraying a solution of NPV in infested areas will produce mortality similar to that seen under conditions of high larva density. The disadvantage of this method is that the virus is not widely available, and needs to be sprayed in the canopy where larvae are feeding. *Bacillus thurengiensis* var. *kurstaki* is a soil bacterium that, when ingested by larval gypsy moths, prevents larvae from feeding. This biological pesticide is readily available, but is not specific to gypsy moths. Several other lepidopterans, including the Karner blue butterfly, are affected in the same way by this bacterium. This solution must be applied where larvae are actively feeding to be most effective. *Entomophaga maimaiga*, is a host-specific fungus that is effective in controlling gypsy moth populations at low and high densities. Once introduced into an area, this fungus remains active and will infect all life stages. Use of this fungus as a control agent is still experimental, but appears to be a safe, target-specific and continuously active control agent.

The Emerald Ash Borer (*Agrilus planipennis*) is a relatively new invasive in Illinois. The first infestation was detected in June 2006 in Kane County. Since then, the insect was also found in Wilmette and Evanston. These areas are approximately 25 miles south of NSGL. A quarantine zone has been established around 51 square miles of Kane County to contain the spread there. Once a survey in Cook County is complete, the quarantine will be amended to reflect the infestation in Wilmette, Evanston and Winnetka areas of the state.

The Emerald ash borer (EAB) is a significant threat to the urban and rural forests of Illinois (IL Dept. of Agriculture, 2006). It was first identified in the spring of 2002 in Ontario and the Detroit area. It is estimated that it has already killed about 16 million ash trees in Michigan. In the two years since it was identified, infestations have broken out in several locations in Ohio, in Maryland, and most recently in Indiana. Thirteen counties in Michigan are quarantined and significant containment and clean-up operations are underway. The outbreaks in Indiana, Maryland and Ohio have required swift, aggressive and organized responses by regulatory and other government agencies and the cooperation of stakeholder groups.

EAB is a slender, elongated (3/4-inch), bright green beetle in the same genus as the bronze birch borer. It likely arrived in Michigan from China at least five years ago, probably traveling with ship cargo. Although chemical and biological controls are being researched and show promise, more aggressive containment and eradication efforts are necessary for new outbreaks outside the core zones and quarantined areas of Michigan.

The borer kills trees relatively quickly and affects white, green, black, pumpkin, and several horticultural varieties of ash whether healthy or stressed. The beetle deposits eggs on the surface or cracks of ash tree bark, which hatch to release larvae that feed on the tree's phloem and outer sapwood. Within several weeks, larval feeding creates S-shaped galleries in the tree's inner bark that wind back and forth, becoming progressively wider and girdling the trunk and branches as larvae grow. Adult beetles emerge headfirst, creating very small (3-4 mm) Dish-shaped exit holes that leave minimal evidence of infestation until the canopy begins to die back. Then the tree quickly declines in the second growing season and is usually dead by the third. The symptoms of emerald ash borer infestation resemble ash decline or damage from the native ash-lilac borer and the two-lined chestnut borer, making detection difficult.

More information on the Emerald Ash Borer and the state management plan can be found at the Illinois Department of Agriculture Website: <http://www.agr.state.il.us/>

The Aquatic Environment

Zebra mussels are a highly invasive, non-native species that can have significant negative impacts to native ecosystems, both aquatic and terrestrial (Boelman et al. 1997). This mussel filters large quantities of phytoplankton from lake waters and reduces availability of food for native planktivores. Zebra mussels will displace populations of native mussels and destroy local spawning reefs by encrusting them. When native mussel populations are displaced, migration and feeding pattern of mussel-eating birds is changed, and may lead to a localized loss of these species. Heavy infestations of zebra mussels increase maintenance costs for water-dependent utilities and operations that draw water directly from Lake Michigan, including those on NSGL. In extreme cases, infestations of zebra mussels may disrupt military mission or readiness by requiring those facilities that draw water to shut down for extended periods of time. Control of zebra mussels within Lake Michigan is outside the scope of this INRMP, but control within the

boundaries of NSGL to prevent damage to structures and water-dependent operations is not.

The threat on NSGL from zebra mussels is possible disruption of water supplies drawn directly from Lake Michigan by either clogging intake pipes or damaging pumps or other structures. Removing zebra mussels from these structures on the Station is through chlorination of water in the intake system and inspection by divers on a regular basis. Because zebra mussel larvae disperse on water currents, attempts to control them within Lake Michigan before they enter intake pipes will not be effective. Therefore, the current control method will continue until more effective methods of controlling zebra mussels are found.

2.10 CANADA GEESE/BIRD AIRCRAFT STRIKE HAZARDS (BASH)

NSGL does not have an airfield. However, rotary wing aircraft do occasionally land on Ross Field and in the hospital area. Any geese congregating in these areas should be harassed and discouraged from occupying aircraft landing areas until the aircraft are clear of the area.

Since air operations on NSGL are very limited and only occur occasionally a formal BASH Plan is not required. No single solution exists to the BASH problem; a variety of techniques and organizations must be involved to ensure success of bird/aircraft avoidance. The program should encompass all actions that may identify, reduce, or eliminate bird or other animal hazards to aviation, specifically, bird avoidance and bird control (including harassment, grounds maintenance, habitat modification, and depredation).

Information and guidance on the Navy BASH program can be found at the Navy Safety Center's Website at:

<http://www.safetycenter.navy.mil/Aviation/operations/bash/default.htm>

A distinction must be made between resident and migrating populations. Resident geese are attracted to an area to breed or feed. Ponds, lakes, drainage ditches, etc., may attract these birds, particularly if these areas contain emergent or submerged vegetation for feeding, nesting, or shelter. Steepening ditch and pond banks and removing vegetation will reduce goose numbers. When possible, drainage of water sources should be accomplished. Pyrotechnics, gas cannons, and effigies are all excellent control techniques. Resident birds are most active at dawn and dusk, moving at low altitudes to and from feeding areas. Aviators should avoid flying near wildlife refuges, or any ponds, lakes or rivers with known waterfowl concentrations during these times. Migrating geese are particularly dangerous to flight safety due to the large numbers and generally higher altitude of the birds. Large flocks of geese travel along traditional flyways to their breeding and wintering grounds during spring and fall. Huge flocks may stop along the route awaiting favorable weather conditions to continue. Migrating birds are most active from sunset through midnight, with numbers decreasing in the early morning hours.

September through February is most hazardous. Avoidance of flying during the evening hours is generally safest. Wintering concentration areas should be avoided.

Willow Glen Golf Course, Ross Field, and other areas of NSGL provide ideal conditions for Canada geese. These birds like open water adjacent to areas with short vegetation giving an unobstructed line of sight over large distances. These conditions, along with a lack of predators in an urban environment, encourage Canada geese to congregate on these areas, creating potential health and safety hazards, hazards to aircraft and inconveniences to users of the facility, thus decreasing the quality of life. Because the areas used by geese are highly visible, control measures must be humane, non-lethal, and as non-intrusive to NSGL recruits, military personnel, civilian employees and visitors to NSGL as possible. Use of firearms in controlling Canada goose numbers is inconsistent with NSGL policies and is not considered further. Trapping and relocating problem geese is only a temporary solution as conditions that initially attracted geese are still present, and new flocks will eventually make use of the area. The best solution is to modify conditions to make them unattractive to Canada geese but otherwise maintain acceptable levels of appearance and function for human uses. Selection of management techniques for Canada geese on NSGL will use the most effective non-lethal means available and appropriate for each location.

Altering the attractiveness of the golf course and other areas used by geese can occur through several means. Application of chemical feeding deterrents to vegetation has had good success on golf courses and other landscaped areas. Methyl anthranilate is a non-toxic compound that makes grass unpalatable to Canada geese. Geese will not use an area as long as methyl anthranilate is present because, in effect, the area does not provide food for geese. Plants do not take up this chemical, so its effectiveness is reduced as plants grow or are mown. Thus repeated and costly applications of methyl anthranilate are required for it to be an effective deterrent.

Using herding dogs (e.g. border collies) to haze Canada geese in urban environments is reported to be an effective means of control. These specially trained dogs work with trained handlers to harass but not kill geese, in effect becoming a “non-lethal predator” to geese and making an area less attractive. Success rates range from displacement of all Canada geese to reductions of numbers to acceptable levels. The use of hazing dogs is generally accepted by the public, and does not require changes in landscape design or maintenance activities. This method does pose potentially prohibitive costs, however. Estimates for purchasing a professionally trained dog range between \$1,000 and \$3,000, and training or hiring a handler can be expensive. Providing adequate shelter, food, and veterinary care for the dog(s) are recurring costs that may outweigh any savings in maintenance costs from displacing Canada geese. Hazing geese may require coordination and a permit from Federal or State wildlife agencies, or may not be permitted in some areas. While use of hazing dogs is an effective and acceptable means of managing Canada geese in an urban environment, costs of implementing this method must be carefully weighed against potential savings in maintenance costs.

Canada geese prefer ponds that lack surface obstructions and are connected to open areas providing an unobstructed view. Placing barriers, such as fences, between ponds and open areas hinders movement between these areas, but does not necessarily prevent use of these areas. If Canada geese are prevented completely from using a pond or adjacent land area, they usually abandon the entire area for one with more suitable conditions. This method has proven to be an effective deterrent on Willow Glen Golf Course. An effective mechanical means of making ponds unattractive to Canada geese is to suspend a grid of wires or synthetic lines over a pond. This method has reduced use of ponds by Canada geese in some areas to near zero, which in turn led to abandoning by geese of adjacent land areas. This management method is non-lethal and accepted by the public in general, but may detract from aesthetic qualities of a golf course and be objectionable to golfers.

Cost per unit area to cover and maintain a grid varies according to materials used in construction. Polypropylene line, for example, is relatively inexpensive to purchase and install, but is fragile and has a life expectancy of three to seven years. Kevlar line is relatively more expensive to purchase, but costs of installation are comparable, the material is stronger and has a life expectancy of ten years. Using Kevlar line in grid construction would be more expensive initially, but over time would be less expensive and provide greater benefit compared to polypropylene line.

SECTION 3.0 MANAGEMENT STRATGEY

3.0 Environmental Management Strategy and Mission Sustainability

Sustainability is acting today to meet the needs of the present in a manner that allows future generations to meet their needs. Sustainability considers not only the environmental aspects and impacts of operations and decisions on the Station's natural resources, but it also considers the social factors (society, economy and individual well-being) associated with these actions. Operating in a sustainable fashion and incorporating natural resource goals and objectives into long term planning goes beyond compliance, saves money and considers the well being of everyone on the Station and in the community, *now and in the future*.

It is the obligation of the Command to ensure that NSGL sailors today – and the sailors of the future – have the land, water and air resources they need to train; a healthy environment in which to live; and the support of local communities and the American people. For those reasons, NSGL embraces mission sustainability as a partnership between our present and our future.

3.1 Cooperative Management

NSGL maintains a partnership with the IL-DNR on many issues relative to managing natural resources on the Station. Partnerships with the IL-DNR include:

- Working to preserve Harbor Island Bird Sanctuary as an Important Bird Area
- Conserving habitat for Illinois RT&E Species, specifically the Common tern
- Restoring important ecosystems by partnering to control invasive species
- Performing bird counts and tracking nesting pairs of Common tern on Harbor Island

NSGL also partners with the National Audubon Society for conservation of important bird habitat on the Station.

The Clean Water Act, the Illinois Environmental Protection Act, and the Illinois Pollution Control Board rules and regulations (35III. Adm. Code, Subtitle C, Chapter 1) provide legislative vehicles for regulating direct and indirect discharge of pollutants into surface waters within the state of Illinois, including NSGL. To regulate quality of storm water runoff, the Illinois EPA issues National Pollutant Discharge Elimination System (NPDES) permits to entities conducting industrial activities. The Station must comply with requirements of NPDES General Permit No. ILR002630. This document only permits discharges of storm water runoff (including snowmelt runoff, and surface runoff and drainage) into Illinois surface waters. Other discharges (i.e., wastewater or cooling water) require a separate NPDES permit.

In addition to state mandates, the Lake County Stormwater Management Commission (LCSMC) administers the Lake County Watershed Development Ordinance and develops watershed plans for the North Branch of the Chicago River (located downstream of the Skokie River) (Werner, 2000). This ordinance requires developers to obtain storm water

permits that protect quality of urban runoff entering the Chicago River for all property development within Lake County. Also within the ordinance are guidelines for improving the quality of storm water runoff. Although NSGL is not required to participate in this program, these guidelines will be followed as part of natural resources management as they are effective in improving water quality. Participation in this program by NSGL will maintain a high level of stewardship without compromising the Installation's military readiness and provide positive public relations with local communities.

NSGL will invite USFWS and IL-DNR to participate cooperatively in this INRMP's scoping, design, and preparation. Although not required by statute, it is expected that the entire INRMP will be developed in cooperation with these agencies - not just those portions of the INRMP that specifically address fish and wildlife conservation and management. This will serve to inform these offices about the DOD mission, invite them to consider solutions to difficult resource management problems, and expedite final INRMP coordination.

SAIA (as amended) requires that Navy installations manage fish and wildlife populations with appropriate Federal and State fish and wildlife agencies. Acceptance and concurrence of the previous INRMP (*Integrated Natural Resources Management Plan, Naval Training Center Great Lakes, 2002*) by appropriate Federal and State fish and wildlife agencies, in essence, serves as a cooperative agreement between these agencies and NSGL.

The Magnuson-Stevens Fishery Conservation and Management Act (MFCMA) governs all marine fishery related activities, including the exclusive economic zone, all anadromous fish throughout their migratory range except when in a foreign nation's waters, and all fish on the Continental Shelf. The MFCMA was amended in 1996 to address the issue of Essential Fish Habitat (EFH), which is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Because the MFCMA specifies conservation in marine waters, no coordination under this act is necessary since such waters are not present in or around NSGL.

NSGL maintains an Environmental Quality Board (EQB). The purpose of the EQB is to promote environmental awareness and continually improve environmental programs at NSGL. Strong emphasis is placed on environmental matters to ensure awareness at all levels and to ensure compliance with Federal, State and local statutes and DoD and Navy policy and regulations. The Board meets bi-monthly to discuss, coordinate and disseminate environmental information.

The Board serves as an internal cooperative effort and brings all the Station stakeholders together to discuss and identify potential environmental and natural resource issues.

3.2 Adaptive Management

An adaptive management approach will be used throughout this INRMP. The management of this INRMP is intended to be a dynamic, multidisciplinary ever changing process.

To provide direction, recognize target management actions, and construct the framework for measuring success of this INRMP, the following goals have been established:

- Provide for the conservation, enhancement, and rehabilitation of land and water resources of the Station while supporting the military mission.
- Maintain or increase the diversity and populations of plants and animals under the stewardship of the Department of the Navy through habitat maintenance, enhancement, or rehabilitation activities on NSGL that do not detract from the military readiness of the Installation.
- Enhance the quality of life of Navy personnel by providing high-quality, accessible, outdoor recreational opportunities that do not degrade the natural resources.
- Foster and promote natural resource stewardship among Navy personnel, their dependents, and the public by providing opportunities to participate in natural resource conservation, education, and rehabilitation activities on NSGL.

From these goals, a variety of management objectives and projects specific to the needs of NSGL have been developed. The management objectives are components of the four goals and represent measurable targets to be used to quantify the success of this INRMP. Ecosystems are dynamic systems, and may exhibit responses to management actions different than those expected. A process of adaptive management will be used to compare the responses exhibited by the natural resources to the management projects against the desired response towards reaching the objective for that management project. Modification of the management objectives and projects may be needed to reach the desired goal. For example, a change in management actions may become necessary because of an unforeseeable and large-scale disturbance (e.g., fires, large storm events, or droughts) to the natural resources. An adaptive management approach allows for changes in short- and long-term objectives from possible large-scale changes in the conditions of the natural resources to reach the goals of this INRMP.

This INRMP acknowledges that improving understanding within and among the complex biophysical, social-economic-political systems on NSGL requires an increased emphasis on new knowledge. As a result, it will utilize an adaptive management strategy to gain new understanding. This strategy employs a four-phase adaptive management cycle (Figure 3-1). In the first phase, plans are framed, based on existing knowledge, organizational goals, current technology, and existing inventories. In phase two, on-the-ground actions are initiated. Phase three involves monitoring results of those actions and, in phase four, results are evaluated. The cycle could then reinitiate, driven by emerging knowledge and experience. Results could validate existing practices and policies or reveal the need for alterations in the plan, or both.

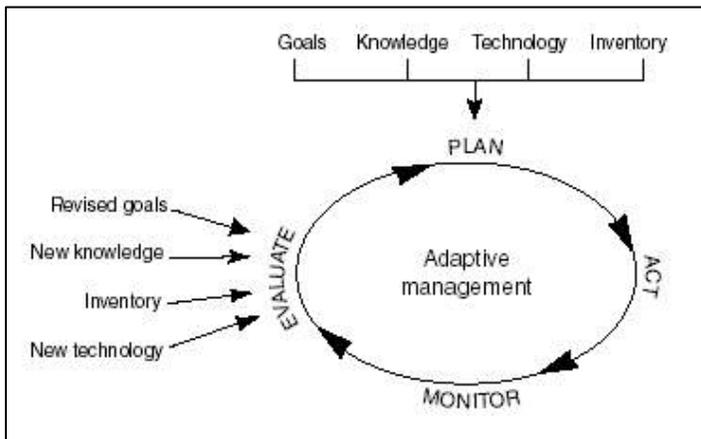


Figure 3-1 Adaptive Management Model

The revision of this INRMP demonstrates NSGL’s use of adaptive management. Through monitoring and evaluating new inventories of State RT&E species have been discovered and new goals and objectives have been created. Economic actions have forced the Station to divest of land inventory previously addressed in the 2002 INRMP and new guidance on DoD INRMP preparation was developed in August 2006.

3.3 Ecosystem Management

Philosophy of Ecosystem Management at NSGL

Management of ecosystems is “driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem structure and function” (Ecological Society of America, 1996). For example, the goals, objectives, and projects defined in this management plan will be accomplished by following the guidelines in the plan; all management actions will be monitored through the Environmental Management program and other monitoring programs; and management will be adapted according to monitoring results-thus, an endless feedback loop.

The goal of ecosystem management on military training lands is to ensure that military lands support present and future training requirements while, as much as possible, preserving, improving, and enhancing an ecosystem’s characteristics and communities of which it is comprised. Over the long term, that approach will maintain and improve the sustainability and biological function of ecosystems; while supporting sustainable economies, human use, and the environment required for realistic military training operations (DoD Instruction 4715.3).

Ecosystem management is based on a holistic, systems-oriented approach, and not predicated on single species management or maximizing the prevalence of a small group of organisms. However, rare species management should absolutely complement the conservation of a healthy, biologically diverse system. Combining both management objectives will ensure that ecosystems maintain their integrity, their constituent species and dynamics, and continue to support those species that are most vulnerable to ecosystem change- state-listed rare species.

Management of Station natural resources will support sustainable military use through the application of an integrated approach to ecosystem management. An ecosystem, by definition, is a dynamic and natural complex of living organisms interacting with each other and with their associated non-living environment.

Ecosystems may exhibit responses to management actions different than those expected. A process of adaptive management will be used to compare the responses exhibited by the natural resources to the management projects against the desired response towards reaching the objective for that management project. An adaptive management approach (*Figure 3-1*) to ecosystems allows for changes in short and long-term objectives due to large-scale changes in the conditions of natural resources.

Ecosystem management is an interdisciplinary planning and management process that focuses on identifying, restoring and maintaining natural communities in support of the military mission and other sustainable activities. The principles of ecosystem management, (DOD Conservation Instruction 4715.3), and how those principles are applied at NSGL, are as follows:

- **Maintain and improve the sustainability and native biological diversity of NSGL ecosystems.** Naval Station Great Lakes sustains extraordinary species and community diversity that has been supported by a half century of sound natural resources management. The three most important ecosystems on NSGL are Pettibone Ravine, panne/lakefront bluffs and wetlands.
- **Administer with consideration of ecological units and timeframes.** Impacts of Station activities are considered in terms of spatial and temporal scales that are relevant to natural processes. Natural resources at NSGL are significant on a base level (providing land and resources for Station activities) and on a regional level (the Station is one of many large state and federal landowners in the region and as such they play a key role in regional initiatives). While it is appropriate to consider many actions solely on an installation level (e.g., construction of new buildings, etc.), some activities need to be considered on a larger scale (e.g., impacts of installation management on RT&E habitat, water quality of Lake Michigan, etc.).
- **Support sustainable human activities.** Ecosystem management recognizes that people are an integral component of ecological systems, and it supports multiple-use of natural resources and sustainable development. Natural resources are managed on NSGL to support the military mission and to provide sustainable environments for training, education, and operations. Within the safety and operational constraints of military training and consistent with the needs of the NSGL region, the Station works to: (1) provide outdoor recreational opportunities consistent with demand from Base personnel, residents, and military retirees in nearby communities; and (2) promote natural resources management, general welfare, and the local economy by appropriately managing natural resources on an environmentally sustainable basis.

- **Develop a vision of ecosystem health.** Ecosystem management depends upon participation by diverse stakeholders (federal, state, local, and tribal governments; nongovernmental organizations; private organizations; and the public) and their ability to develop a shared vision of what constitutes a desirable future condition for the region of concern. At NSGL, this means considering the mission as well as the relationship of the Station to surrounding communities and regional environmental efforts.
- **Develop priorities and reconcile conflicts.** Station objectives are established, prioritized, and revisited on a regular basis. This includes consideration of natural resources management to meet both Station (mission) and regional objectives. If there are any conflicts, they can be resolved through periodic regional workshops and stakeholder discussion.
- **Develop coordinated approaches to work towards ecosystem health.** Because ecosystems do not follow political and social boundaries, a coordinated approach on military installations must: (1) include early and regular participation by military operations personnel and regional stakeholders (to include other state and federal agencies); (2) incorporate ecosystem management goals into strategic, financial, and program planning and design budgets; and (3) seek to prevent duplication of effort and minimize inefficiencies. These efforts are ongoing on NSGL.
- **Rely on the best science and data.** Understanding of ecosystems and natural communities is constantly evolving through science and discussion. NSGL is committed to the collection, maintenance, and use of scientific data required for making sound natural resources and land use management decisions. For example, NSGL uses Geographical Information Systems (GIS) mapping technologies to guide management actions.
- **Use benchmarks to monitor and evaluate outcomes.** The ecosystem management approach depends on “specific and measurable objectives and criteria with which to evaluate activities in the ecosystem.” This revised INRMP will include specific, measurable goals and objectives, and task schedules for NSGL.
- **Use adaptive management.** Ecosystems are constantly changing. Management practices must accommodate changes in both the ecosystem and our understanding of these systems (*Figure 3-1*). This revised INRMP will be reviewed again as required in five years. The NSGL Environmental Division will adapt environmental management efforts when new information is available or significant changes to the ecosystem occur.
- **Implement through installation plans and programs.** Ecosystem management activities identified in an INRMP cannot stand alone. Instead, they must be incorporated into other planning and budgeting documents which help direct land management planning at NSGL.

3.4 Achieving No Net Loss to the Military Mission.

The SAIA states that an INRMP shall provide for “no net loss in the capability of military installation lands to support the military mission of the installation.” The SAIA also states that the purpose of an INRMP is to “ensure consistency with the use of military installations to support the preparedness of the Armed Forces, while providing for (1) the conservation and rehabilitation of natural resources on military installations; (2) the sustainable multipurpose use of the resources including hunting, fishing, trapping, and non-consumptive uses; and (3) public access to military installations within safety and military security requirements.”

3.4.1 Integrated Land Use and Natural Resource Decisions.

All activities that are part of the military mission have the potential for impacting the natural resources of the NSGL. However, all training practices are restricted to areas and schedules that have little or no impact on the natural resources of NSGL. Any training activities that are potentially destructive to natural resources are currently prohibited on the Station. These activities include firing lead ammunition, anti-tank missile fire, artillery or mortar fire, deforestation, burning gun powder, demolition, creation and use of open latrines, vehicle refueling in the field, as well as any training activity, with the exception of authorized foot travel, within the following areas:

- 400 feet from a water supply well
- Wetland/wetland buffers
- 100 feet from vernal pools
- Grassland habitat
- Cultural resource locations with high sensitivity
- An IR remediation site
- Pettibone Ravine
- The panne and lakefront bluffs
- Any area not approved by the Environmental Division

3.5 Supporting Sustainability of the Military Mission and the Natural Environment.

Natural resources required to fulfill the training needs of the NSGL and to support the military mission include all existing habitats on the Station. However, the variety of habitats on NSGL are used primarily for outdoor recreation and conservation areas. Training on Pettibone Ravine, the panne, lake bluffs and wetland areas does not occur. NSGL is unlike other DoD installations where light infantry maneuvers and common task training, map reading, terrain orientation, camouflage training, ambush and defense training, bivouac operations, air operations, weapons and artillery fire regularly occur. Most outdoor military training takes place in open areas with little vegetation and consists primarily of marching, formations, running and general physical exercise.

Managing the Community: Sustainment of Navy Personnel

NSGL resembles a diverse city in the middle of a managed microecological region. It has a cantonment area that functions much like an American hometown and provides for the well being of all members of the military community. Its services are a fundamental part of the social contract the Navy makes with its people. The Station has training areas for personnel, maintenance facilities, industrial facilities, administrative areas and natural areas. The Station is further set in a larger ecological region that is under constant stress from the changing and growing human landscape around it.

The lessons learned from managing this complex community come in the context of a decades-long decline in financial resources for infrastructure, increasing environmental compliance requirements, and mounting liability concerns. These issues have led to regular reexamination of how the Navy meets its social contract with its sailor communities. In some cases (for example, privatization), the formula has been to replace the service provider to allow capital to flow into maintenance of assets.

The DoD Military Housing Privatization Initiative (MHPI) conveys real property to another party for long-term (50 years) operation and maintenance. NSGL privatized all of the Station's housing areas in January of 2006. All lands were turned over to a private developer and over the next five decades these properties will be upgraded or renewed in some form every 20 years, just as they would be in the private sector. To finance these projects, the private-sector developer/partners will leverage public funds with substantial private investment.

In addition, MPHI adds the value of encouraging the development of community values beyond housing management and maintenance. The incentives for making communities more environmentally sustainable are subtle e.g., cozy, small-town layouts to reduce car trips to service providers. The private-sector partners will design, build and operate livable communities for NSGL families that include the amenities and support services found and enjoyed in America's most sustainable neighborhoods.

This program represents the first true effort for NSGL to infuse sustainability planning into installation construction projects.

Training Space and Resource Competition

Even with increased security isolating NSGL from easy public access, there is no way to turn back to a time when the Station's resources could be isolated from the readiness-limiting effects of external competition, regulatory restrictions or resource depletion. This challenge becomes more obvious when it affects the natural areas and buffer areas of the Station.

NSGL's limited outdoor training and maneuvering activities are not in competition with the Station's natural resource inventory at this particular time however, missions change and through adaptive management of NSGL resources the Station will be well prepared



to address mission changes and training space resource competition if it becomes a reality in the future.

Managing Training Space for Sustainability

The challenges to the sustainment of realistic training on NSGL are not merely external. Reinventing the Master Planning process and weaving environmental responsibilities into mission goals and objectives are internal processes many military installations are seeking to improve. Regulatory constraints and loss of stable land for freedom of movement are factors that may affect future training missions on NSGL. NSGL is committed to maintaining the few natural ecosystems remaining on the Station. It is not believed that the relatively small land areas set aside as natural areas would impact the ability of NSGL to carry out the mission of training our nation's war fighters.

3.6 Natural Resources Consultation Requirements

It is Navy policy that installations must comply with laws for the protection and management of natural resources. To ensure compliance, Station projects and actions that may affect regulated resources require consultation with, and/or acquisition of required permitting documentation from appropriate regulatory agencies. The natural resource manager at NSGL is routinely in communication with agencies such as the USFWS, IL-DNR and the State of Illinois Regional Water Quality Control Board.

To facilitate effective and efficient management of NSGL resources while ensuring regulatory compliance for ongoing programs and actions, programmatic consultations may be established in coordination with appropriate regulatory agencies. For example, no current federally listed RT&E Species currently exist on the Station however, if in the future that becomes a reality NSGL may consult under Section 7 of the federal Endangered Species Act with the USFWS on ongoing activities and ecosystem conservation programs.

While formal consultations are required under many circumstances, natural resource managers often engage in informal consultations with regulatory agencies as well. Such informal consultations are integral to the continued assurance of compliance under

varying circumstances, to facilitation of management planning and project support, and to building of positive working relationships with regulating agencies.

3.7 Planning for National Environmental Policy Act (NEPA) Compliance

The primary planning tool for the evaluation of projects and actions potentially affecting the environment and for the coordination of these projects and actions with NSGL environmental management programs is the National Environmental Policy Act. NEPA is the basic national charter for the protection of the environment and requires federal agencies to assess and document, in detail, the potential environmental impacts of their actions that could significantly affect the quality of the environment. NEPA is intended to help decision makers make informed decisions and take actions that protect, restore, and enhance the environment. In brief, the NEPA process requires that the Station: consider the environment in decisions concerning potential individual and cumulative impacts; make diligent efforts to inform and involve the public at appropriate stages in the decision making process; develop and evaluate less environmentally damaging alternatives to potential projects; and support informed decisions with quality documents. NEPA requires a detailed statement of significant environmental impacts of major federal actions. For example, an action may be considered significant if it has a long-term impact or potential risk because of its effect on a species protected under the federal ESA. The process identifies reasonable alternatives to proposed actions that might have less or no environmental effect. Individual and cumulative impacts must be considered. The following three-tiered approach is used to document impacts:

- Categorical Exclusions (CATEX) are used for actions that do not individually or cumulatively have a significant effect on the human environment and therefore do not require preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS).
- An EA is the analysis to be completed when the government is uncertain as to whether an action will significantly affect the environment or whether the action is controversial; the result of an EA is either a Finding of No Significant Impact or a requirement to complete an EIS.
- An EIS is a full-disclosure document that presents a full and complete discussion of significant impacts, informing the public and decision makers of reasonable alternatives to the proposed action.

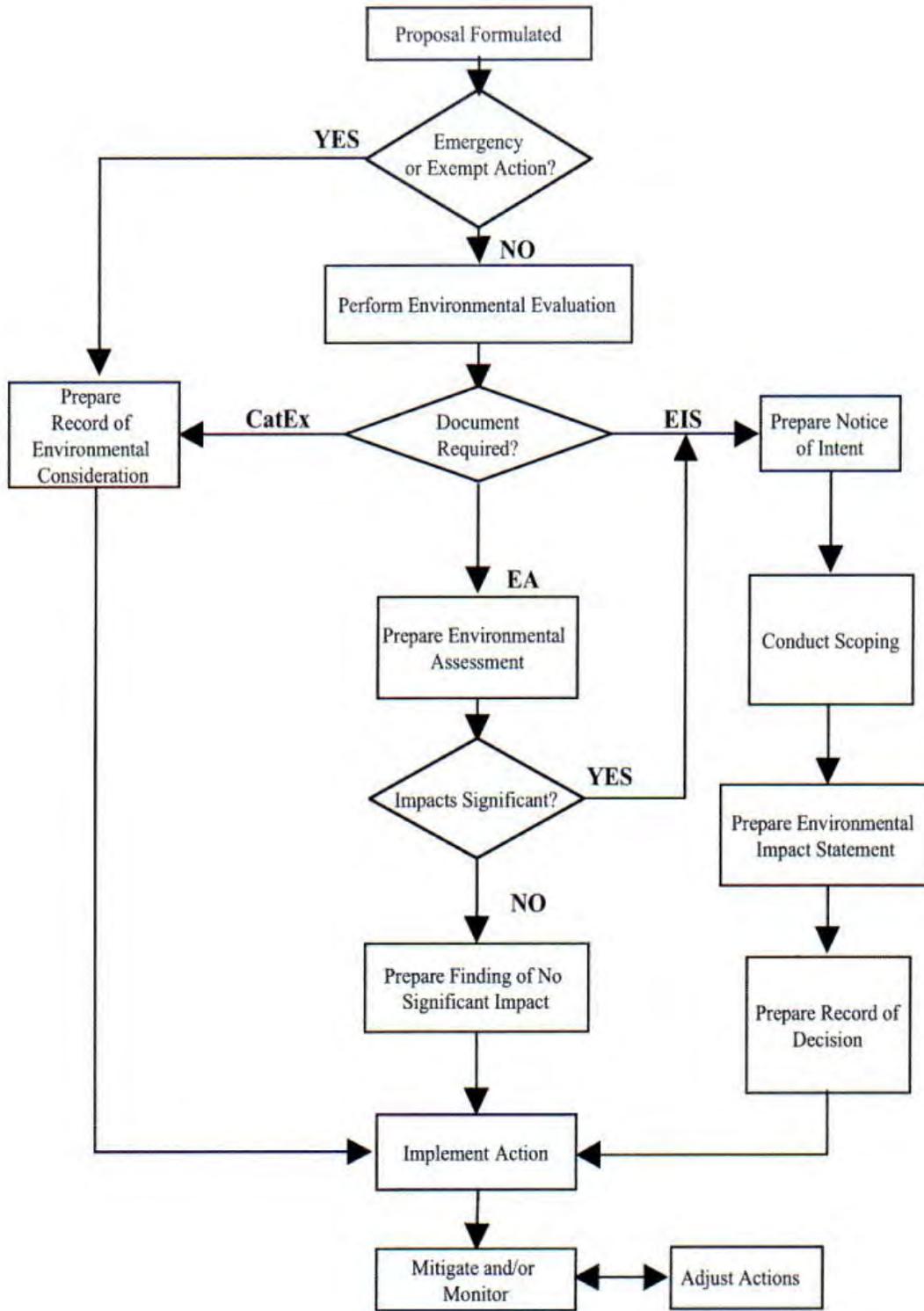


Figure 3-2 NEPA Process Chart

3.7.1 Coordination and Planning for Construction and Facility Maintenance

Construction actions at NSGL require prior consultation with, and approval by, NAVFAC-MW Business Line, PWD Environmental Division and other PWD Divisions. The Environmental Division determines the type and level of regulatory agency coordination and permitting that is required. These general requirements reflect NSGL's strategy to take site-specific measures to provide special protection to isolated sensitive resources regardless of their designation. General requirements for all areas include, but are not limited to, the following:

- ENV DIV site approval is required for all facilities-related activities, including, but not limited to, development, reconstruction, repairs, utilities, leases, and easements. Actions that result in the possible introduction of hazardous material (including accidents) to a noncontained area must be approved by the ENV DIV. Any action that involves the use of hazardous substances in areas not designed for containment of these substances must be coordinated through the ENV DIV.
- NSGL will design, use, and promote construction and facility maintenance practices to minimize adverse effects on the natural habitat. For example, NSGL ENV DIV will coordinate with those scheduling and performing construction and/or maintenance to avoid impacting birds during their breeding season, where possible. Wording in contracts and work orders will explain the Migratory Bird Treaty Act (MBTA), and that it applies to all persons (not just federal agencies). A contract or work order does not authorize, encourage, or condone violation of the Act, and workers are expected to comply. The ENV DIV Natural Resources Manager has developed contractual and work order language for construction, reconstruction, and maintenance projects on the Station to minimize loss of bird nests and costly delays due to MBTA prohibitions. This information is available for use in contracts and work orders and has been incorporated into many project specifications.
- The ENV DIV routinely reviews all major construction/facility maintenance projects in the planning and design stage to insure compliance to applicable statutes. Proposed site locations are investigated to insure suitability for the structure or action and comments and recommendations are made.
- Pest control required as part of any construction project or contract must be coordinated with PWD for scheduling and monitoring of the pest management contractor. Any new construction should conform to all applicable laws. Contractors report daily use of pesticides applied, unit of measure, target pest, control operation, name of individual applying pesticide, EPA requirements, percentage concentration, amount, and location where applied by completing

The Environmental Division analyzes all project impacts via the NEPA process described previously. Effective land use planning considers conservation of natural resources through reuse of disturbed areas and existing facilities. This approach reduces ground disturbance and erosion effects. The ENV DIV encourages the implementation of best management practices during all construction projects. These practices include:

- Minimizing the amount of area disturbed and the length of time barren ground is left exposed during construction activities to limit erosion;
- Utilizing general sediment and erosion controls (stabilization). This may include temporary seeding, mulching, sod stabilization, and creation of vegetative buffer strips using native seeds and seedlings during construction;
- Installing engineering structures to divert or store flow, or limit runoff;
- Using sediment and erosion control measures; and
- Utilizing landscaping practices that minimize pesticide use, erosion, flooding, and future maintenance.

3.7.2 Mitigation Planning

Mitigation, as discussed here, is lessening adverse effects an undertaking may cause relative to natural resources. Mitigation can include the following actions (DoD Instruction 4715.3; Definitions):

- Avoiding the effect altogether;
- Limiting the magnitude of the action;
- Repairing, rehabilitating, or restoring the affected resource;
- Reducing or eliminating the effect over time by conservation and maintenance operations during the life of the action; and/or
- Compensating for the effect by providing substitute resources or environments.

In general, regulatory agencies' preferred order of performing mitigation is avoidance, then minimization, then compensation in kind, and then compensation out of kind. Mitigation proposed for a specific impact at NSGL will be addressed on a case-by-case basis. Mitigation requirements shall be planned for, funded, and implemented as part of the proposed action by the action proponent.

One typical form of mitigation is restoration of disturbed areas (as noted above). Re-vegetation of disturbed areas is one of the few means of creating additional habitat for RT&E Species. Techniques to be considered include ripping and cultivating, seeding, transplanting, mulching, irrigating, and controlling weeds. Any restoration plan would contain a monitoring schedule, as well as performance standards (success criteria). As with other mitigation, early involvement of resource agencies is important. Regulatory agency approval of restoration/mitigation plans is usually required as a condition of ESA and CWA permit approvals. Techniques used to restore disturbed areas can also include

soil mitigation, irrigation, planting of native plants, prescribed burning, imprinting, and use of herbicides.

Persons planning and/or preparing mitigation actions need to be aware that military lands cannot be set aside as permanent environmental preserves. NSGL must maintain the flexibility to adapt its defense mission to political and technological developments (DoD Instruction 4715.3, paragraph F.1.i(4)).

The type of mitigation proposed for a specific impact at NSGL will be addressed on a case-by-case basis. The action proponent is responsible for ensuring that mitigation requirements for a proposed action are planned, funded, and implemented. As the action proponent typically does not have in-house expertise for conducting the biological elements of mitigation requirements, these actions are often accomplished through contractual agreements. The ENV DIV oversees any mitigation actions that require restoration, enhancement, monitoring, etc. of the resources. Because the funding or MILCON projects is congressionally limited to use within a five year period, it is important to develop mitigation objectives that can be met within this timeframe.

Project specific requirements and details that are appropriate for a proposed action cannot be provided in this INRMP since such specifics must be tailored to each individual project and determined through applicable consultation and permitting processes in coordination with regulatory agencies. However, many elements of mitigation actions and planning are common to most situations. The following mitigation measures should be planned for all proposed actions unless a determination can be made, in consultation with ENV DIV Natural Resources Manager, that they are not appropriate:

Impact Avoidance and Minimization. The first step in mitigation planning should be avoidance of impacts. The primary purpose of mitigation is to lessen the severity of an action. Once avoidance has been implemented to its fullest extent, remaining impacts should be minimized. This must be the first step in the mitigation planning process because numerous regulatory authorizations require demonstration of maximum impact avoidance and minimization before authorization may be given. Avoidance and minimization of adverse impacts may involve modification of building design or orientation to avoid unnecessary and incidental resource damage. Limitations on the timing of activities are also often required for avoiding and minimizing adverse impacts to natural resources (e.g., to avoid behavioral disruptions during the breeding season for federal/state listed birds). Proposed actions must include requirements for impact avoidance and minimization measures as part of implementation of any proposed action. Measures which should be considered include: worker environmental protection briefings, signs, markers, protective fencing, exclusion fencing, biological monitoring, erosion and sedimentation prevention, noise baffling, and temporary impact restoration. These measures are included as part of an Environmental Protection Section in all Standard Operating Procedures, work requests, and contracts effecting natural resource areas.

Effects Analysis. Potential direct and indirect effects of a proposed action must be addressed when planning mitigation. Direct effects occur immediately upon impact of the action. Indirect effects have an impact at some point later in time. An example of indirect effects includes the case where use and maintenance of a new facility is likely to have an adverse effect beyond the building “footprint” following construction. Fencing may be necessary to prevent landscape maintenance and concentrated human foot traffic from damaging naturally occurring resources that were avoided by the construction of a building. Often, maintenance and safety considerations associated with new or re-utilized facilities are overlooked by planners and are not realized until the project is implemented. Such considerations must be treated as part of the initial project and mitigated accordingly. Some direct effects of a proposed action may be less tangible; a common concern is noise and nighttime lighting associated with construction. As a general rule, noisy construction activities need to be kept far enough away from noise sensitive threatened and endangered species such that the level in the occupied habitat varies little from background. Other examples include changes to wetland hydrology, and sedimentation from construction sites to wetlands. Often the temporary effects that may result from construction are avoided by performing work outside the sensitive breeding and growing seasons as presented in this planning guidance. Other effects that are likely to have a longer or permanent adverse effect must be mitigated.

Endangered Species Act and Presence/Absence Determinations. Threatened or endangered species presence or absence determinations must be made using survey guidelines developed by the U.S. Fish and Wildlife Service or other means acceptable to them. Where no such guidelines or protocols exist, surveys must be conducted by qualified persons (see minimum criteria for biological monitor, below) using methods recognized and accepted in the professional consulting field. When making presence/absence determinations relative to a project, areas where indirect effects may adversely impact a species must be considered as well. If a habitat is used by a species for some important part of their life cycle, it is considered occupied regardless of whether the species is temporarily absent.

Migratory Bird Treaty Act. The MBTA and implementing regulations and orders generally protect migratory birds. On NSGL, most birds are covered under the MBTA. Planners must review proposed actions with regard to conduct of actions during the active breeding seasons and project caused loss of traditionally used nesting/roosting sites. Habitat clearing activities should be timed to avoid breeding seasons to the maximum extent practicable to avoid damage to active bird nests. All contracts and work orders prepared for NSGL must include provisions in an Environmental Protection section that prohibit harming, damage, or destruction of active bird nests while requiring “work arounds” without incurring additional cost. The natural resource manager, ENV DIV, can provide contractual language for construction contracts.

Biological Monitor. An on-site biological monitor is typically required for all proposed actions that require active avoidance, are expected to affect threatened or endangered species or wetlands (including vernal pools), or require active re-vegetation or habitat compensation. The role of the biological monitor is to educate workers regarding

applicable natural resource related issues, oversee and implement impact avoidance and minimization, document impacts, and/or guide re-vegetation efforts. At a minimum, this individual must have: (1) a bachelor's degree with an emphasis in ecology, natural resource management, or related science; (2) demonstrated local experience with the resource(s) involved; and (3) a good understanding of the regulations regarding wetlands and endangered species.

Mitigation Costs. The cost of mitigating impacts to natural resources should be considered when evaluating proposed action alternative locations and planning for funding. Mitigation must be treated as part of the project that will be fully funded by the action proponent. Some environmental authorizations and permitting require mitigation funding to be secured and assured prior to causing adverse affects. Technical natural resource specialists should be contacted during project planning to assist with estimating the likely mitigation costs associated with a proposed action. Cost considerations for impact prevention during action implementation need to be accounted for, as well as habitat restoration and/or compensation (e.g., biological monitoring, placing protective signs/fencing, sedimentation controls, etc.).

Mitigation Plan. All actions that require active habitat restoration, enhancement, and/or compensation must have an appropriate plan developed prior to implementation. Such plans must discuss the site conditions, methods to be implemented, monitoring and maintenance (usually 3 to 5 years), success criteria, remedial actions if expected success is not being achieved, and reporting requirements. The plans must ensure that all applicable requirements of regulatory approvals are incorporated. Review and approval of plans must be accomplished through the ENV DIV. In addition, regulatory agencies often require that they have an opportunity to review and approve plans where their authorization is needed for resource impacts.

3.8 Beneficial Partnerships and Collaborative Resource Planning

Under authority of the Readiness and Environmental Protection Initiative (within Section 2811, FY 2003 National Defense Authorization Act) installations may now enter into formal agreements with a partnership of various federal, state, and private organizations to protect and manage land around military installations.

While no former partnerships or agreements exist between NSGL and outside organizations there are numerous informal cooperative efforts in place. The NSGL ENV DIV in cooperation with the IL-DNR and the National Audubon Society formed partnerships to have Harbor Island designated as an Important Bird Area (IBA). Together they have constructed an electric fence around a portion of the island in order to keep predators from disrupting Common tern nesting areas. The protected habitat has attracted a diversity of rare and unusual birds. Large numbers of migratory shorebirds use this protected site during their long migration to and from their nesting sites in the arctic tundra to Central and South America where they over-winter. NSGL has taken steps to protect migratory bird resting and nesting sites and has made special provisions to

provide access to staff Natural Heritage biologists from the IL-DNR to actively assist in managing and monitoring the site.

NSGL is partnering with IL-DNR to create a long-term vegetation management plan to control invasive species and conserve important bird habitat areas on the Station.

3.9 Public Access and Outreach

3.9.1 Public Access and Outdoor Recreation

NSGL manages natural resources to provide outdoor recreational opportunities for Station personnel, retirees and civilian personnel authorized to access the Station. However, recreational opportunities at NSGL are limited by military operational and security needs, safety concerns, limited management staff to administer programs and the relatively small land area with a finite resource base. Recreational activities dependent on developed facilities, such as RV Park, swimming beach and marina, are managed and operated by MWR under their specific guidelines. Management of the Harbor and Marina is accomplished jointly with the MWR managing recreational and business management aspects and the ENV DIV providing technical support regarding fisheries and water quality issues.

Management issues at NSGL include determining the appropriate level of public access to allow for natural resource-dependent outdoor recreation on the Station; implementing a program for such access; and integrating outdoor recreation with the operations and military mission of NSGL without compromising either. Proper management and supervision of outdoor recreation programs is needed to ensure that military safety and security requirements are met and natural resource damage is prevented. Without an increase in staffing, future development of natural resources-based outdoor recreation will be limited. Further, recreational access to the few undeveloped areas at NSGL is limited to a few activities that have been approved by the ENV DIV and/or the Commanding Officer.

Compatibility of other outdoor recreational activities must meet:

- Military operational and security needs;
- Safety and liability issues, such as rough terrain and potential water hazards;
- Staffing limitations; and
- Requirements for resources conservation, which must be carefully evaluated and will continue to limit recreational access.

As surrounding areas have become urbanized, there has been increasing interest from the public to access NSGL for natural resource-related field tours and other outdoor recreation. Requests for field tours are typically limited to granting access on a case-by-case basis. Any requests for field trips for activities such as bird watching or nature

walking need to be sponsored by a Station activity or tenant and approved by the ENV DIV and Station security.

NSGL has been and will continue to be a limited public access facility due to Force Protection concerns. Currently the Command is reviewing granting the public access to the Willow Glen Golf Course. Willow Glen is separate from the main Station and consideration is being given to allowing the general public access to this facility. At the writing of this plan no decision has been made. However, if access is granted, the INRMP will be updated to reflect public utilization of Willow Glen Golf Course. Public access may occasionally be granted for school and public tours, scientific studies, and to individuals, but this access is allowed on a case-by-case basis and may be revoked on short notice.

3.9.2 Public Outreach

NSGL prepares news releases to inform the public of various natural resource efforts underway on the Station. Numerous articles about the status of the State Endangered Common tern and habitat restoration efforts on Harbor Island have been published in the *Great Lakes Bulletin* and other area publications.

NSGL involves public interest groups such as The National Audubon Society and the American Bird Conservatory in migratory bird recovery and habitat issues on the Station. These two public interest groups have worked closely with the Station and the IL-DNR to have certain habitats on the Station designated “Important Bird Areas.”

The Station is working with various community groups and is exploring options that may lead to public access of Willow Glen Golf Course.

3.10 Encroachment Partnering

There are currently no encroachment partnerships at NSGL. The highly urbanized nature of the Station and the community surrounding the Station presents no encroachment issues or opportunities. Section 2.3 discusses encroachment issues.

3.11 GIS Management, Data Integration, Access, and Reporting

NSGL does not currently utilize GIS systems for data and inventory management. The NSGL ENV DIV recognizes the value of this platform and is exploring options to integrate this technology into its environmental programs.

3.12 Training of Natural Resource Personnel

The NSGL ENV DIV Natural Resource Manager has been DoD trained and certified as a Pesticide Applicator and Installation Pest Management Coordinator. This training has given the Natural Resources Manager valuable expertise in pest management/pesticide

use operations and their impact on the Station's natural resources. The natural resource manager also attends various government workshops and conferences (DoD Natural Resource Training, USFWS Conservation Landscape Management, etc.) subject to availability and funding.

SECTION 4.0 PROGRAM ELEMENTS

4.0 Program Elements:

The implementation of this INRMP is intended to be a dynamic, multidisciplinary process. To provide direction, recognize target management actions, and construct the framework for measuring success of this INRMP, the following goals have been established:

- Provide for the conservation, enhancement, and rehabilitation of land and water resources of the Installation while supporting the military mission.
- Maintain or increase the diversity and populations of plants and animals under the stewardship of the Department of the Navy through habitat maintenance, enhancement, or rehabilitation activities on NSGL that do not detract from the military readiness of the Installation.
- Enhance the quality of life of Navy personnel by providing high-quality, accessible, outdoor recreational opportunities that do not degrade the natural resources.
- Foster and promote natural resource stewardship among Navy personnel, their dependents, and the public by providing opportunities to participate in natural resource conservation, education, and rehabilitation activities on NSGL.

From these goals, a variety of management objectives and projects specific to the needs of NSGL have been developed. The management objectives are components of the four goals and represent measurable targets to be used to quantify the success of this INRMP. It should be noted that individual goals, objectives and projects could be applied to one or more program elements. For example, a goal of controlling invasive plants also enhances habitat for RT&E species and also furthers the management goals for wetlands and wildlife by endeavoring to maintain native flora in support of the management objectives for these program elements. A more detailed discussion of the goals, objectives and projects in relation to various program elements follow.

4.1 Threatened and Endangered Species, Critical Habitat, and Species of Concern

Species of Concern include those that are federally listed as endangered or threatened, or proposed candidates for such listing (refer to Tables 2-1 and 2-2). Definitions for categories of Species of Concern are provided in Section 2.1, *Threatened and Endangered Species and Species of Concern*. NSGL's approach to Species of Concern is to proactively collect information on presence or absence, location, habitat availability and suitability, and life history requirements to support planning for military operational requirements and habitat conservation.

The USFWS lists six species of animals and seven species of plants in Lake County as threatened or endangered (USFWS, 2006). Lack of suitable habitat for most of these species and urbanization surrounding the Station greatly reduce the possibility of finding any Federal-listed threatened or endangered species on these locations. A county-by-

county listing of Federal-listed threatened and endangered species in Illinois is available at: <http://www.fws.gov/endangered/wildlife.html> - Species

The Illinois Endangered Species Protection Board (IESPB) listed 299 species of plants as endangered and 58 as threatened in Illinois. In addition, 21 species of fish are listed as endangered and nine species as threatened. Nine species of amphibians and reptiles are listed as endangered, with the same number listed as threatened. Thirty-two species of birds are listed as endangered and nine species are listed as threatened. Six species of mammals are listed as endangered, and three are listed as threatened. The latest lists of State-listed threatened and endangered species can be found on the World Wide Web at <http://dnr.state.il.us/esp/>

Objectives, Goals and Planned Projects (see [Appendix A](#) for a detailed listing of projects).

Goal 1: Enhance and protect the existing panne ecosystem

- Objective 1: Continue to identify and control invasive vegetation in the panne in order to foster an ecosystem conducive to the growth of native vegetation and continued support of Species of Concern.
- Objective 2: Continue to work cooperatively with the IL-DNR to track the presence and nesting of Species of Concern birds on Harbor Island IBA.

Goal 2: Develop a plan to monitor for the presence of Federal and Stated listed RT&E species and to protect and manage their habitat.

- Objective 3: By FY 2010 develop a monitoring program for Federal and State listed RT&E species.

Projects Supporting Goals and Objectives:

Project 7: Study and implement noxious and invasive weed control

Project 10: Ongoing monitoring plan to control phragmites and purple loosestrife in wetlands, dunes and panne

Project 11: By 2010 update the 1995 RT&E species survey

Project 12: Develop a program for managing RT&E species, population estimates and map distributions

Project 13: Implement recommendations by IL-DNR for protection of Common tern

Project 14: Identify important bird areas and maintain suitable nesting conditions

4.2 Wetlands

NSGL supports wetlands including vernal marshes, fresh water marshes, and portions of some riparian vegetation types and edges of open water lakes. As is the case with vernal pools, management and use of these areas requires careful consideration of the CWA,

ESA, and the national policy (Executive Order 11990, *Protection of Wetlands*) to permit no overall net loss of wetlands.

Clayton Environmental Consultants was contracted to perform a jurisdictional determination and delineation of the boundaries of “waters of the United States,” including wetlands, which occur within 11 pre-defined areas of NSGL. J.F. New & Associates (JFNA) was subcontracted by Clayton to conduct the fieldwork.

The contractor inspected the 11 “areas of concern” in the field in September, and November 1999. Based on data collected in the field for all 11 areas it was determined that Areas 2, 3, 5, and 13 contain jurisdictional wetland (*Table 2-2*). The areas containing jurisdictional wetlands were delineated.

The Raymond Professional Group – Government, Inc. was retained by the Naval Training Center Great Lakes in July 2001 to prepare wetlands identification and delineation at the Willow Glen Golf Course in Great Lakes, Illinois (*Table 2-4*). Willow Glen is approximately 138 acres and is located on the north side of Illinois Route 137 (Buckley Road) between U.S. Route 41 (Skokie Highway) and Illinois Route 131 (Green Bay Road) in Lake County.

Nine wetland areas were identified on the golf course. Earlier investigations performed by PRC Environmental Management in 1996 and by Beling Consultants in 1997 identified ten wetlands; however, one of the wetlands no longer exists due to changes made in the layout of the golf course and drainage improvements.

Goal 3: Protect and enhance the quality of surface waters on NSGL to meet or exceed State of Illinois water quality standards.

- Objective 4: By the end of FY 2010 develop plans and policies to improve the quality of storm water runoff.

Projects Supporting Goals and Objectives:

Project 8: Implement a regular schedule to monitor water quality.

Project 9: Update 1999 and 2001 wetland surveys.

4.3 Fish and Wildlife

Conservation of undeveloped areas of the Station and the habitat in those areas will protect the viability of all wildlife populations on NSGL. All species of wildlife will benefit from NSGL’s basic strategy to limit activities, avoid development, and perform mitigation actions in areas supporting high densities of threatened or endangered species, and other wetlands without adverse impact on the mission. Furthermore, the basis of good management is an understanding of the diversity, abundance, distribution, population dynamics, and habitat requirements of species. This approach is reflected in the Station’s past and ongoing management activities. These activities include monitoring

of migratory birds and future surveys for invertebrates, reptiles, amphibians and other small mammals.

Goal 4: Improve conditions on NSGL for fish and wildlife through habitat protection, enhancement, and creation where and when it is possible and by providing urban wildlife habitat where feasible.

- Objective 5: By the end of FY 2010, improve water quality and habitat conditions in Pettibone Ravine.
- Objective 6: Continue the improvement of habitat conditions on the slopes of the ravines and bluffs currently found on NSGL
- Objective 7: During the lifespan of this INRMP, assess the effectiveness of management activities by estimating population sizes and distributions of indicator species during regularly scheduled biological surveys.

Projects Supporting Goals and Objectives:

Project 1: Develop and implement slope stabilization/soil and water conservation measures for Pettibone Ravine.

Project 2: Investigate and implement soil and water conservation requirements and project for lake front slopes and bluffs.

Project 4: Remove building debris from slopes of Pettibone Ravine.

Project 11: By 2010 update the 1995 RT&E species survey.

Project 12: Develop a program for managing RT&E species, population estimates, map distributions and GIS database.

Project 13: Implement recommendations and continue cooperation with IL-DNR for protection of Common tern.

Project 15: Select indicator species to monitor during regular biological inventories.

Project 18: Conduct a fish population survey of Pettibone Creek and the Harbor.

4.4 Vegetation/Invasive, noxious weeds

Effective vegetation management is critical to maintaining, restoring, and rehabilitating native vegetation and its associated wildlife habitats. When vegetation management is focused on habitat improvement for wildlife, it should include maintenance of wildlife corridors and habitat linkages. The maintenance and restoration of training lands is an equally important aspect of general vegetation management.

Quantitative descriptions of vegetative attributes, such as cover, biomass, or composition, are helpful for habitat condition or trend monitoring, and a planned management objective of this INRMP. Monitoring allows for periodic review of ecosystem quality and management objective success.

NSGL must comply with Executive Order 13112, *Invasive Species*. An invasive species is defined as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health”. Federal agencies are to prevent the

introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause. Invasive plants can be a serious threat to natural plant communities. These species can change the structure of a plant community and degrade its value for wildlife and native plant species.

NSGL has been identifying and controlling invasive plant species, including phragmites and purple loosestrife. The priority for species controls changes due to changing threats associated with invasive species, effectiveness of ongoing control, cost/benefit factors, and available control resources.

Goal 5: Control noxious weeds and invasive/exotic species of plants found on NSGL within the lifespan of this INRMP.

- Objective 8: By 2008 identify area of native vegetation heavily infested with noxious weeds and invasive species and implement management projects to reduce the extent and severity of the infestation.
- Objective 9: By September 2010, identify landscaped areas infested with noxious weeds and prioritize these areas for management projects.

Projects Supporting Goals and Objectives:

Project 7: Study and implement noxious and invasive weed control; identify, map and prioritize areas; reintroduce replacement native flora and establish long-term surveillance. Project 10: Continue ongoing monitoring plan to eradicate phragmites and purple loosestrife in wetlands, dunes and panne.

4.5 Land Management/Urban Forest

Grounds maintenance practices and landscaping operations include general weed control. It is Navy policy to maintain an acceptable level of appearance on all installations using cost reducing landscaping practices. It is also Navy policy that environmentally and economically beneficial landscaping practices be used, per Executive Order 13148 and as outlined in a Presidential Memorandum (26 April 1994). The Presidential Memorandum directs federal agencies to:

- Use regionally native plants for landscaping;
- Design, use, or promote construction practices to minimize adverse effects on the natural habitat;
- Prevent pollution by reducing fertilizer and pesticide use, using integrated pest management, recycling green waste, minimizing runoff, and similar practices;
- Implement water efficient practices; and create outdoor demonstrations incorporating native plants and other similar practices.

Soil erosion can severely delay the re-establishment of vegetation and habitat conditions needed to sustain plant and wildlife species. This is of particular concern when Species of Concern habitat is the focus of habitat improvements. Soil erosion may also affect the

maintenance of training lands, which require vegetative cover for maintaining and enhancing training realism, and the preservation of important ecosystems on the Station

The Soil Conservation Act provides for the application of soil conservation practices on federal lands. Navy installations are required to manage lands to control and prevent soil erosion and preserve natural resources by conducting surveys and implementing soil conservation measures. Erosion control is meant to preserve the integrity of soil productivity and function. It encompasses water quality concerns and protection of riparian functions that affect water quality. Altered or degraded landscapes and associated habitats are to be restored and rehabilitated whenever practicable.

Erosion and sedimentation issues are important at NSGL due to highly erodible soils and the quality of water entering Lake Michigan. Excess sediment or altered flows can affect watershed hydrologic function, water quality, and wildlife habitat. Watershed malfunction that results in excessive runoff can degrade or even destroy whole ecosystems, individual plant communities, or specialized zones, such as riparian areas. Gullies can lower the water table, potentially affecting vegetative cover and the hydrology of an entire watershed. Roads can alter water flow and potentially divert water from natural streams.

4.5.1 Slope Stabilization, Erosion Control and Revegetation

The slopes of Pettibone Ravine are unstable in many locations, and are eroding in specific areas (*Figure 4-1*). Undercutting, bank slumping, and structural failures that vary in degree (*Figure 4-2*) affect portions of the ravine. These conditions can threaten structures at the tops of the ravines, and the military mission (U.S. Navy, 1988; 1993). A survey of Pettibone Ravine and bluffs on NSGL, completed in January 1999, identified 37 specific sites having significant erosion problems or impending slope failure. Erosion and slope failure at the majority of these sites are predicted to substantially increase repair and recovery costs if not corrected



Photo A - Erosion in Pettibone Ravine resulting from storm water runoff being direct into the ravine instead of a storm sewer.



Photo B - Large section of storm sewer undercut and exposed by erosion and slope failure.



Photo C - Concrete debris near Bunker 24D that was placed on the slope in an effort to stabilize the area.

Figure 4-1 Slope Failure Pettibone Ravine



Photo A - A section of Pettibone Ravine that has slumped and become revegetated.



Photo B - A section of Pettibone Ravine that has slumped recently.



Photo C - A section at the top of Pettibone Ravine that has slumped recently.

Figure 4-2 Slope Failure Pettibone Ravine

Another potential threat from soil erosion is ruptured sanitary sewers. Raw sewage from broken sanitary sewer lines in ravines in close proximity to NSGL is documented.

Untreated sewage from these lines can flow directly into Lake Michigan and create health hazards. Beach closures have occurred north and south of NSGL due to high fecal and total coliform bacteria counts from breaks in sanitary sewer lines caused by ravine erosion (Shabica, 1998).

4.5.2 Ravine Slope Stabilization

Construction of infrastructure in support of the military mission disturbed soils and native vegetation within Pettibone Ravine. This infrastructure includes a service road located along the north bank of Pettibone Creek at the toe of the ravine slopes, several now abandoned ammunition bunkers built into the ravine, steam delivery pipes, bridges, and storm sewers. These structures are contributing to increased rates of soil erosion observed within the ravine. The soil erosion has the potential to cause structural damage to infrastructure and interfere with the military mission. A survey within Pettibone Ravine showed numerous storm sewers and bridge foundations that are now exposed and contributing to rapid soil erosion around these structures (*Figure 4-3*). Broken concrete rubble was placed on slope faces (*Figure 4-1*) near a variety of areas in an effort to stabilize the slopes, but this effort has had limited success.



Photo A - Bridge Erosion

Photo B - Utility Erosion



Photo C - Erosion Bridge Utility Support

Figure 4-3 Erosion Around Utilities

Eroding ravines on the western shore of Lake Michigan are a serious threat to Lake Michigan water quality (Shabica et al., 1992). Storm water runoff originating from developed areas is directed into ravines, leading to increases in quantities of storm water

runoff and flow velocities within the ravines. The increased quantities of storm water runoff and flow velocities result in the removal of large amounts of sediment by dislocating ravine beds and side slopes, loosening toes of ravine slopes, and carrying this material downstream into Lake Michigan. As toes of slopes fail, rates of slope slumping and slope creep increase. Heavy and record rainfall events can destabilize slopes and lead to slope failure within ravines. These events also contribute to an increase in groundwater within silt and sand layers in the soil profile. These silt and sand layers transport groundwater towards the surface of the slope, where it destabilizes surface soil, weakened by saturation from excessive rainfall. This all leads to slope instability.

Three comprehensive slope erosion and stability studies have been conducted since 1988 to identify causes of slope instability and soil erosion on the ravine and bluff slopes of the NSGL (U.S. Navy, 1988, 1992, 2000c). The study conducted in 1988 identified 99 specific locations that had the potential for slope failure and extreme soil erosion. An analysis of three specific slope failure areas (Buildings AA, 130, and 150) led to the conclusion that these failures resulted from a number of erosion producing phenomena including elevated groundwater levels and overland storm water runoff on unprotected slopes (U.S. Navy, 1988). The report gave detailed descriptions of slope stability and erosion problems along the entire Pettibone Ravine and lakefront bluffs occurring at that time. The 1992 study examined in detail lake bluffs near Building AA, ravine slopes near Buildings 130 (now demolished) and 76, and ravine slopes beneath the parking lot of Building 111 (now demolished). This study indicated similar conclusions regarding causes of slope instability on NSGL; however, the recommendations made in the 1992 study were significantly different and more costly than those made in the 1988 study. It was also indicated in the 1992 study that there were strong concerns that the previously recommended solutions would have limited effectiveness. The 2000 study did not identify specific causes of erosion and slope instability, but did identify sites with the highest risk of failure from erosion and made recommendations for the use of native vegetation to stabilize slope surfaces.

Since the writing of the 2002 INRMP numerous soil and water conservation (S&WC) and slope stabilization projects (*Figure 4-4*) have been completed in Pettibone Ravine:

Project #1 (NTCGL INRMP 2002) stated: Implement recommended slope stabilization measures from the study conducted in 2000 for Pettibone Ravine:

- SUMMER 00. Phase I completed – E. of Camp Barry Bridge. ERMS funded project at \$124,328.
- NOV 01. Phase II completed – E. of Bldg. 42. ERMS funded project at \$91,910.
- SEP 03. Phase IV, completed – E. of Camp Barry Bridge; ERMS #0021019734 funded project at \$35,700..

NSGL expects the Pettibone Ravine S&WC and slope stabilization projects (*Figure 4-4*) to be ongoing over the course of this INRMP (2007-2016)



Photo A - Erosion Control Project
Pettibone Ravine

Photo B - Erosion Control Baskets
and Retaining Wall Project



Photo C - Erosion Control Projects
Pettibone Ravine

Figure 4-4 Erosion Control (S&WC) Projects

Bioengineering integrates biological and earth sciences with engineering to provide a sound, cost-effective, and environmentally compatible way to address environmental

concerns. Typically, vegetation with deeply penetrating roots that stabilizes soil on slopes, becoming stronger over time, is a major component of bioengineering solutions for slope stabilization. The most recent slope stabilization and erosion control study (U.S. Navy, 2000c) recommends this approach over exclusive use of constructed hard structures for slope stabilization and erosion control. This analysis included a preliminary evaluation of slope stability in Pettibone Ravine and developed conceptual recommendations for future detailed evaluations. Additionally, related problematic conditions within the ravines are invasive plant species, including tartan honeysuckle (*Lonicera tatarica*) and garlic mustard (*Alliaria petiolata*), as well as fire suppression and heavy shading. Vegetation management within the ravine system is required for effective erosion control. Although the ravines are naturally wooded, these areas are not under a formal management program. The present tree stands are considered to have little or no commercial potential; however, maintaining the ecological integrity of the native wooded plant community of the ravines is an integral part of slope stabilization and erosion control. Recommendations contained in the most recent study (U.S. Navy, 2000c) for restoring and maintaining the natural integrity of Pettibone Creek Ravine as it relates to the vegetation are:

- Develop a policy statement as part of a comprehensive master control plan.
- Eliminate two invasive tree species (box elder and sugar maple).
- Eliminate garlic mustard and control bush honeysuckle.
- Plant native grasses and other herbaceous species.
- Implement a monitoring and maintenance program for vegetation on the slope.

Dewatering as proposed in the 1988 and 1992 studies could have an adverse effect on native vegetation growing on the slopes. Loss of this vegetation from soils that are too well drained would contribute to slope instability. The direct and indirect effects of dewatering on native vegetation would need to be investigated before a dewatering project is begun because maintaining a native plant community in ravines is an integral part of slope stabilization and erosion control.

Goal 6: Develop and implement effective bioengineering methods to stabilize the slopes and bluffs of NSGL and to prevent further loss of land that may threaten structures vital to the military mission of the Station.

- Objective 10: Develop a comprehensive strategic plan for NSGL to address slope stabilization in Pettibone Ravine by the end of FY 2008.

Goal 7: Develop and implement a plan to monitor, protect and replace urban trees used in urban landscaping on NSGL.

- Objective 11: Beginning FY 2011, develop a comprehensive Urban Forestry and Landscape Management Plan to improve conditions for urban forests and enhance the quality of life for personnel on NSGL.

Projects Supporting Goals and Objectives:

Project 1: Implement recommended slope stabilization measures from study conducted in 2000 for Pettibone Ravine.

Project 2: Develop and implement soil and water conservation measurements for the south and west tributary ravine slopes of Pettibone Ravine.

Project 3a: Develop and implement soil and water conservation plan of action for lakefront slopes and bluffs.

Project 3b: Implement soil and water conservation projects along lakefront slopes and bluffs.

Project 5: Develop and initiate an urban tree program, tree survey, GIS database and policy of avoiding losses of urban trees.

Project 6: Create no-mow strips at the tops of slopes and bluffs.

Project 7: Study and implement noxious and invasive weed control; identify, map and prioritize areas; reintroduce replacement native flora and establish long-term surveillance.

Project 16: Establish and begin a monitoring and control program for Emerald Ash Borer, Asian longhorned beetle and other invasive species destructive to urban trees.

4.6 Floodplains

There are two types of floodplains at NSGL, riverine and coastal floodplains. Flooding of riverine areas is caused by rainstorm runoff that exceeds the natural carrying capacity of the channel. Flooding of the Lake Michigan coast areas results from excessive high water levels, wave run-up from high winds, and storms (U.S. Navy, 1998a).

The majority of NSGL is outside of the 100-year floodplain. Historically, localized flooding has occurred along Pettibone Creek and the Skokie River, in isolated upland depressional areas, and during major storm events, in the streets and building areas within the developed areas of the Station. Flooding from high lake levels or storm surges outside of the beach areas at the Station are unlikely because they are 45 to 70 feet (14 to 21 m) higher in elevation than normal lake levels.

4.7 Outdoor Recreation

A broad goal of NSGL natural resources management is to manage natural resources to provide high quality outdoor recreational opportunities, as appropriate. However, recreational opportunities at NSGL are limited by military operational and security needs, safety concerns, limited management staff to administer programs, and the relatively small land area with a finite resource base. Outdoor recreation activities consist of:

- Boating at the marina, harbor and small boat launch
- RV parking at the RV Park
- Lakeside swimming and fishing
- Archery and camping
- Walking on designated nature trails
- Golfing

Many outdoor recreational activities at NSGL are based on water and the Station's proximity to beautiful Lake Michigan.



The RV Campground borders the lake; this year-round camping facility has 20 concrete sites with electrical hook-ups, restrooms, and nearby access to shower facilities. Other facilities associated with the campground include a beach with a beach house, fishing piers with a cleaning station, a playground, picnic areas and an archery range. Campers also have access to the Marina Rental Center and the Ship's Store. Campers can reserve a site in person, by phone

or online.

The Harbor and Marina, also located on Lake Michigan, supports facilities for boating, sailing and fishing. A charter boat with an experienced captain is available for fishing trips. In the summer months, sailing classes are available. Activities around the marina area include a new small boat launch and fishing contests. The Ship's Store sells boating, fishing/hunting supplies and licenses. Boat slips, moorings and storage are also available, as well as a launch ramp. There are picnic tables as well as shelters for family/social outings or official command functions, including the large Beach House.



The Willow Glen Golf Club has an 18-hole golf course. The par 71 layout plays 6,637 yards from championship tees. The course encompasses approximately 138 acres with four sets of tees per hole. Rolling fairways

surrounded by contoured mounding and greens make for a scenic round of golf. The course offers several water features and sculptured bunkering creating a pleasingly aesthetic atmosphere.

Practice facilities at Willow Glen include a driving range that features target greens and an all grass teeing area. A practice putting green is also available to help golfers.

Goal 8: Enhance the quality of life of navy personnel by providing high-quality, accessible outdoor recreational opportunities that do not degrade the natural environment.

- Objective 12: By the end of FY 2010 create a natural trail system on the Station that maximizes outdoor recreational opportunities and minimizes threats to the natural environment

- Objective 13: By the summer of 2008, provide supervised and structured outdoor recreational activities

Goal 9: Foster and promote natural resource stewardship within NSGL personnel and the general public by providing opportunities to learn about natural resources and participate in their management on NSGL.

- Objective 14: Continue to develop partnerships with regional universities, conservation organizations, State and Federal agencies and sources of volunteers to participate in natural resource management projects on NSGL
- Objective 15: Continue to develop and implement public relations programs for residents, military members and employees at NSGL that instill a sense of stewardship in participants.

Projects Supporting Goals and Objectives:

Project 18: Conduct a fish population survey of Pettibone Creek and the Harbor.

Project 20: Prepare press releases after completing natural resources management projects.

Project 23: Select best-qualified partners from outside agencies and organizations for partnerships for natural resources management issues.

Project 24: Develop a nature trail throughout approved areas that showcase unique flora and fauna for educational and recreational purposes.

4.8 Wildlife Damage Management/Bird Aircraft Strike Hazard

NSGL's boundaries interface with both urban and natural environments. Conflicts can arise with nuisance animals (*e.g.*, deer, ground hogs, squirrels, skunks, fox and coyotes), which occasionally pose a health hazard. Furthermore, Special Status Species and other native wildlife are prey for some domestic animals. NSGL pest control contract services are conducted through the Public Works Department, and if necessary, other local vector/animal control agencies. In general, special permits are usually required to remove nuisance animals and can delay the response to the problem.

The BASH (Bird Aircraft Strike Hazard) program is an important consideration at NSGL. Occasionally rotary wing aircraft use the parade field for transportation to and from NSGL. Bird collisions with rotary aircraft could be a serious threat to flight safety. At NSGL, the problem has been largely with the Canada geese. Distribution and abundance of bird species that pose a potential hazard can change seasonally and also vary by altitude, temperature, rainfall patterns, and surrounding land use. The Station has no formal BASH plan, mainly because NSGL does not support flight operations. However, as discussed in Section 2.9 occasional problems associated with rotary wing aircraft and Canada Geese do arise.

Goal 10: Develop and implement a plan to manage nuisance wildlife on NSGL that is humane, effective and provides for the safety of aircraft operations and personnel.

- Objective 16: Continue to monitor and control resident and migratory Canada geese that inhabit ponds and other areas of the Station.
- Objective 17: Institute management options outlined in Section 2.9 to make areas more unattractive for geese.

Projects Supporting Goals and Objectives:

Project 17: Modify conditions on and around ponds and other designated areas of NSGL to make them more unattractive for geese. The use of wire grids is one such method.

4.9 Law Enforcement

Educational and training programs will continue at NSGL as proactive measures to prevent violations of natural resource-related laws and regulations. Natural resource compliance and conservation awareness efforts include educating Station personnel about natural resources and the use of this INRMP.

Violations documented by the Station organization responsible for compliance are referred to the Station Commanding Officer for determination regarding reporting, investigation, adjudication, corrective and/or punitive actions. Law enforcement associated with individual actions beyond official federal duties, including poaching, will be the responsibility of the Station Security Office, or other entities as directed by the Commanding Officer, with technical assistance from the Environmental Division's Natural Resources Manager.

Fishing is permitted at the NSGL lake front areas. Personnel must comply with State of Illinois DNR fishing regulations. The IL-DNR allows the Station the freedom to manage this fishing program under general state fishing regulations. Personnel are required to possess a state fishing license. Regulations applicable to fishing are enforced by the IL-DNR.

NSGL has no hunting programs.

Occasionally, the services of state and federal fish and wildlife agency enforcement personnel may be used where their technical expertise or extra manpower is needed. Navy policy is to permit access to installation lands by federal, state, and local conservation personnel for official purposes after proper safety and security measures are taken.

Goal 11: Maintain regulatory awareness of natural resource issues in personnel utilizing NSGL natural resource areas.

- Objective 18: Continue to encourage stakeholder involvement by participating in quarterly Environmental Quality Board meetings

Projects Supporting Goals and Objectives:

Project 22: Provide professional development for the Natural Resource Manager by participating in training classes, seminars, conferences, etc.

4.10 Migratory Birds

NSGL provides habitats and open space for a wide variety of migratory birds that migrate annually within and beyond North America. Regardless of how birds use the Station, their presence provides important ecological services and an important indicator of ecosystem health. Primary considerations with regard to migratory bird management are compliance with the Migratory Bird Treaty Act (MBTA); implantation of migratory bird management actions in accordance with EO 13186 (*Responsibilities of Federal Agencies To Protect Migratory Birds*); and support, contribution, and compatibility with the goals



Common tern chick fledged on Harbor Island IBA

and efforts of numerous regional migratory and game bird conservation programs.

The MBTA is an international agreement between the United States, Canada, and Mexico that protects designated species of birds. Virtually all birds that occupy NSGL throughout the year are protected under the act. The MBTA controls many actions that may negatively affect migratory birds, particularly collection and transport of birds.

Special purpose permits may be requested and issued that allow for the relocation or transport of

migratory birds for management purposes.

Executive Order 13186 was issued on 10 January 2001 and requires federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within 2 years, a MOU with the USFWS.

It is not expected that military operations on NSGL will have any measurable negative effects on migratory birds. NSGL has partnered with the IL-DNR and the National Audubon Society to have the Harbor Island panne ecosystem designated an Important Bird Area. NSGL recognizes that this area is instrumental to the perpetuation of certain species of migratory birds and is working diligently to restore and protect this important ecosystem.

All persons, organizations, and agencies, are liable for prosecution for violations of the MBTA and must follow permitting requirements for taking migratory birds. Special

purpose permits may be requested and issued by the USFWS that allow for the relocation or transport of migratory birds for management purposes.

NSGL partners with IL-DNR Natural Heritage Program biologists to monitor migratory birds on the Station. Bird counts are performed throughout the year and data is kept on not only Species of Concern but on all migratory birds that utilize NSGL for resting during migration stopovers and nesting.

Goal 12: Develop and implement plans to protect and enhance sensitive habitats found on NSGL

- Objective 19: By summer of 2007, develop and implement a management program for the panne that protects and enhances the native plant community and makes the ecosystem more favorable for migratory birds.
- Objective 20: Continue to partner with IL-DNR to perform bird counts and cooperatively manage habitat for the State endangered Common tern.

Projects Supporting Goals and Objectives:

Project 1: Develop and implement slope stabilization/soil and water conservation measures for Pettibone Ravine.

Project 2: Develop and implement soil and water plan of action for the south and west tributary ravine slopes

Project 3a &b: Investigate and implement soil and water plan of action/projects for lake front slopes and bluffs.

Project 7: Study and implement noxious and invasive weed control

Project 10: Ongoing monitoring plan to eradicate phragmites and purple loosestrife in wetlands, dunes and panne.

Project 12: Develop a program for managing threatened and endangered species including: estimate population sizes; map distributions; identify areas with poor/degrading habitats initiating methods for restoration at predetermined sites.

Project 13: Implement recommendations and continue cooperation with IL-DNR for protection of the Common tern.

Project 23: Select best-qualified partners from outside agencies and other sources for creating partnership agreements for natural resources management

4.11 Long Range Environmental Planning

Long range environmental planning is key to successful natural resource management, integration, compliance, and mission support at NSGL. Long range planning helps to ensure that Station activities are consistent with natural resource management goals and objectives, and that those goals and objectives are consistent with the military mission. Long range planning helps to ensure the integration of, and consistency among, planned actions.

The INRMP itself is an important long range planning document for developing environmental baseline information to support activity and operational planning, formalizing natural resource goals and objectives, establishing planned actions to help meet those goals and objectives, and integrating actions and responsibilities basewide. The INRMP review and revision process (Chapter 1) is as important as the document itself, providing a venue for self-evaluation, communication, adaptive management, and further refinement of long range planning and integration.

It is important that the INRMP be fully integrated with other planning documents on NSGL, especially the Station Master Plans. The installation master planners, who are within the PWD and NAVFAC-MW, should be very familiar with the INRMP because they designate land use. Master plans typically extend to a 20- to 30-year period, whereas the INRMP provides a planning period of ten years. The INRMP may identify designated sensitive areas with land use restrictions. It is imperative that the natural resource manager coordinate such restricted areas with the master planners so that, at a minimum, they can be incorporated into the master planners' maps and databases. Currently, the NSGL Master Plans primarily focus on the development of facilities and are in the process of being up-dated and integrated with other long term planning documents on the Station (including those for training and natural resource management). The INRMP is expected to complement and be fully compatible with Master Plans and support strategic planning.

Goal 13: Maintain a high level of quality in natural resources management by regularly reviewing and updating the INRMP.

- Objective 21: Throughout the lifetime of this INRMP, provide training in natural resources management to the Installation Natural Resources Manager in order to maintain a high level of effectiveness in managing all natural resources.

Goal 14: Through adaptive management, continually update this INRMP

- Objective 22: During FY 2010, conduct a complete review and evaluation of goals, objectives and projects in this INRMP, to adjust goals, objectives and projects to reflect changes in natural resources laws and regulations, the military mission, natural resources inventory and management issues. Evaluate results of previous natural resources management activities.

Goal 15: Update/rewrite the Integrated Pest Management Plan (IPMP).

- Objective 23: Evaluate the current IPMP and current Station Pest Management Program, incorporate new guidance, operations and conditions.

Projects Supporting Goals and Objectives:

Project 19: Update/rewrite Integrated Pest Management Plan

Project 21: Update and revise the Integrated Natural Resources Management Plan, addressing program accomplishments, regulatory and policy changes.

Project 22: Provide professional development for the Natural Resource Manager through participating in training classes, seminars, conferences, etc.

SECTION 5.0 IMPLEMENTATION

5.0 Implementation

The Environment Management Division for NSGL is responsible for implementing this INRMP. The Natural Resources Program Manager provides program management for natural resource compliance and management on the Station. Division activities include the following:

- Planning for and accomplishing established goals, objectives, and planned actions to support the ongoing military mission of the Station;
- Providing technical guidance regarding vegetation management, soil conservation, management of Species of Concern, wetland conservation, fish and wildlife management and outdoor recreation.
- Providing technical advice on military and non-military NEPA documents, facility planning, construction plans, maintenance activities, military operations, and other proposed actions that may affect natural and cultural resources;
- Using in-house staff, contracts, and cooperative agreements to conduct fieldwork, surveys, and inventories to provide specific information on the flora and fauna on NSGL and proactively maintain up-to-date resource data for activity and project planning, thereby minimizing resource data collection delays;
- Serving as the lead for planning and addressing natural resource compliance issues, such as wetland and endangered species regulatory requirements;
- Providing technical natural resource management support to Station action proponents regarding resource compliance requirements and BMPs involved with their actions; and
- Providing conservation education training to military and civilian personnel to raise awareness and improve community relations with the goal of preventing resource damage.

The Command is dedicated to implementation of this INRMP, as required by the Sikes Act and other federal laws. Just as importantly, the Command is dedicated to maintaining and improving the military mission at NSGL. Implementation of this INRMP is a means to that end. Many projects for natural resources management within the next five years require command support. The Commanding Officer is personally liable for noncompliance with environmental laws, such as those affected by this INRMP. Thus, he has a personal interest in ensuring that this INRMP is properly implemented.

5.1 Detailed Prescriptions That Drive the Projects

The natural resources programs and projects described in this INRMP are divided into mandatory and stewardship categories to reflect implementation priorities. Every effort will be made to acquire Operations and Maintenance (Naval) [O&M(N)] Environmental, or other funding to implement DOD mandatory projects, in the timeliest manner possible. Stewardship-type projects will be funded through forestry, agricultural outleases, fish and wildlife, Legacy, or other fund sources as funding and personnel resources become available.

For this INRMP, NSGL is divided into ten Natural Resources Management Program Elements (NRMPEs). NRMPEs are tools to help identify major natural resources management issues; identify, plan, and conduct management projects; and identify opportunities to integrate projects from different natural resource management categories. Boundaries of NRMPEs may change to meet mission and natural resource management needs and changing natural resource management goals. NRMPEs are not exclusive. Areas of overlap of two or more NRMPEs indicate good potential for integrating projects to address issues and meet goals of different natural resources management categories (e.g., addressing land management and wildlife management issues by integrating their respective projects into one project).

The ten NRMPEs were formed according to the guidance in *Integrated Natural Management Plan Guidance for Navy Installations July, 2006*.

- Threatened and Endangered Species, Critical Habitat, and Species of Concern
- Wetlands
- Fish and Wildlife
- Vegetation/Invasive and Noxious Weeds
- Land Management and Urban Forests
- Outdoor Recreation
- Wildlife Damage/Bird Animal Aircraft Strike Hazard
- Law Enforcement
- Migratory Birds
- Long Range Planning

Projects to address natural resources management issues are introduced in *Section 4.0*. Within the section, projects are grouped according to NRMPEs and major natural resources management issues. Under each element is a list describing individual goals and objectives and the projects that would serve to meet the stated goals and objectives. Priority of each project as mandatory (required by law) or stewardship (authorized but not required), legal driver(s) for each project, funding sources and priorities, and estimated costs of specific projects are found in [Appendix A, Table A-1](#). Proposed sources of funding for each project in each fiscal year of the INRMP is summarized in [Appendix A, Table A-2](#).

5.2 Environmental Planning and Mission Sustainability

Long range environmental planning is key to successful natural resource management, integration, compliance, and mission support at NSGL. Long range planning helps to ensure that Station activities are consistent with natural resource management goals and objectives, and that those goals and objectives are consistent with the military mission. Long range planning helps to ensure the integration of, and consistency among, planned actions.

Natural resources required to fulfill the training needs of the NSGL and to sustain the military mission include all existing habitats on the Station. However, the variety of

habitats on NSGL are used primarily for outdoor recreation and nature/conservation areas.

Training schedules and activities are planned and implemented by the various training commands on the Station. Training in natural areas such as Pettibone Ravine, the panne, lake bluffs and wetland areas does not occur. The current military mission of NSGL does not require training in or near these areas. Most outdoor military training takes place in open and paved areas of the Station with little vegetation and consists primarily of marching, formations, running and general physical exercise.

Environmental coordinators of the multiple training commands and tenants on the Station are members of the Environmental Quality Board (EQB). The Public Works Department Environmental Division Director chairs the Board. The EQB meets monthly and training activities that are new or may have an impact on natural resources are addressed within the Board. Natural Resource Managers have an opportunity to discuss the possible impacts of the new activities and any potential regulatory hurdles with the coordinators of the commands.

The Station Master Planners will use this INRMP and consider natural resource implications when in the planning and design phase for new facilities. Negative impacts to natural ecosystems have just begun to enter into decision-making in the construction industry. Forced by environmental legislation such as the National Environmental Policy Act of 1970, all significant federal projects now require an Environmental Impact Assessment of the project to be completed before construction can proceed. Still, however, many project planners, designers, and contractors see natural resource considerations as an obstacle to be overcome rather than a way to achieve benefits for themselves and others. By incorporating this INRMP into the Master Planning process, actions taken to mitigate natural resource impacts of projects are applied up front in the planning and design stage of the project rather than end-of-the-pipe.

Another example of long range planning is the DoD Military Housing Privatization Initiative (MHP). NSGL has just begun to enter into this long range planning process. MHP conveyed Station real property to a private land developer for long-term (50 years) operation and maintenance of Navy military housing. NSGL privatized all of the Station's housing areas in January of 2006. All lands were turned over to the developer and over the next five decades these properties will be upgraded or renewed in some form every 20 years, just as they would be in the private sector. To finance these projects, the private-sector developer/partners will leverage public funds with substantial private investment.

Rather than enter into a contract with the developer the Navy negotiates a Community Development Management Plan (CDMP). The CDMP is a document that provides a blueprint for the development and long-term property management of the facilities and land for the next 50 years. The CDMP addresses environmental implications however, since the land has been conveyed, the developer is responsible for compliance under state

law. Compliance is enforced by the State through the development and permitting process. As of the writing of this INRMP the CDMP is still in the development stage.

5.3 Achieving No Net Loss

The SAIA states that an INRMP shall provide for “no net loss in the capability of military installation lands to support the military mission of the installation.” The SAIA also states that the purpose of an INRMP is to “ensure consistency with the use of military installations to support the preparedness of the Armed Forces, while providing for (1) the conservation and rehabilitation of natural resources on military installations; (2) the sustainable multipurpose use of the resources including hunting, fishing, trapping, and non-consumptive uses; and (3) public access to military installations within safety and military security requirements”

All activities that are part of the military mission have the potential for impacting the natural resources of NSGL. However, all training practices are restricted to areas and schedules that have little or no impact on the natural resources of NSGL. Any training activities that are potentially destructive to natural resources are currently prohibited on the Station.

Many projects (see [Appendix A](#) for detailed project descriptions) in this INRMP provide a benefit to natural resources while achieving no net loss of training land. For example, soil and water conservation projects in Pettibone Ravine would enhance the ecosystem of the area by conserving soil and improving water quality of the creek and harbor but also preserve the foundations of utility infrastructure passing over and through the ravine. Failure of the utility infrastructure would have an adverse impact on military training.

Wetland and sensitive habitat areas of NSGL such as lake front dunes, panne and Pettibone Ravine are not currently located within training lands. These areas and the flora and fauna that occupy these areas can be preserved while enhancing the military environmental mission without achieving a net loss in training lands.

All Navy INRMPs must follow CNO N4 Memo of 30 Oct 2002, “Procedures for Introducing/ Actively Attracting Endangered Species onto U.S. Navy Property.” Mitigation for non-Navy actions or activities should not be suggested for Navy lands or supported in an INRMP unless it has been approved by the chain of command to the CNO level.

5.4 Use of Cooperative Agreements (CA)

A Cooperative Agreement is used to acquire goods or services or stimulate an activity undertaken for the public good. Use of cooperative agreements requires substantial involvement between the Federal agency and recipient during performance of the activity. Sikes Act Cooperative agreements may be used to accomplish work identified in the INRMP and may be entered into with States, local governments, non-governmental organizations, and individuals to provide for the maintenance and improvement of natural

resources or to benefit natural resources research on DOD installations. Cooperative Agreements authorized by the Sikes Act are not subject to the provisions of the Federal Grant and Cooperative Agreement Act, but must comply with the procedural requirements of the DOD Grant and Cooperative Agreement Regulations. Funds approved for a particular fiscal year may be obligated to cover the costs of goods and services provided under a Cooperative Agreement during any 18-month period beginning in that fiscal year in accordance with the Sikes Act. The use of Cooperative Agreements to accomplish projects is a very efficient means to implement INRMPs and can be administered through the NAVFAC field offices.

While not a formal Cooperative Agreement, NSGL maintains a partnership with the IL-DNR on many issues relative to managing natural resources on the Station. Partnerships with the IL-DNR include:

- Working to preserve Harbor Island Bird Sanctuary as an Important Bird Area
- Conserving habitat for Illinois RT&E Species, specifically the Common tern
- Restoring important ecosystems by partnering to control invasive species
- Performing bird counts and tracking nesting pairs of Common tern on Harbor Island

NSGL also partners with outside organizations such as The National Audubon Society and The American Bird Conservancy for conservation of important bird habitat on the Station.

5.5 National Environmental Policy Act Compliance

An Environmental Assessment (EA) is the appropriate level of NEPA analysis and documentation for the development and implementation of the INRMP. Several actions have been taken to integrate this updated INRMP within the previous NEPA analysis and documentation process. The NEPA process was integrated early into the planning and development of the previous *Integrated Natural Resources Management Plan, Naval Training Center Great Lakes, 2001*. The NEPA scoping process, through a Notice of Intent, was used to collect natural resources management information from the public, and State and Federal agencies for the previous INRMP. This was accomplished to ensure public involvement in the early development of the INRMP as required by the Sikes Act. Letters were written and ads were placed in local newspapers requesting input regarding the INRMP and management of natural resources at NSGL. The purpose of the NEPA analysis is to identify and evaluate environmental consequences of the Plan. The previous EA for the current INRMP covered a period of 10 years through 2011. This INRMP is being written and updated due to the new guidance issued by the Deputy Under Secretary of Defense, (Environment, Safety and Occupational Health). NSGL believes that a new EA is not required because no major changes have occurred in natural resource program areas and this INRMP is only updated to conform with the new DoD guidance. This process satisfies the requirements of Navy regulations and supports the intent of NEPA. A discussion of the different approaches to natural resource management can be found in the EA with this INRMP representing the preferred alternative.

NEPA analysis will be integrated into each INRMP project discussed in Section 4 of this Plan and summarized in [Table A.1](#) . If the project is exempt, i.e. an emergency action or a categorical exclusion, a Record of Environmental Consideration will be prepared. If the action of the project requires further environmental analysis then a more complete NEPA scoping process will be undertaken.

5.6 Funding

NSGL's natural resource management program will seek appropriate funding and will set priorities based on funding actually received. Implementation of planned actions and projects is a requirement of the Sikes Act, which directs the development and implementation of INRMPs.

This INRMP will be considered to be implemented when NSGL:

- Actively requests, receives, and uses funds for Must Fund Projects and activities;
- Ensures that sufficient numbers of professionally trained natural resources management staff are available to perform the tasks required by the INRMP;
- Coordinates annually with all cooperating offices; and
- Documents specific INRMP action accomplishments undertaken each year.

Funding Definitions:

DoD Instruction 4715.3 describes funding classifications that pertain to Must Fund Projects (Class 0 and Class 1) and other planned projects that are not required to meet INRMP implementation status (Class 2 and Class 3).

Class 0, Recurring Natural and Cultural Resources Conservation Requirements (*"Federal and State laws, regulations, Presidential Executive orders, and DoD policies"*) shall contain any INRMP actions necessary to rehabilitate or prevent resource degradation that may affect military readiness.

Class 1, Current Compliance shall contain requirements to managed federally listed threatened or endangered species, proposed federally listed threatened or endangered species, candidate species, proposed critical habitat on the installation or court-ordered actions to prevent the listing of species or habitat that could affect military readiness. Class 1 includes projects needed because an installation is currently out of compliance (*"has received an enforcement action from a duly authorized Federal or State agency, or local authority; has a signed compliance agreement or has received a consent order; has not met requirements based on applicable Federal or State laws, regulations, standards, Presidential Executive orders, or DoD policies...and/or are immediate and essential to maintain operation integrity or sustain readiness of the military mission"*). Class 1 also includes projects that are not currently out of compliance but shall be if projects are not implemented in the current program year.

Class 2, Maintenance Requirements shall include those projects that are not currently out of compliance but shall be out of compliance (with applicable laws, regulations, standards, Executive Orders, or DoD Policy) if projects are not implemented in time to meet an established deadline beyond the current program year.

Class 3, Enhancement Actions Beyond Compliance shall include projects that enhance conservation resources or the integrity of the installation mission, or are needed to address overall environmental goals and objectives, but are not specifically required under regulation or executive order and are not of an immediate nature (*e.g.*, community outreach, educational and public awareness projects, management or surveys for candidate species for listing, natural resources restoration when no compliance requirements exist, volunteer program management).

Must Fund Projects and activities include those required to:

- Meet special management criteria for threatened and endangered species management,
- Provide for qualified natural resources personnel, and
- Prevent resource loss or degradation (*e.g.*, soil loss, other maintenance activities) that may affect military readiness.

Formal adoption of an INRMP by the Installation Commanding Officer constitutes a commitment to seek funding and execute, subject to the availability of funding, all Must Fund Projects in accordance with specific time frames identified in the INRMP. Under the Sikes Act, any natural resources management activity that is specifically addressed in the plan must be implemented (subject to availability of funds). Failure to implement the INRMP is a violation of the Sikes Act and may be a source of litigation.

Must Fund Projects and Other Planned Projects are described in a more detailed, standardized format in [Appendix A](#). The year identified for any given planned project is the year for which funding is programmed. Other Planned Projects are identified for implementation as funding permits and may be delayed for a year or more before such delay could cause a management problem.

All actions and projects (In-house Management Actions, Projects in Progress, Must Fund Projects, and Other Planned Projects) are summarized in tabular format in [Appendix A](#) to provide a means of monitoring overall INRMP implementation.

SECTION 6.0 REFERENCES

6.0 References

6.1 Laws, Regulations, Instructions and Guidance

- a) Sikes Act Improvement Act of 1997(16 U.S.C. 670(a) *et seq.*), including all amendments, up to and including PL 105-85, the Sikes Act Improvement Amendments of 1997.
- b) DODINST 4715.3 of 3 May 1996, Environmental Conservation Program.
- c) OPNAVINST 5090.1B Change 3 of 17 October 2002, Environmental and Natural Resources Program Manual (Chapter 22: Natural Resources Management).
- d) Assistant Deputy Under Secretary of Defense (Environmental Safety and Health) Integrated Natural Resources Management Plan Template Instructions August 14, 2006.
- e) Deputy Under Secretary of Defense (I&E) Memorandum, 10 October 2002, Implementation of Sikes Act Improvement Act: Updated Guidance with Attachment (see Appendix B of Memorandum).
- f) Naval Facilities Engineering Command (NAVFACENGCOM) Natural Resources Management Procedural Manual, P-73, Vol. II of May 1987.
- g) NAVFACENGCOM Real Estate Procedural Manual, P-73, Volume 1 of September 1989.
- h) Assistant Secretary of the Navy (Installation & Environment) Memorandum of 12 August 1998, Department of the Navy (DON) Policy Memorandum 98-06: Review of INRMPs Under the National Environmental Policy Act (NEPA).
- i) CNO Letter of 30 November 1998, Guidance on Preparing NEPA Documents for INRMP.
- j) Conserving Biodiversity on Military Lands—A Handbook for Natural Resources Managers, 1996.
- k) USFWS Memo of 8 June 2001 on Guidance for Coordination on DOD Sikes Act INRMPs.
- l) CNO N4 Memo of 30 Oct 2002, Procedures for Introducing/Actively Attracting Endangered Species onto Navy Property.
- m) Navy Environmental Requirements Guidebook Updated Fiscal Year 2002 (see http://155.252.252.6/wrs/guidebook/WRSGB_TOC.HTM).

- n) *Resources for INRMP Implementation: A Handbook for the Natural Resources Manager* from the Legacy Resource Management Program, January 2002.

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APPENDIX A PROJECT TABLES

Table A.1

Project #	Project Description	INRMP Section Ref.	Scheduled Implementation (FY)	Prime Legal Driver	Navy Assessment Level (1)	Funding Priority (2)	Budget Criteria (3)	Cost Estimate In \$	Source of Funds	NEPA Requirement	Date Project Completed
1	Implement recommended slope stabilization measures from the study conducted in 2000 for Pettibone Ravine	4.5.1	2008-2010	10, 11	1	M	12035	550,000	ENV	Yes	
2	Develop and implement soil and water plan of action for the south and west tributary ravine slopes	4.5.1	2010	10, 11	1	M	12015	37,500	ENV	No	
3a	Develop soil and water conservation plan of action for the lake front slopes and bluffs	4.5	2009	10, 11	1	M	12015	125,000	ENV	No	
3b	Implement soil and water conservation projects along the lake front slopes	4.5	2010	10, 11	1	M	12015	375,000	ENV	Yes	
4	Remove and replace building debris located on Pettibone Ravine slopes which are harming soil and water resources	4.5	2010	10, 11	1	M	12015	200,000	ENV	No	
5	Develop and initiate an urban tree program, consisting of: tree survey, periodic inspection program and prioritization of tree management projects and policy to avoid loss of urban trees	4.5	20010	11	5	S	12035	20,000	STA (NRR)	No	

Project #	Project Description	INRMP Section Ref.	Scheduled Implementation (FY)	Prime Legal Driver	Navy Assessment Level (1)	Funding Priority (2)	Budget Criteria (3)	Cost Estimate In \$	Source of Funds	NEPA Requirement	Date Project Completed
6	Create a no-mow strip at the tops of slopes and bluffs	4.4	2006-2008		5	S	12035	1,000	STA	No	
7	Study and implement a noxious weed and invasive exotic plant (i.e. garlic mustard, Canada thistle, buckthorns, phragmites, etc.) control program, in areas of native vegetation. Project will consist of: identify, map and prioritize areas, initiate control measures, re-introduce replacement native flora, and establish long-term surveillance	4.4	2009-2011	1, 2, 12	1	M	12005	65,000	ENV	No	
8	Develop a policy to implement a regular schedule for monitoring quality of water - entering within, and discharged from waterways of predetermined property sites	4.5	2009-2011	5	5	S	12035	18,750	STA	No	
9	Update the 1999/2001 wetland delineation reports to ensure wetlands are adequately protected with no loss or degradation	4.2	20011	5, 15	1	M	12027	85,000	ENV	No	
10	Develop monitoring plan and continue to remove/ eradicate purple loosestrife, phragmites, woody and invasive plants from the sand dunes- wetland communities	4.4	2011	1, 12	1	M	12036	20,000	ENV	No	

Project #	Project Description	INRMP Section Ref.	Scheduled Implementation (FY)	Prime Legal Driver	Navy Assessment Level (1)	Funding Priority (2)	Budget Criteria (3)	Cost Estimate In \$	Source of Funds	NEPA Requirement	Date Project Completed
11	Update the 1995 RT&E species survey, document changes, and conduct baseline survey of areas previously omitted	4.1	2010	4	1	M	12025	87,000	ENV	No	
12	Develop a program for managing threatened and endangered species, including: estimate population sizes; map distributions; identify areas with poor/degrading habitats initiating methods for restoration at predetermined sites	4.1	2006-2011	4, 2	1	M	12036	55,000	ENV	No	
13	Implement recommendations and continue cooperation with IL-DNR for protecting nesting colony of Common terns on Harbor Island IBA	4.10	2006-2011	4,7	5	S	12036	3,000	STA	No	
14	Continue to identify areas important as nesting sites for migratory birds, restricting access by unauthorized personnel and manage them to maintain suitable nesting conditions	4.10	2011	4,7	5	S	12036	20,000	STA, AO, NRR	No	
15	Select indicator species to monitor during regularly scheduled biological inventories, estimate population sizes, trends and determine effectiveness of management actions	4.10	2010	4,7	5	S	12001	6,000	STA	No	

Project #	Project Description	INRMP Section Ref.	Scheduled Implementation (FY)	Prime Legal Driver	Navy Assessment Level (1)	Funding Priority (2)	Budget Criteria (3)	Cost Estimate In \$	Source of Funds	NEPA Requirement	Date Project Completed
16	In coordination with the US Forest Service, establish and begin program of monitoring Asian Longhorned beetles, gypsy moths, Emerald Ash Borer and other destructive / invasive species	4.5	2007-2011	12	5	S	12035	25,000	AO, NRR, STA, SCAS	No	
17	Modify conditions on and around ponds and other designated areas of NS Great Lakes to make them unattractive to Canada geese	4.8	2007-2011		5	S	12036	12,000	STA, (MWR)	No	
18	Conduct a fish population survey of Pettibone Creek and the Harbor	4.3	2009				12018	40,000	STA,		
19	Update and rewrite the Integrated Pest Management Plan	4.11	2010	17,18	1	M		40,000	ENV	No	
20	Prepare press releases after completion of natural resources management projects on N S Great Lakes	4.11	2007-2011		5	S	12999	NC	STA	No	
21	Update & revise the Integrated Natural Resources Management Plan, addressing program accomplishments, regulatory and policy changes	4.11	2011	2	1	M	12026	60,000	ENV	No	

Project #	Project Description	INRMP Section Ref.	Scheduled Implementation (FY)	Prime Legal Driver	Navy Assessment Level (1)	Funding Priority (2)	Budget Criteria (3)	Cost Estimate In \$	Source of Funds	NEPA Requirement	Date Project Completed
22	Provide professional improvement for the Natural Resources Manager through participation in training classes, seminars, conferences, self-study programs, etc.	4.11	2007-2011	2	1	M	12940	30,000	ENV	No	
23	Select best qualified partners from outside agencies and other sources for creating partnership agreements for natural resources management	4.11	2007-2011		5	S	12008	NC	STA	No	
24	Develop nature trails throughout approved areas that showcase the unique flora, fauna, ecology, etc. for both educational and recreational purposes.	4.7	2010-2013		2	S	12018	40,000	STA MWR	No	

LEGEND

(1) From EPR "Guidebook" (Cookbook),

(2) From DOD Instruction 4715.3, Enclosure

(4) "Guidebook Number" is from Chapter 12 of EPR Guidebook (Cookbook)

NC 'No Cost' anticipated; project will be performed by NSGL Natural Resources Manager as a part of normal duties and responsibilities.

SOURCE OF FUNDS

Table A.2

STA	Station O&MN	LY	Legacy
FOR	Forestry	ENV	Environmental O&MN
AO	Agricultural Outleasing	MWR	Morale, Welfare & Recreation
NRR	Natural Resources Reserve	UF	User Fees
FR	Forestry Reserve	SCAS	Student Conservation Association Coordinator

PRIMARY LEGAL DRIVERS

Table A.3

(1)	7 USC 2814	Management of undesirable plants on Federal lands
(2)	16 USC 670a-f	Sikes Act Improvement Act
(3)	16 USC 1456 (c)(1)(A) & (c)(2)	Coastal Zone Management Act
(4)	16 USC 1531 & 1536	Endangered Species Act
(5)	33 USC 1251	Clean Water Act
(6)	16 USC 1955	Magnuson Stevens Fisheries Management Act
(7)	16 USC 703	Migratory Bird Treaty Act
(8)	16 USC 2912	North American Wetland conservation Act
(9)	16 USC 4408	North American Wetland Conservation Act
(10)	32 CFR 190	Natural Resources Management Program
(11)	Executive Order 13148	Greening the Government Through Leadership in Environmental Management
(12)	Executive Order 13112	Invasive Species
(13)	Executive Order 13089	Coral Reef Protection
(14)	Executive Order 12962	Recreational Fisheries
(15)	Executive Order 11990	Protection of Wetlands
(16)	DOD INST 4715.3	Environmental Conservation Program
(17)	7 USC 135	FIFRA
(18)	DoD INST 4150.7	DoD Pest Management

Navy Assessment Code

1 = Legal Requirement
2 = Navy Policy
3 = Pending Regulation
4 = Future Requirements
5 = Leadership Initiative

APPENDIX B SURVEYS

B.1 Rare, Threatened and Endangered Species

TABLE B.1 BIRDS STATE-LISTED AS THREATENED OR ENDANGERED DOCUMENTED TO OCCUR ON NSGL

Common name	Scientific name	Status *	NSGL
Black-crowned night heron	<i>Nycticorax nycticorax</i>	E	X
Bald eagle	<i>Haliaeetus leucocephalus</i>	T, FT	**P
Peregrine Falcon	<i>Falco peregrinus</i>	E	X
Osprey	<i>Pandion haliaetus</i>	E	**P
Common snipe	<i>Gallinago gallinago</i>	WL	**P
Forster's tern	<i>Sterna forsteri</i>	E	X
Common tern	<i>Sterna hirundo</i>	E	X
Least flycatcher	<i>Empidonax minimus</i>	WL	**P
Wood thrush	<i>Hylocichla mustelina</i>	WL	**P
Piping plover	<i>Charadrius melodus</i>	FT	**P
Ovenbird	<i>Seiurus aurocapillus</i>	WL	**P
Cerulean warbler	<i>Dendroica cerulea</i>	T	X

*T = State listed threatened, E = State listed endangered, FT = Federal listed threatened, WL = State watch list **P= possible transient migrant X=present on site

Source: U.S. Navy, 1995; IL-DNR, 2001

TABLE B.1.1 PLANTS STATE-LISTED AS THREATENED OR ENDANGERED DOCUMENTED TO OCCUR ON NSGL

Common name	Scientific name	Status *	NSGL
Marram grass	<i>Ammophila breviligulata</i>	E	X
Sea rocket	<i>Cakile edentula</i>	T	X
Seaside spurge	<i>Chamaesyce polygonifolia</i>	E	X
Forked aster	<i>Aster furcatus</i>	T	X
Green yellow sedge	<i>Carex viridula</i>	E	X

*T = threatened, E = endangered, PFE = Proposed Federal Endangered, X = present at this location.

Source: U.S. Navy, 1995; IL-DNR, 2001

B.2 Wetlands

TABLE B.2 WETLAND SITES FOUND ON NSGL

SITE #	BASE AREA	SITE DESCRIPTION	SIZE/ ACRE	*TYPE
2	Center of Lake Front	Panne & sand dune area	1.25	Palustrine (Vernal Pool)
3	Center of Lake Front	Outer harbor shoreline jetty & Harbor Island	12.3	Palustrine (Vernal Pool)
*4	Pettibone Ravine	Pettibone Creek - Water of the U.S.	N/A	N/A
5	South of Boat Basin	Lower Ravine area	0.27	Palustrine (Wet Meadow)
*12	S. of Buckley Road	Skokie Creek - Water of the U.S.	N/A	N/A
13	NSGL Supply	Fenceline W. of Bldgs. 3501 to 3405	0.012	Palustrine (Prairie Pothole)
NSGL - TOTAL:			[13.832]	

Note: * Palustrine - Wetlands which include - marshes, swamps and floodplains. Palustrine systems include any inland wetland which lacks flowing water and contains ocean derived salts of less than 0.05%.

TABLE B.2.1 WILLOW GLEN WETLANDS

SITE #	BASE AREA	SITE DESCRIPTION	SIZE/ ACRE	*TYPE
17	Golf Course	SW corner of Golf Course	0.24	Palustrine (Prairie Pothole)
18	Golf Course	Buckley Rd N. along Skokie Creek	2.27	Palustrine (Wet Meadow)
19	Golf Course	N. end of Skokie Creek	0.15	Palustrine (Prairie Pothole)
20	Golf Course	Center of Course	0.48	Palustrine (Wet Meadow)
21	Golf Course	Former Site / Eliminated		
22	Golf Course	SE adjacent to propertyline	0.02	Palustrine (Wet Meadow)
23	Golf Course	E. center - adjacent to fenceline	0.01	Palustrine (Wet Meadow)
24	Golf Course	E. center - adjacent to fenceline	0.03	Palustrine (Wet Meadow)
25	Golf Course	E. center - adjacent to fenceline	0.02	Palustrine (Wet Meadow)
26	Golf Course	N. pond(s) - adjacent to fenceline	1.68	Palustrine (Wet Meadow)
Willow Glen Golf Course - TOTAL:			[4.9]	

B.3 Vegetation

TABLE B.3 Vegetation on NSGL

<i>Scientific Name</i>	Common Name	Location	Species Status (1)
<i>Acalypha rhomboidea</i>	Three-seeded mercury	RAVINE	
<i>Acer negundo</i>	Boxelder	RAVINE, BEACH	
<i>Acer platanoides</i>	Norway maple	RAVINE	I
<i>Acer saccharinum</i>	Silver maple	RAVINE	
<i>Acer saccharum</i>	Sugar maple	RAVINE	
<i>Achillea millefolium</i>	Yarrow	RAVINE, BEACH	
<i>Actaea pachypoda</i>	White baneberry	RAVINE	
<i>Actaea rubra</i>	Red baneberry	RAVINE	
<i>Agrimonia gryposepala</i>	Tall agrimony	RAVINE	
<i>Agrimonia pubescans</i>	Soft agrimony	RAVINE	
<i>Agropyron repens</i>	Quack grass	RAVINE	
<i>Agrostis alba</i>	Redtop	RAVINE, BEACH	
<i>Agrostis perennans</i>	Thingrass	RAVINE	
<i>Alliaria petiolata</i>	Garlic mustard	RAVINE	I
<i>Allium canadense</i>	Wild onion	RAVINE	
<i>Allium tricoccum</i>	Wild leek	RAVINE	
<i>Allium tricoccum</i> var. <i>burdickii</i>	Wild leek	RAVINE	
<i>Amaranthus powellii</i>	Tall amaranth	BEACH	
<i>Ambrosia artemisiifolia</i> var. <i>elatio</i>	Common ragweed	RAVINE, BEACH	
<i>Ambrosia trifida</i>	Giant ragweed	BEACH	
<i>Amelanchier laevis</i>	Allgheny shadblow	RAVINE	
<i>Ammophila breviligulata</i>	Marram grass	BEACH	E
<i>Amphicarpa bracteata</i>	Upland hog peanut	RAVINE	
<i>Anemone cylindrical</i>	Thimbleweed	RAVINE	
<i>Anemone quinquefolia</i>	Wood anemone	RAVINE	
<i>Anemonella thalictroides</i>	Rue anemone	RAVINE	
<i>Antennaria plantaginifolia</i>	Pussy toes	RAVINE	
<i>Apois americana</i>	Ground nut	RAVINE	
<i>Apocynum sibiricum</i>	Dogbane	BEACH	
<i>Arabis laevigata</i>	Smooth bank cress	RAVINE	
<i>Aralia nudicaulis</i>	Wild sarsaparilla	RAVINE	
<i>Aralia racemosa</i>	Spikenard	RAVINE	
<i>Arctium minus</i>	Common burdock	RAVINE, BEACH	
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	RAVINE	
<i>Artemisia vulgaris</i>	Mudwort	BEACH	
<i>Asclepias syriaca</i>	Common milkweed	RAVINE, BEACH	
<i>Asparagus officinalis</i>	Asparagus	BEACH	
<i>Aster furcatus</i>	Forked aster	RAVINE	T
<i>Aster lateriflorus</i>	Side-flowering aster	RAVINE, BEACH	
<i>Aster macrophyllus</i>	Big-leaved aster	RAVINE	
<i>Aster pilosus</i>	Hairy aster	RAVINE, BEACH	
<i>Aster sagittifolius</i>	Arrow-leaved aster	RAVINE	
<i>Aster sagittifolius</i> var. <i>drummondii</i>	Drummond's aster	RAVINE	

Scientific Name	Common Name	Location	Species Status (1)
<i>Athyrium felix-femina</i> var. <i>michauxii</i>	Lady fern	RAVINE	
<i>Barbarea vulgaris</i>	Yellow rocket	RAVINE, BEACH	
<i>Berberis thunbergii</i>	Japanese barberry	RAVINE	I
<i>Bidens comosa</i>	Swamp tickseed	RAVINE	
<i>Bidens frondosa</i>	Common beggar's tick	RAVINE, BEACH	
<i>Boehmeria cylindrical</i>	False nettle	RAVINE	
<i>Brassica nigra</i>	Black mustard	RAVINE	
<i>Bromus inermis</i>	Smooth brome	RAVINE, BEACH	I
<i>Bromus latiglumis</i>	Ear-leaved brome	RAVINE	
<i>Bromus pubescens</i>	Woodland brome	RAVINE	
<i>Cakile edentula</i>	Sea rocket	BEACH	T
<i>Calamovilfa longifolia</i> var. <i>magna</i>	Sand reed	BEACH	
<i>Cardaria draba</i>	Hoary cress	RAVINE	
<i>Carduus nutans</i>	Nodding thistle	RAVINE	
<i>Carex annectans</i>	Large yellow fox sedge	BEACH	
<i>Carex bebbii</i>	Bebb's oval sedge	BEACH, BEACH	
<i>Carex blanda</i>	Common wood sedge	RAVINE	
<i>Carex cephalophora</i>	Short-headed bracted sedge	RAVINE	
<i>Carex cristatella</i>	Crested oval sedge	BEACH, BEACH	
<i>Carex granularis</i>	Pale sedge	BEACH, BEACH	
<i>Carex hystericina</i>	Porcupine sedge	RAVINE	
<i>Carex jamesii</i>	Grass sedge	RAVINE	
<i>Carex laxiflora</i>	Beech wood sedge	RAVINE	
<i>Carex pedunculata</i>	Long-stalked hummock sedge	RAVINE	
<i>Carex pellita</i>	Broad-leave wooly sedge	BEACH, BEACH	
<i>Carex pensylvanica</i>	Common oak sedge	RAVINE	
<i>Carex rosea</i>	Curly-styled wood sedge	RAVINE	
<i>Carex sparganioides</i>	Loose-headed bracted sedge	RAVINE	
<i>Carex stipata</i>	Common fox sedge	RAVINE, BEACH	
<i>Carex tetanica</i>	Common stiff sedge	BEACH,	
<i>Carex viridula</i>	Green yellow sedge	BEACH,	T
<i>Carex vulpinoidea</i>	Brown fox sedge	RAVINE	
<i>Carpinus caroliniana</i> var. <i>virginiana</i>	Blue beech	RAVINE	
<i>Carya ovata</i>	Shagbark hickory	RAVINE	
<i>Catalpa speciosa</i>	Hardy catalpa	RAVINE	I
<i>Caulophyllum thalictroides</i>	Blue cohosh	RAVINE	
<i>Celastrus orbiculatus</i>	Oriental bittersweet	RAVINE	I
<i>Celastrus scandens</i>	Climbing bittersweet	RAVINE	
<i>Celtis occidentalis</i>	Hackberry	RAVINE	
<i>Cerastium nutans</i>	Nodding chickweed	RAVINE	
<i>Cerastium vulgatum</i>	Mouse-ear chickweed	RAVINE	
<i>Chamaesyce polygonifolia</i>	Seaside spurge	BEACH	E
<i>Chenopodium album</i>	Lamb's quarters	RAVINE	
<i>Chenopodium glaucum</i>	Cak-leaved goosefoot	BEACH	
<i>Chenopodium leptophyllum</i>	Narrow-leaved goosefoot	RAVINE	
<i>Chrysanthemum leucanthemum</i> <i>pinnatifidum</i>	Ox-eye daisy	RAVINE, BEACH	
<i>Cichorium intybus</i>	Chicory	RAVINE, BEACH	

Scientific Name	Common Name	Location	Species Status (1)
<i>Cinna arundinacea</i>	Common wood reed	RAVINE	
<i>Circaea lutetiana</i> var. <i>canadensis</i>	Enchanter's nightshade	RAVINE	
<i>Cirsium arvense</i>	Canada thistle	RAVINE, BEACH	N
<i>Cirsium vulgare</i>	Bull thistle	RAVINE, BEACH	
<i>Convallaria majalis</i>	Lily-of-the valley	RAVINE	
<i>Convolvulus arvensis</i>	Field bindweed	BEACH	
<i>Convolvulus sepium</i>	Hedge bindweed	BEACH	
<i>Corispermum hyssopifolium</i>	Bugseed	BEACH	
<i>Cornus alterifolia</i>	Pagoda dogwood	RAVINE	
<i>Cornus drummondii</i>	Rough-leaved dogwood	RAVINE	
<i>Cornus racemosa</i>	Gray dogwood	RAVINE	
<i>Cornus stolonifera</i>	Red-osier dogwood	RAVINE	
<i>Corylus Americana</i>	American hazelnut	RAVINE	
<i>Crataegus flabellata</i>	Large-seeded hawthorn	RAVINE	
<i>Crataegus mollis</i>	Downy hawthorn	RAVINE	
<i>Crataegus pruinosa</i>	Frosted hawthorn	RAVINE	
<i>Cryptotaenia canadensis</i>	Honewort	RAVINE	
<i>Cuscuta sp.</i>	Dodder	RAVINE	
<i>Cycloma atriplicifolium</i>	Winged pigweed	BEACH	
<i>Cyperus esculentus</i>	Field nut sedge	RAVINE	
<i>Cyperus filiculmis</i>	Slender sand sedge	BEACH	
<i>Cyperus rivularis</i>	Brook nut sedge	BEACH	
<i>Cyperus schweinitzii</i>	Rough sand sedge	BEACH	
<i>Cyperus strigosus</i>	Long-scaled nut sedge	BEACH	
<i>Dactylis glomerata</i>	Orchard grass	RAVINE	
<i>Danthonia spicata</i>	Poverty oat grass	RAVINE	
<i>Daucus carota</i>	Queen Anne's lace	RAVINE, BEACH	
<i>Desmodium glutinosum</i>	Pointed tick trefoil	RAVINE	
<i>Diervilla lonicera</i>	Dwarf honeysuckle	RAVINE	
<i>Dioscorea villosa</i>	Wild yam	RAVINE	
<i>Dipsacus sylvestris</i>	Common teasel	RAVINE	
<i>Dodecathon media</i>	Shooting star	RAVINE	
<i>Echinochloa crusgalli</i>	Barnyard grass	RAVINE	
<i>Echinocysis lobata</i>	Wild cucumber	RAVINE	
<i>Elaeagnus angustifolia</i>	Russian olive	BEACH	
<i>Eleocharis erythropoda</i>	Red-rooted spike rush	BEACH	
<i>Eleocharis smallii</i>	Marsh spike rush	BEACH	
<i>Elymus arenarius</i>	Lyme grass	BEACH	
<i>Elymus Canadensis</i>	Canada wild rye	BEACH	
<i>Elymus riparius</i>	Riverbank wild rye	RAVINE	
<i>Elymus villosa</i>	Silky wild rye	RAVINE	
<i>Elymus virginicus</i>	Virginia wild rye	RAVINE	
<i>Epilobium coloratum</i>	Cinnamon willow herb	RAVINE	
<i>Epipactis helleborine</i>	Helleborine orchid	RAVINE	
<i>Equisetum areense</i>	Horsetail	RAVINE, BEACH	
<i>Equisetum hyemale</i>	Tall scouring rush	BEACH	
<i>Equisetum laevigatum</i>	Smooth scouring rush	BEACH	
<i>Equisetum x nelsonii</i>	Scouring rush	BEACH	
<i>Eragrostis pectinacea</i>	Small love grass	BEACH	
<i>Erigeron canadensis</i>	Horseweed	RAVINE	

<i>Scientific Name</i>	Common Name	Location	Species Status (1)
<i>Erigeron philadelphicus</i>	Marsh fleabane	RAVINE	
<i>Erigeron pulchellus</i>	Robin's plantain	RAVINE	
<i>Erysimum cheiranthoides</i>	Wormseed mustard	RAVINE, BEACH	
<i>Erythronium albidum</i>	White trout lily	RAVINE	
<i>Erythronium americanum</i>	Yellow trout lily	RAVINE	
<i>Eupatorium perfoliatum</i>	Common boneset	BEACH	
<i>Eupatorium purpureum</i>	Purple Joe pye weed	RAVINE	
<i>Eupatorium rugosum</i>	White snakeroot	RAVINE	
<i>Eupatorium serotinum</i>	Late boneset	BEACH	
<i>Euphorbia supine</i>	Spotted creeping spurge	BEACH	
<i>Fagus grandifolia</i>	Beech	RAVINE	
<i>Festuca obtusa</i>	Nodding fescue	RAVINE	
<i>Festuca pratensis</i>	Meadow fescue	RAVINE, BEACH	
<i>Forsythia x intermedia</i>	Golden bell	RAVINE	
<i>Fraxinus americana</i>	White ash	RAVINE	
<i>Fraxinus nigra</i>	Black ash	RAVINE	
<i>Fraxinus pennsylvanica</i>	Red ash	RAVINE	
<i>Fraxinus pennsylvanica</i> var. <i>subintegemma</i>	Green ash	RAVINE	
<i>Galium aparine</i>	Annual bedstraw	RAVINE, BEACH	
<i>Geranium maculatum</i>	Wild geranium	RAVINE	
<i>Geum canadense</i>	White avens	RAVINE	
<i>Glechoma hederacea</i>	Creeping charlie	RAVINE	
<i>Gleditsia triacanthos</i>	Honey locust	RAVINE	
<i>Glyceria striata</i>	Fowl meadow grass	RAVINE, BEACH	
<i>Hackelia virginiana</i>	Stickseed	RAVINE	
<i>Hamamelis virginiana</i>	Witch hazel	RAVINE	
<i>Helenium autumnale</i>	Sneezeweed	RAVINE	
<i>Helianthus annuus</i>	Garden sunflower	BEACH	
<i>Helianthus decapetalus</i>	Pale sunflower	RAVINE	
<i>Hemerocallis fulva</i>	Orange day lily	RAVINE	
<i>Hepatica acutiloba</i>	Sharp-lobed hepatica	RAVINE	
<i>Heracleum maximum</i>	Cow parsnip	RAVINE	
<i>Hesperis matronalis</i>	Dame's rocket	RAVINE	
<i>Hordeum jubatum</i>	Squirrel-tail grass	RAVINE, BEACH	
<i>Hydrophyllum virginianum</i>	Virginia waterleaf	RAVINE	
<i>Hystrix patula</i>	Bottlebrush grass	RAVINE	
<i>Impatiens capensis</i>	Orange jewel weed	RAVINE, BEACH	
<i>Impatiens pallida</i>	Yellow jewel weed	RAVINE	
<i>Iris sp.</i>	Iris	RAVINE, BEACH	
<i>Juglans cinerea</i>	Butternut	RAVINE	
<i>Juncus acuminatus</i>	Sharp-fruited rush	BEACH	
<i>Juncus balticus</i> var. <i>littoralis</i>	Lake shore rush	BEACH	
<i>Juncus nodosus</i>	Joint rush	BEACH	
<i>Juncus torreyi</i>	Torrey's rush	BEACH	
<i>Lactuca canadensis</i>	Wild lettuce	RAVINE	
<i>Laportea canadensis</i>	Wood nettle	RAVINE	
<i>Leersia oryzoides</i>	Rice cut grass	RAVINE	
<i>Leersia virginica</i>	White grass	RAVINE	
<i>Lepidium campestre</i>	Field cress	RAVINE	
<i>Lepidium virginicum</i>	Common peppergrass	BEACH	

<i>Scientific Name</i>	Common Name	Location	Species Status (1)
<i>Linaria vulgaris</i>	Butter-and-eggs	RAVINE, BEACH	
<i>Lobelia siphilitica</i>	Great blue lobelia	RAVINE	
<i>Lonicera dioica</i>	Red honeysuckle	BEACH	
<i>Lonicera morrowii</i>	Morrow's honeysuckle	BEACH	
<i>Lonicera tatarica</i>	Tartarian honeysuckle	RAVINE, BEACH	I
<i>Lonicera x bella</i>	Showy fly honeysuckle	RAVINE	
<i>Lotus corniculata</i>	Bird's foot trefoil	RAVINE, BEACH	
<i>Luzula multiflora</i>	Common wood rush	RAVINE	
<i>Lychnis alba</i>	White campion	RAVINE	
<i>Lycopus asper</i>	Rough water horehound	RAVINE, BEACH	
<i>Lysimachia ciliata</i>	Fringed lossestrife	RAVINE	
<i>Lysimachia lanceolata</i>	Lance-leaved loosestrife	BEACH	
<i>Lysimachia quadriflora</i>	Narrow-leaved loosestrife	BEACH	
<i>Lythrum salicaria</i>	Purple loosestrife	RAVINE, BEACH	N
<i>Maianthemum canadense var. interius</i>	Canada mayflower	RAVINE	
<i>Malus ioensis</i>	Iowa crab	RAVINE	
<i>Malus pumila</i>	Apple	RAVINE	
<i>Medicago lupulia</i>	Black medick	RAVINE, BEACH	
<i>Medicago lupulina var. glandulosa</i>	Black medick	BEACH	
<i>Medicago sativa</i>	Alfalfa	BEACH	I
<i>Melilotus alba</i>	White sweet clover	RAVINE, BEACH	
<i>Mentha arvensis var. villosa</i>	Wild mint	BEACH	
<i>Mirabilis nyctagines</i>	Wild four o'clock	BEACH	
<i>Monarda fistulosa</i>	Wild bergamot	RAVINE	
<i>Monotropa uniflora</i>	Indian pipe	RAVINE	
<i>Morus alba</i>	White mulberry	RAVINE, BEACH	I
<i>Muhlenbergia frondosa</i>	Common satin grass	RAVINE	
<i>Muhlenbergia schreberi</i>	Nimblewill	RAVINE	
<i>Myoston aquaticum</i>	Water chickweed	RAVINE	
<i>Narcissus x medioluteus</i>	Primrose peerless	RAVINE	
<i>Nepeta cataria</i>	Catnip	RAVINE, BEACH	
<i>Oenothera biennis</i>	Evening primrose	RAVINE, BEACH	
<i>Oenothera clelandii</i>	Sand evening primrose	BEACH	
<i>Osmorhiza longistytis</i>	Smooth sweet cicely	RAVINE	
<i>Ostrya virginiana</i>	Ironwood	RAVINE	
<i>Oxalis europaea</i>	Tall wood sorrel	RAVINE	
<i>Panicum capillare</i>	Old witch grass	BEACH	
<i>Panicum implicatum</i>	Old-field panic grass	BEACH	
<i>Panicum virgatum</i>	Switch grass	RAVINE, BEACH	
<i>Parietaria pensylvanica</i>	Pellitory	RAVINE	
<i>Parthenocissus inserta</i>	Thicket creeper	RAVINE	
<i>Partenocissus quinquefolia</i>	Virginia creeper	RAVINE, BEACH	
<i>Pastinaca sativa</i>	Wild parsnip	RAVINE	I
<i>Phalaris arundinacea</i>	Reed canary grass	RAVINE, BEACH	
<i>Phleum pratense</i>	Timothy	BEACH	
<i>Phlox divaricata</i>	Blue phlox	RAVINE	
<i>Phragmites australis</i>	Common reed	RAVINE, BEACH	
<i>Phryma leptostachya</i>	Lopseed	RAVINE	
<i>Physalis ixocarpa</i>	Ground cheery	BEACH	

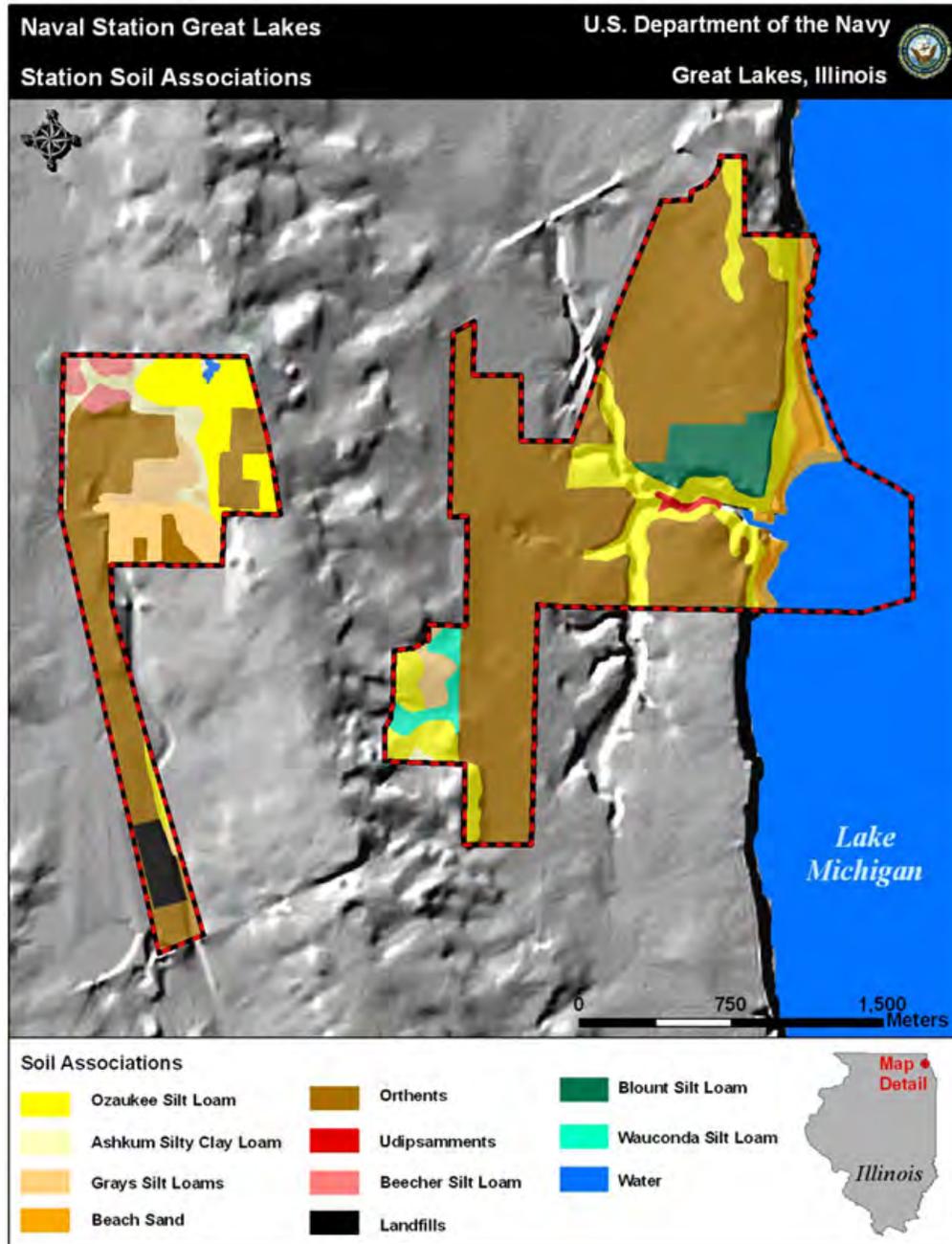
<i>Scientific Name</i>	Common Name	Location	Species Status (1)
<i>Pilea pumila</i>	Clear weed	RAVINE	
<i>Plantago lanceolata</i>	English plantain	RAVINE, BEACH	
<i>Poa compressa</i>	Canada blue grass	RAVINE	
<i>Poa pratensis</i>	Kentucky blue grass	RAVINE, BEACH	
<i>Poa trivialis</i>	Rough blue grass	RAVINE	
<i>Podophyllum peltatum</i>	May apple	RAVINE	
<i>Polanisia graveolens</i>	Clammy weed	BEACH	
<i>Polygonatum canaliculatum</i>	Smooth solomon's seal	RAVINE	
<i>Polygonum arenastrum</i>	Sidewalk knotweed	RAVINE	
<i>Polygonum convolvulus</i>	Black bindweed	RAVINE	
<i>Polygonum hydropiperoides</i>	Mild water peper	RAVINE	
<i>Polygonum lapathifolium</i>	Heartsease	RAVINE, BEACH	
<i>Polygonum persicaria</i>	Lady's thumb	RAVINE, BEACH	
<i>Polygonum scandens</i>	Climbing false buckwheat	RAVINE	
<i>Populus alba</i>	White poplar	RAVINE	I
<i>Populus deltoides</i>	Cottonwood	RAVINE, BEACH	
<i>Populus tremuloides</i>	Trembling aspen	RAVINE, BEACH	
<i>Potentilla anserine</i>	Silverweed	RAVINE, BEACH	
<i>Potentilla argentea</i>	Silvery cinquefoil	RAVINE	
<i>Potentilla norvegica</i>	Rough cinquefoil	RAVINE	
<i>Potentilla recta</i>	Sulfur cinquefoil	RAVINE	
<i>Potentilla simplex</i>	Common cinquefoil	RAVINE	
<i>Prenanthes alba</i>	White lettuce	RAVINE	
<i>Prunella vulgaris</i>	Lawn prunella	BEACH	
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	Self heal	RAVINE	
<i>Prunus padus</i>	European bird cherry	RAVINE	
<i>Prunus serotina</i>	Black cherry	RAVINE	
<i>Prunus tomentosa</i>	Nanking cherry	RAVINE	
<i>Prunus virginiana</i>	Choke cherry	RAVINE, BEACH	
<i>Quercus alba</i>	White oak	RAVINE	
<i>Quercus macrocarpa</i>	Bur oak	RAVINE	
<i>Quercus rubra</i>	Red oak	RAVINE	
<i>Ranunculus abortivus</i>	Small-flowered buttercup	RAVINE	
<i>Ranunculus recurvatus</i>	Hooked buttercup	RAVINE, BEACH	
<i>Ranunculus septentrionalis</i>	Swamp buttercup	RAVINE	
<i>Rhamnus cathartica</i>	Common buckthorn	RAVINE	I
<i>Rhamnus frangula</i>	Glossy buckthorn	RAVINE, BEACH	I
<i>Rhus glabra</i>	Smooth sumac	RAVINE	
<i>Rhus typhina</i>	Staghorn sumac	RAVINE	
<i>Ribes americanum</i>	Wild black current	RAVINE	
<i>Ribes missouriense</i>	Wild gooseberry	RAVINE	
<i>Ribes odoratum</i>	Golden current	RAVINE	
<i>Robinia pseudoacacia</i>	Black locust	RAVINE, BEACH	I
<i>Rosa multiflora</i>	Multiflora rose	RAVINE, BEACH	N
<i>Rosa sp.</i>	Unknown rose	RAVINE	
<i>Rubus idaeus</i> var. <i>strigosus</i>	Red raspberry	RAVINE, BEACH	
<i>Rubus occidentalis</i>	Black raspberry	RAVINE, BEACH	
<i>Rudbeckia laciniata</i>	Wild golden glow	RAVINE	
<i>Rumex crispus</i>	Curly dock	RAVINE, BEACH	
<i>Rumex obtusifolius</i>	Bitter dock	RAVINE	

Scientific Name	Common Name	Location	Species Status (1)
<i>Salix amygdaloides</i>	Peach-leaved willow	BEACH	
<i>Salix discolor</i>	Pussy willow	RAVINE	
<i>Salix fragilis</i>	Crack willow	RAVINE	I
<i>Salix glaucophylloides</i>	Blue-leaved willow	BEACH	
<i>Salix interior</i>	Sandbar willow	BEACH	
<i>Salix interior f. whelleri</i>	Sandbar willow	BEACH	
<i>Salix nigra</i>	Black willow	RAVINE, BEACH	
<i>Sambucus canadensis</i>	Elderberry	RAVINE	
<i>Sanguinaria canadensis</i>	Bloodroot	RAVINE	
<i>Sanicula gregaria</i>	Clustered black snakeroot	RAVINE	
<i>Sanicula marilandica</i>	Black snakeroot	RAVINE, BEACH	
<i>Saponaria officinalis</i>	Bouncing bet	RAVINE, BEACH	
<i>Schizachyrum scoparium</i>	Little bluestem	BEACH	
<i>Scirpus atrovirens</i>	Dark green rush	RAVINE	
<i>Scirpus pungens</i>	Chairmaker's rush	BEACH	
<i>Scirpus validus var. creber</i>	Great bulrush	BEACH	
<i>Scrophularia marilandica</i>	Late figwort	RAVINE	
<i>Senecio pauperculus</i>	Balsam ragwort	RAVINE	
<i>Senecio vulgaris</i>	Common groundsel	RAVINE	
<i>Setaria faberi</i>	Giant foxtail	RAVINE	
<i>Setaria glauca</i>	Yellow foxtail	RAVINE	
<i>Setaria viridis</i>	Green foxtail	BEACH	
<i>Setaria viridis var. major</i>	Giant green foxtail	RAVINE	
<i>Silene noctiflora</i>	Night flowering catchfly	RAVINE	
<i>Sisyrinchium sp.</i>	Blue-eye grass	BEACH	
<i>Sium suave</i>	Tall water parsnip	RAVINE, BEACH	
<i>Smilacina racemosa</i>	False Solomon seal	RAVINE	
<i>Smilacina stellata</i>	Starry Solomon seal	RAVINE	
<i>Smilax echinata</i>	Upright carrion flower	RAVINE	
<i>Smilax taminoides var. hispida</i>	Bistly green brier	RAVINE	
<i>Solanum americanum</i>	Black nightshade	RAVINE	
<i>Solanum dulcamara</i>	Bittersweet nightshade	RAVINE	
<i>Solidago altissima</i>	Tall goldenrod	RAVINE, BEACH	
<i>Solidago flexicaulis</i>	Broad-leaved goldenrod	RAVINE	
<i>Solidago gigantea</i>	Late goldenrod	RAVINE, BEACH	
<i>Solidago graminifolia var. nuttallii</i>	Hairy grass-leaved goldenrod	RAVINE, BEACH	
<i>Solidago missouriensis var. fasciculata</i>	Missouri goldenrod	BEACH	
<i>Solidago ulmifolia</i>	Elm-leaved goldenrod	RAVINE	
<i>Sonchus asper</i>	Spin sow thistle	RAVINE, BEACH	
<i>Sonchus uliginosus</i>	Common sow thistle	BEACH	
<i>Sorghastrum nutans</i>	Indian grass	BEACH	
<i>Spenopholis intermedia</i>	Slender wedge grass	RAVINE	
<i>Sporobolus asper</i>	Rough dropseed	BEACH	
<i>Stellaria media</i>	Common chickweed	RAVINE	
<i>Symplocarpus foetidus</i>	Skunk cabbage	RAVINE	
<i>Syringa vulgaris</i>	Lilac	RAVINE	
<i>Taenidea integerrima</i>	Yellow pimpernel	RAVINE	
<i>Taraxacum officinale</i>	Dandelion	RAVINE, BEACH	
<i>Teucrium accidentale</i>	Germander	BEACH	

<i>Scientific Name</i>	Common Name	Location	Species Status (1)
<i>Thalictrum dasycarpum</i>	Purple meadow rue	RAVINE	
<i>Thalictrum dioicum</i>	Early meadow rue	RAVINE	
<i>Thlaspi arvense</i>	Penny cress	RAVINE	
<i>Tilia americana</i>	Basswood	RAVINE	
<i>Toxicodendron radicans</i>	Poison ivy	RAVINE, BEACH	
<i>Tragopogon dubius</i>	Sand goat's beard	BEACH	
<i>Trifolium hybridum</i>	Alsike clover	BEACH	
<i>Trifolium pratense</i>	Red clover	RAVINE, BEACH	
<i>Trifolium repens</i>	White clover	RAVINE, BEACH	
<i>Trillium grandiflorum</i>	Large-flowered trillium	RAVINE	
<i>Trillium recurvatum</i>	Red trillium	RAVINE	
<i>Triosteum aurantiacum</i>	Early horse gentian	RAVINE	
<i>Triplasis purpurea</i>	Sand grass	BEACH	
<i>Typha angustifolia</i>	Narrow-leaved cattail	RAVINE	
<i>Ulmus americana</i>	American elm	RAVINE	
<i>Ulmus pumila</i>	Siberian elm	RAVINE	I
<i>Ulmus rubra</i>	Slippery elm	RAVINE	
<i>Urtica procera</i>	Tall nettle	RAVINE	
<i>Uvularia grandiflorum</i>	Bellwort	RAVINE	
<i>Verbascum blatteria</i>	Moth mullein	RAVINE	
<i>Verbascum thapsus</i>	Common mullein	RAVINE	
<i>Verbena hastata</i>	Blue vervain	RAVINE, BEACH	
<i>Verbena simplex</i>	Narrow-leaved vervain	BEACH	
<i>Verbena urticifolia</i>	Hairy white vervain	RAVINE	
<i>Veronica arvensis</i>	Corn speedwell	RAVINE	
<i>Viburnum acerifolium</i>	Maple-leaved arrow-wood	RAVINE	
<i>Viburnum lantana</i>	Wayfaring tree	RAVINE	
<i>Viburnum lentago</i>	Nannyberry	RAVINE	
<i>Viburnum opulus</i>	European highbush cranberry	RAVINE	
<i>Viburnum prunifolium</i>	Black haw	RAVINE	
<i>Viburnum rafinesquiarum</i>	Downy arrow-wood	RAVINE	
<i>Viola missouriensis</i>	Missouri violet	RAVINE	
<i>Viola pubescens</i>	Yellow violet	RAVINE	
<i>Viola sororia</i>	Common blue violet	RAVINE	
<i>Vitis aestivalis</i>	Summer grape	RAVINE	
<i>Vitis riparia</i>	Riverbank grape	RAVINE	
<i>Vitis riparia var. syrticola</i>	Riverbank grape	RAVINE, BEACH	
<i>Xanthium strumarium</i>	Cocklebur	BEACH	
<i>Xanthoxylem americanum</i>	Prickly ash	RAVINE	
<i>Zizia aurea</i>	Golden alexanders	RAVINE	

B.4 Soils

Figure B.4 Soils



B.5 Migratory Birds

TABLE B.5 BREEDING AND MIGRATORY BIRDS DOCUMENTED ON NSGL

Common name	Scientific name	NSGL
Podicepsidae		
Horned grebe	<i>Podiceps auritus</i>	M
Pied-billed grebe	<i>Podilymbus podiceps</i>	B, M
Phalacrocoracidae		
Double-crested cormorant	<i>Phalacrocorax auritus</i>	M
Ardeidae		
Great blue heron	<i>Ardea herodias</i>	M
Green-backed heron	<i>Batorides striatus</i>	M
Black-crowned night heron	<i>Nycticocorax nycticocorax</i>	M
Anatidae		
Blue-winged teal	<i>Anas discors</i>	B, M
Mallard	<i>Anas platyrhynchos</i>	B, M
Redheaded duck	<i>Aythya americana</i>	M
Lesser scaup	<i>Aythya affinis</i>	B, M
Canada goose	<i>Branta canadensis</i>	M
Bufflehead	<i>Bucephala albeota</i>	M
Red-breasted merganser	<i>Mergus serrator</i>	M
Falconidae		
Peregrine Falcon	<i>Falco peregrinus</i>	M
Rallidae		
American coot	<i>Fulica americana</i>	M
Sora rail	<i>Porzana carolina</i>	M
Charadriidae		
Spotted sandpiper	<i>Actitis macularia</i>	B, M
Ruddy turnstone	<i>Arenaria interpres</i>	M
Sanderling	<i>Calidris alba</i>	M
Dunlin	<i>Calidris alpina</i>	M
Killdeer	<i>Charadrius vociferous</i>	B, M
American avocet	<i>Recurvirostra americana</i>	M
Laridae		
Herring gull	<i>Larus argentatus</i>	M
Ring-bill gull	<i>Larus delawarensis</i>	B, M
Bonaparte's gull	<i>Larus Philadelphia</i>	M
Franklin's gull	<i>Larus pipixcan</i>	M
Parasitic jaegar	<i>Stercorarius parasiticus</i>	M
Caspian tern	<i>Sterna caspia</i>	M
Forster's tern	<i>Sterna forsteri</i>	M
Common tern	<i>Sterna hirundo</i>	B, M
Columbidae		
Rock dove	<i>Columba livia</i>	M
Mourning dove	<i>Zenaida macroura</i>	B, M
Strigidae		
Eastern screech owl	<i>Otus asio</i>	M
Caprimulgidae		
Common nighthawk	<i>Chordeiles minor</i>	M
Apodidae		
Chimney swift	<i>Chaetura pelagrica</i>	B, M
Alcedinidae		
Belted kingfisher	<i>Ceryle alcyon</i>	B, M

Common name	Scientific name	NSGL
Picidae		
Northern flicker	<i>Colaptes auratus</i>	B, M
Red-bellied woodpecker	<i>Melanerpes carolinus</i>	B, M
Redheaded woodpecker	<i>Melanerpes erythrocephalus</i>	M
Downy woodpecker	<i>Picoides pubescens</i>	B
Hairy woodpecker	<i>Picoides villosus</i>	M
Yellow bellied sapsucker	<i>Sphyrapicus varius</i>	M
Tyranidae		
Eastern wood-pewee	<i>Contopus virens</i>	M
Willow flycatcher	<i>Empidonax traillii</i>	M
Acadian flycatcher	<i>Empidonax virescens</i>	M
Eastern phoebe	<i>Sayornis phoebe</i>	
Eastern kingbird	<i>Tyranus tyrannus</i>	M
Hirundinidae		
Cliff swallow	<i>Hirundo pyrrhonota</i>	M
Barn swallow	<i>Hirundo rustica</i>	B, M
Bank swallow	<i>Riparia riparia</i>	M
Tree swallow	<i>Tachycineta bicolor</i>	M
Bombicilidae		
Cedar waxwing	<i>Bombycilla cedrorum</i>	M
Troglodytidae		
House wren	<i>Troglodytes aedon</i>	B, M
Mimidae		
Gray catbird	<i>Dumetella carolinensis</i>	B, M
Northern mockingbird	<i>Mimus polyglottus</i>	B,M
Brown thrasher	<i>Toxostoma rufum</i>	M
Turdidae		
Veery	<i>Catharus fuscescens</i>	M
Hermit thrush	<i>Catharus guttatus</i>	M
Golden crowned kinglet	<i>Regulus satropa</i>	M
American robin	<i>Turdus migratorius</i>	B, M
Paridae		
Black-capped chickadee	<i>Parus atricapillus</i>	B, M
Sittidae		
White-breasted nuthatch	<i>Sitta carolinensis</i>	B, M
Certhiidae		
Brown creeper	<i>Certhia americana</i>	M
Emberizidae		
Northern cardinal	<i>Cardinalis cardinalis</i>	B, M
Dark-eyed junco	<i>Junco hyemalis</i>	M
Swamp sparrow	<i>Melospiza georgiana</i>	M
Song sparrow	<i>Melospiza melodia</i>	B, M
Indigo bunting	<i>Passerina cyanea</i>	B, M
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	M
Rufus-sided towhee	<i>Pipilo erythrophthalmus</i>	M
Chipping sparrow	<i>Spizella pallida</i>	M
White-throated sparrow	<i>Zonotrichia albicollis</i>	M
Parulidae		
Cerulean warbler	<i>Dendroica cerulea</i>	M
Yellow rumped warbler	<i>Dendroica coronata</i>	M
Prairie warbler	<i>Dendroica discolor</i>	M
Blackburnian warbler	<i>Dendroica fusca</i>	M

Common name	Scientific name	NSGL
Magnolia warbler	<i>Dendroica magnolia</i>	M
Chestnut-sided warbler	<i>Dendroica pennsylvanica</i>	M
Blackpoll warbler	<i>Dendroica striata</i>	M
Kentucky warbler	<i>Geothlypis formosa</i>	M
Common yellowthroat	<i>Geothlypis trichas</i>	B, M
Black and white warbler	<i>Mniotilta varia</i>	M
American redstart	<i>Setophaga ruticilla</i>	M
Tennessee warbler	<i>Vermivora peregrina</i>	M
Wilson's warbler	<i>Wilsonia pusilla</i>	M
Vireonidae		
Yellow throated vireo	<i>Vireo flavifrons</i>	M
Warbling vireo	<i>Vireo gilvus</i>	M
Icteridae		
Redwinged blackbird	<i>Agelaius phoeniceus</i>	B, M
Northern oriole	<i>Icterus galbula</i>	B, M
Brownheaded cowbird	<i>Molothrus ater</i>	B, M
Common Grackle	<i>Quiscalus quiscula</i>	B, M
Eastern meadowlark	<i>Sturnella magna</i>	M
Fringillidae		
American Goldfinch	<i>Carduelis tristis</i>	B, M
Ploceidae		
House sparrow	<i>Passer domesticus</i>	B, M
Sturnidae		
European starling	<i>Sturnus vulgaris</i>	B, M
Corvidae		
American crow	<i>Corvus brachyrhyncus</i>	B, M
Northern raven	<i>Corvus corax</i>	M
Bluejay	<i>Cyanocitta cristata</i>	B, M

B.6 Fish

TABLE B.6 FISHES DOCUMENTED FROM LAKE MICHIGAN IN AND NEAR NSGL HARBORS DURING SURVEYS CONDUCTED IN 1983, 1984, AND 1986

Common Name	Scientific Name
Coho Salmon	<i>Oncorhynchus kisutch</i>
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>
Lake Trout	<i>Salvelinus namaycush</i>
Brown Trout	<i>Salmo trutta</i>
Rainbow Trout	<i>Oncorhynchus mykiss</i>
Carp	<i>Cyprinus carpio</i>
Carp x Goldfish	<i>Cyprinus carpio x Carassius auratus</i>
Gizzard Shad	<i>Dorosoma cepedianum</i>
Lake Whitefish	<i>Coregonus clupeaformis</i>
Alewife	<i>Alosa pseudoharengus</i>
Black Bullhead	<i>Ameiurus melas</i>
Bluntnose Shiner	<i>Pimephales notatus</i>
Golden Shiner	<i>Notemigonus crysoleucas</i>
Emerald Shiner	<i>Notropis atherinoides</i>
Rainbow Smelt	<i>Osmerus mordax</i>
Rock Bass	<i>Ambloplites rupestris</i>
White Sucker	<i>Catostomus commersoni</i>
Yellow Perch	<i>Perca flavescens</i>
Northern Pike	<i>Esox lucius</i>
White Crappie	<i>Pomoxis annularis</i>

B.7 Invasive Species

TABLE B.7 INVASIVE AND EXOTIC PLANT SPECIES IDENTIFIED ON NSGL

Common name	Scientific name	NSGL
Amur maple	<i>Acer ginnala</i>	X
Norway maple	<i>Acer platanoides</i>	X
Garlic mustard	<i>Allaria petiolata</i>	X
Japanese barberry	<i>Berberis thunbergii</i>	X
Common reed	<i>Phragmites australis</i>	X
Smooth brome	<i>Bromus inermis</i>	X
Oriental bittersweet	<i>Celastrus orbiculatus</i>	X
Western catalpa	<i>Catalpa speciosa</i>	X
Canada thistle	<i>Cirsium arvensae</i>	X
Tatarian honeysuckle	<i>Lonicera tatarica</i>	X
Purple loosestrife	<i>Lythrum salicaria</i>	X
White sweet clover	<i>Melilotus alba</i>	X
White mulberry	<i>Morus alba</i>	X
Wild parsnip	<i>Pastinaca sativa</i>	X

White poplar	<i>Populus alba</i>	X
Common buckthorn	<i>Rhamnus cathartica</i>	X
Glossy buckthorn	<i>Rhamnus frangula</i>	X
Black locust	<i>Robinia pseudoacacia</i>	X
Weeping willow	<i>Salix babylonica</i>	X
Brittle willow	<i>Salix fragilis</i>	X
Dandelion	<i>Taraxicum officianale</i>	X
Siberian elm	<i>Ulmus pumila</i>	X

B.8 Soil and Water Conservation

TABLE B.8 AREAS EXPERIENCING EXTREME EROSION OR SLOPE FAILURE ON MAIN INSTALLATION IDENTIFIED DURING A SURVEY CONDUCTED IN 1998

Site ⁽¹⁾	Site Description	Observed Conditions	Observed or Potential Impacts	Issues ⁽²⁾
1 ⁽³⁾	SW corner of Building 130 parking lot	> 10,000 yd ³ eroded; damage to full slope length	Storm drain and parking lot	SD/IR
2	S side of Building 130 parking lot	> 1,000 yd ³ eroded; slope failure	Parking lot	SD/IR
3	S side and between Building 76 and 130	> 500 linear ft. of degradations and failures	Damaged fence; top of slope < 12 ft. from building foundations	SD/IR
4 ⁽⁴⁾	15 ft. E of Building 42	> 350 linear ft. of degradations and failures	Damaged fence; top of slope < 25 ft. from building foundations	SD/IR
5	W side of Rodgers St.; W of Building 177	> 200 linear ft. of eroding and failing slope	Parking lot	SD/IR
6	NW corner of Camp Barry Bridge	> 500 linear ft. of eroding and failing slope	Sedimentation of Pettibone Creek, uprooting of trees	NPSP
7	SE corner of Camp Barry Bridge	> 500 linear ft. of eroding and failing slope	Storm sewer outfall	SD/IR NPSP
8	S and SW of Buildings 24 and 24A	> 800 linear ft. of eroding and failing slope	Storm sewer outfall	SD/IR NPSP
9	Crosley Dr.	> 4,500 linear ft. of road in poor condition	Service road, exercise path	SD/IR
10	SE of Building 152 parking lot	Erosion forming a gully	Parking lot; sedimentation of Pettibone Creek	SD/IR NPSP
11	NE of Building 152 parking lot	Surface erosion	Parking lot; sedimentation of Pettibone Creek	SD/IR NPSP
12 ⁽³⁾	N of Building 154	500 yd ³ eroded; slope failure	Sedimentation of Pettibone Creek	NPSP
13	Steam lines SE of Building 180	Eroding and failing slope forming gullies	Aboveground steam lines and supports	SD/IR
14	Steam lines E of Building 180	> 300 linear ft. of slope failure and erosion	Aboveground steam lines and supports	SD/IR
15A	Slope on S side of road at Boat Basin	Eroding and failing slope	Access road; sedimentation of Boat Basin	SD/IR NPSP
15B	Road from Boat Basin to Hospital	720 linear ft. of eroding slope; sides inclining 4 to 150 ft.	Access road; storm sewers; sedimentation of Boat Basin	SD/IR NPSP
16	S of Building 142 – Family Housing Unit	12 linear ft. of slope degradation; > 1,000 yd ³ eroded	Back yard of family housing unit	NPSP
17	S of Building 142 – Family Housing Unit	Slope degradation; approximately 2,000 yd ³ eroded	Back yard to family housing unit	NPSP
18	S of Building 142 – Family Housing Unit	Slope degradation; > 2,000 yd ³ eroded	Back yard to family housing unit	NPSP

Site ⁽¹⁾	Site Description	Observed Conditions	Observed or Potential Impacts	Issues ⁽²⁾
19	Base of Sampson St. Bridge	Erosion around base of bridge; riprap dislodged	Sampson St. Bridge; sedimentation of Pettibone Creek	SD/IR NPSP
20	SW of Building 73	> 10,000 yd ³ eroded; general slope degradation	Building 73 and adjacent parking lot	SD/IR
21	NE of Building 42	> 3,000 yd ³ eroded;	Storm sewer	SD/IR
22	SE of Building 203	Slope erosion and degradation	Family Housing Quarters	SD/IR NPSP
23	NE of Building 202	Slope erosion and degradation	Family Housing Quarters	SD/IR NPSP
24	N of Building 202	> 700 linear ft. of slope degradation and erosion	Top of slope 15 ft. from Building 202, < 3 ft. from parking garage	SD/IR
25	Slope SE of Quarters A	Damaged and failing retaining wall	Steam line at slope base	SD/IR
26	Slope E of Quarters A	Slope erosion and failure; very sparse vegetation cover	Steam line at slope base	SD/IR
27	Slope E of Quarters A to Quarters F	Slope erosion and failure; very sparse vegetation cover	Steam line at slope base	SD/IR
28	Slope E of Quarters F	Damaged and failing retaining wall	Road at slope base	SD/IR
29	Slope E of Quarters H	Slope erosion and failure; very sparse vegetation cover	Buildings 12A to 12C	SD/IR
30	E side of Building 140	> 1,000 yd ³ eroded;	Top of slope < 15 ft. from sidewalk, 25 ft. from Building 140	SD/IR
31 ⁽³⁾	E side of Building 62	> 25,000 yd ³ eroded; very sparse vegetation cover	Top of slope < 35 ft. from Building 62	SD/IR NPSP
32	E side of Building 616 and parking area	Slope failure	Top of slope < 1 ft. from paved parking and surface road	SD/IR
33	NE of Building 616	> 25,000 yd ³ eroded;	Top of slope 8 ft. from road; Building 616	SD/IR NPSP
34	Gravel parking lot E of Building 621	> 25,000 yd ³ eroded;	Parking lot; discharge of sediment into Lake Michigan	SD/IR NPSP
35	N side of Downes Dr.	> 500 linear ft. by 35 linear ft. area of slope with sparse vegetation cover	Slope < 1 foot from road; discharge of sediment into storm sewer system	SD/IR NPSP
36	W end of Downes Dr., W of Building 143	> 400 linear ft. by 35 linear ft. area of slope with sparse vegetation cover	Top of slope 10 ft. from Family Housing Quarters	SD/IR
37	Slope between Mahan Rd. and Building 1A parking lot	> 500 linear ft. of slope failure and erosion; sparse vegetation cover	Mahan Rd; sedimentation of Pettibone Creek	SD/IR NPSP

(1) Restoration projects at Sites 1, 12, and 31 have been completed.

(2) SD/IR = Structural Damage/Increased Repair Costs
NPSP = Non-Point Source Pollution

(3) A restoration project at Site 4 is currently in progress, as of April 2001.

APPENDIX C CRITICAL HABITAT ISSUES

C.1 Current Conditions

The USFWS has designated approximately 10.2 km (6.3 mi) of Lake Michigan shoreline in Lake County, Illinois as critical habitat for the Piping plover (*Charadrius melodus*), it includes areas that were historically occupied by piping plovers. Approximately 4.7 km (2.9 mi) are part of the Illinois Beach State Park and Nature Preserve, approximately 1.3 km (0.8 mi) is municipal property (Zion municipal park and Waukegan municipal beach), and the remaining 4.2 km (2.6 mi) are privately owned. This unit extends from 17th Street and the Lake Michigan shoreline in Illinois Beach State Park southward to the northern Waukegan Beach breakwall at North Beach Park, excluding the public beach and campground to just south of the Illinois Beach State Park Lodge and Conference Center and Headland Dunes State Park. These critical habitat areas are in relatively close proximity to NSGL.

As recently as 2006 the IL-DNR has documented the Piping plover as utilizing NSGL Harbor Island as a resting area during its migratory stopover (IL-DNR 2006). IL-DNR Natural Heritage Biologists do not feel the area currently offers suitable habitat for the species to nest (IL-DNR 2006) however, current NSGL plans and projects to control invasive vegetation may render the habitat favorable to the species at some future point. Harbor Island currently supports the only nesting colony of the state endangered Common tern (*Sterna hirundo*). NSGL is currently working in cooperation with the IL-DNR to keep the habitat favorable for the continued nesting of the species. Current and future steps and projects that may prove to be favorable to both species are:

- Controlling invasive vegetation (Phragmites) on the island and adjacent panne.
- Maintaining mechanical and electrical fencing barriers to discourage mammalian predators from preying on eggs and fledglings
- Keeping the island designated as an “Important Bird Area” (IBA) and discouraging human disturbance of the area

Concurrent with a determination to list a species as threatened or endangered, the Secretary of Interior is required to designate any habitat of the species that is considered to be critical habitat. However, the ESA was revised via the National Defense Authorization Act of 2004, Public Law 108-136 to recognize INRMP conservation measures and species benefit that could obviate the need for critical habitat designation on Navy lands.

Section 4(a)(3) of the revised ESA states that:

“The Secretary [of the Interior] shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.”

C.2 Critical Habitat

Critical habitat is defined in the Endangered Species Act as the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management consideration or protections; and specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. “Conservation” means the use of all methods and procedures that are necessary to bring an endangered or a threatened species to the point at which listing under the Act is no longer necessary.

If, during annual bird surveys, it is discovered that the Piping plover is nesting on the Harbor Island IBA, NSGL will endeavor to consult with the USFWS. Current management practices on Harbor Island are proving favorable to the Common tern and may subsequently prove to be favorable to the Piping plover.

C.3 Conservation Agreements

A conservation agreement is a formal, written document agreed to by the USFWS and other cooperators that identifies specific actions and responsibilities for which each party agrees to be accountable. The objective of a conservation agreement is usually to reduce threats to a candidate or proposed species or its habitat, possibly lowering the listing priority or eliminating the need to list the species. Conservation agreements are usually less restrictive than mitigation banks and do not require transfer of ownership (Foreman 1997). When appropriate, NSGL will consider the option of a conservation agreement.

If conservation agreements are considered, there must be early involvement of USFWS and other agencies. Such agreements include mechanisms by which future consultations and accompanying biological opinions will direct mitigation requirements. For example, terms and conditions of future biological opinions that involve the set-aside or special management of habitat would draw on a mitigation bank or conservation agreement. This would allow comprehensive long-term mitigation planning, rather than project-specific or activity-specific mitigation.

Navy INRMPs must follow CNO N4 Memo of 30 Oct 2002, “Procedures for Introducing/Actively Attracting Endangered Species onto U.S. Navy Property.” Mitigation for non-Navy actions or activities should not be suggested for Navy lands or supported in an INRMP unless it has been approved by the chain of command to the CNO level.

APPENDIX D MIGRATORY BIRD MANAGEMENT

D.1 Introduction

NSGL provides habitats and open space for a wide variety of migratory birds that migrate annually within and beyond North America (Table E-1). Regardless of how these migratory birds use NSGL, their presence provides important ecological services and an important indicator of ecosystem health. Primary considerations with regard to migratory bird management are compliance with the Migratory Bird Treaty Act (MBTA); implementation of migratory bird management actions in accordance with Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds; and support, contribution and compatibility with the goals and efforts of numerous regional migratory and game bird conservation programs.

Virtually all birds that occupy NSGL throughout the year are protected under the MBTA. The MBTA controls many actions that may negatively affect migratory birds, particularly collection and transportation of birds. Special purpose permits may be requested and issued that allow for the relocation or transport of migratory birds for management purposes. NSGL may request a depredation control permit for various gull species and Canada geese periodically. This permit allows the base to take management actions regarding Bird/Animal Strike Hazards (BASH) around areas of the Station where they may pose a threat to aviation.

Executive Order 13186, issued on 10 January 2001, requires all federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within 2 years, a MOU with the USFWS. The Department of Defense (DoD) is in process of developing a MOU that addresses management actions and conservation of migratory birds on installations. Comprehensive bird conservation plans for migratory birds have recently been developed for land birds, shorebirds and water birds.

These conservation plans identify species and habitat conservation priorities at the national and more detailed regional scales. Plans that encompass Illinois and are applicable to NSGL include:

- Partners in Flight, North American Land Bird Conservation Plan
- Partners in Flight, Bird Conservation Plan for Great Lakes
- North American Waterfowl Management Plan (NAWMP)
- U. S. Shorebird Conservation Plan (USSCP)
- North American Water bird Conservation Plan (NAWCP)
- North American Bird Conservation Initiative (NABCI)

These plans provide the framework, conservation priorities, goals, and objectives comparable to INRMP goals and objectives for various migratory bird species and their habitats within the manageable areas of NSGL.



Consistent with these plans, and within the framework of mission-focused conservation, NSGL's conservation management will continue to support migratory bird conservation efforts. NSGL's conservation of wetlands, upland forest and restoration of dune and panne communities all contribute valuable habitat benefits to migratory birds. NSGL also takes proactive measures to minimize recreation pressures for the benefit

of nesting or resting migratory shorebirds and water birds.

D.2 Population Monitoring

Migratory bird surveys and breeding bird counts provide a strong, statistically valid framework for detecting trends in migratory bird populations and assist managers in meeting their bird conservation goals. NSGL, the IL-DNR and local volunteers participate in tracking and counting bird populations on the shorelines of NSGL. The results of the counts are compiled into a table and used to maintain historical data of resting and nesting trends for migratory birds.

D.3 Habitat

D.3.1 Panne and Sand Dune Communities

The panne ecosystem on NSGL is a rare and unique community within the region, and provides primary habitat for numerous migratory birds. Panne in this context refers to a freshwater interdune wetland that receives regular inundation and saturation from a large body of water, and supports emergent, herbaceous wetland plants. Pannes enrich the



regional biodiversity that is in decline because of urbanization, human disturbances, and alterations to the natural disturbance cycles by supporting a large number of plant and animal species. The panne on the Station serves as a breeding area for the State-listed endangered Common tern, adding to the importance of this community in conservation of regional biodiversity and natural heritage.

D.3.2 Urban Forest /Shrub Communities

Urban forest communities and the shrub woodlands found on NSGL have long been recognized as important bird habitat. The mature trees, and numerous under story shrubs that dominate the urban forest shrub communities on NSGL are indicative of the most urban-forested areas of Illinois. NSGL recognizes that urban forest and shrub habitat is important for all migratory birds moving to and from their wintering grounds as well as other wildlife found in this unique system. Existing high quality woodland and scrub habitats found on NSGL's wooded areas will continue to provide benefits to goldfinches and many other migrating birds.

D.3.3 Wetlands

Wetlands are among some of the most important bird habitat in the Great Lakes Region. Wetlands on NSGL are diverse and include the costal wetlands of Lake Michigan, inland wetland marshes and ponds and vernal wetlands. Wetlands management and protection is addressed in Chapter 2. Operations, maintenance and military training activities on NSGL consider the ecological value of wetlands and are consistent with the overall goal of maintaining and restoring predominantly mature wetland ecosystems.

Table D.1. Bird Counts of Harbor Island (NSGL, 2006)

GEN. FAMILY GROUPINGS (120 identified species)	ALPHA CODE	SCIENTIFIC NAME	STATUS	COMMENTS	YEARS IDENTIFIED						
					2001	2002	2003	2004	2005	2006	
ACCIPITRIDAE (Hawk, Eagle)											
Bald Eagle	BAEA	<i>Haliaeetus leucocephalus</i>	IL-T; F-T		x						
Osprey	OSPR	<i>Pandion haliaetus</i>	IL-T		x	x	x				
Rough-legged Hawk	RLHA	<i>Buteo lagopus</i>				x					
ALCEDINIDAE (Kingfisher)											
Belted Kingfisher	BEKI	<i>Megaceryle alcyon</i>			x						x
ANATIDAE (Ducks & Geese)											
			WF								
Bufflehead	BUFF	<i>Bucephala albeola</i>				x					x
Canada Goose	CAGO	<i>Branta canadensis</i>			x	x	x	x	x	x	x
Canvasback	CANV	<i>Aythya valisineria</i>									FO
Common Merganser	COME	<i>Mergus merganser</i>			x		x				x
Gadwall	GADW	<i>Anas strepera</i>				x		x			
Hooded Merganser	HOME	<i>Lophodytes cucullatus</i>						x	x		
Mallard Duck	MALL	<i>Anas platyrhynchos</i>			x	x	x	x			x
Northern Pintail	NOPI	<i>Anas acuta</i>				x					
Northern Shoveler	NOSV	<i>Anas clypeata</i>				x	x	x			x
Red-Breasted Merganser	RBME	<i>Mergus serrator</i>				x	x	x	x	x	x
Redhead Duck	REDH	<i>Aythya americana</i>			x			x			x
Ring-necked Duck	RNDU	<i>Aythya collaris</i>				x					x
Ruddy Duck	RUDU	<i>Oxyura jamaicensis</i>									FO
Scaup - Greater	GRSC	<i>Aythya marila</i>						x	x		x
Scaup - Lesser	LESC	<i>Aythya affinis</i>						x	x	x	x
Teal - Blue-Winged	BWTE	<i>Anas discors</i>			x	x	x	x	x	x	x
Teal - Green-winged	GWTE	<i>Anas crecca</i>		includes 'Common Teal'	x	x	x	x			x
Wigeon - American	AMWI	<i>Anas americana</i>					x	x			
Wood Duck	DODU	<i>Aix sponsa</i>			x						

GEN. FAMILY GROUPINGS (120 identified species)	ALPHA CODE	SCIENTIFIC NAME	STATUS	COMMENTS	YEARS IDENTIFIED					
					2001	2002	2003	2004	2005	2006
Chimney Swift	CHSW	<i>Chaetura pelagica</i>			x					
ARDEIDAE (Bittern & Heron)										
American Bittern	AMBI	<i>Botaurus lentiginosus</i>	IL-E			x	x			
Black-crowned Night Heron	BCNH	<i>Nycticorax nycticorax</i>	IL-E		x	x	x			x
Great Blue Heron	GBHE	<i>Ardea herodias</i>			x	x	x		x	x
Great Egret	GREG	<i>Casmerodius albus</i>	IL-E			x	x			
Snowy Egret	SNEG	<i>Egretta thula</i>	IL-E			x				
Yellow-Crowned Night-Heron	YCNH	<i>Nyctanassa violacea</i>								FO
FALCONIDAE (Falcons)										
Peregrine Falcon	PEFA	<i>Falco peregrinus</i>	IL-T							FO
CATHARTIDAE										
Turkey Vulture	TUVU	<i>Cathartes aura</i>	UL				x			
CHARADRIIDAE (Plovers)										
American Avocet	AMAV	<i>Recurvirostra americana</i>	SB		x	x	x	x		x
American Golden	AMGP	<i>Pluvialis dominica</i>		aka 'Lesser Golden-Plover'	x					
Black-bellied	BBPL	<i>Pluvialis squatarola</i>			x	x	x		x	
Lesser Golden	LEGP	<i>Pluvialis dominica</i>				x				
Piping Plover	PIPL	<i>Charadrius melodus</i>	IL-E; Fed-E	Unconfirmed in 2001	??					FO
Semi-palmated	SEPL	<i>Charadrius semipalmatus</i>			x	x	x		x	x
Killdeer	KILL	<i>Charadrius vociferus</i>			x	x	x	x		x
COLUMBIDAE (Pigeons & Doves)										
Mourning Dove		<i>Zenaida macroura</i>			x					
CORVIDAE (Jays, Crows)										
American Crow	AMCR	<i>Corvus brachyrhynchos</i>			x					

GEN. FAMILY GROUPINGS (120 identified species)	ALPHA CODE	SCIENTIFIC NAME	STATUS	COMMENTS	YEARS IDENTIFIED						
					2001	2002	2003	2004	2005	2006	
EMBERIZINAE (Sparrows)											
American Redstart	AMRE	<i>Setophaga ruticilla</i>		2001-Heard, but not seen	x						
American Tree Sparrow	ATSP	<i>Spizella arborea</i>									x
Baltimore Oriole	BAOR	<i>Icterus galbula</i>			x	x					
Dark-Eyed Juncos	WWJU	<i>Junco hyemalis</i>		aka 'White-Winged Junco'							FO
Eastern Towhee	EATO	<i>Pipilo erythrophthalmus</i>				x					
Northern Cardinal	NOCA	<i>Cardinalis cardinalis</i>			x						
Lapland Longspur	LALO	<i>Calcarius lapponicus</i>					x				
Palm Warbler	PAWA	<i>Dendroica palmarum</i>					x				x
Red-winged Blackbird	REDW	<i>Agelaius phoeniceus</i>							x		
Chipping Sparrow	CHSP	<i>Spizella passerina</i>			x						
Field Sparrow	FISP	<i>Spizella pusilla</i>				x					
House Sparrow	HOSP	<i>Passer domesticus</i>			x						
Nelson's Sharp Tailed Sparrow	NSTS	<i>Ammodramus caudacutus ??</i>				x					
Savannah Sparrow	SAVS	<i>Passerculus sandwichensis</i>				x					
Song Sparrow	SOSP	<i>Melospiza melodia</i>			x	x	x	x			
Swamp Sparrow	SWSP	<i>Melospiza georgiana</i>				x		x			
White-Throated Sparrow	WTSP	<i>Zonotrichia albicollis</i>					x				
GAVIIDAE (Loon)											
Red-throated Loon	RTLO	<i>Gavia stellata</i>					x				
GREBES											
Pied-billed	PBGR	<i>Podilymbus podiceps</i>	IL-T				x				
GULLS											
Bonapart's	BOGU	<i>Larus philadelphia</i>				x	x	x	x	x	x
Franklin's	FRGU	<i>Larus pipixcan</i>			x						
Great Black-backed Gull	GBBG	<i>Larus marinus</i>						x			
Herring	HEGU	<i>Larus argentatus</i>			x	x	x	x	x	x	x

GEN. FAMILY GROUPINGS (120 identified species)	ALPHA CODE	SCIENTIFIC NAME	STATUS	COMMENTS	YEARS IDENTIFIED					
					2001	2002	2003	2004	2005	2006
Ring-billed	RBGU	<i>Larus delawarensis</i>			X	X	X	X	X	X
Thayer's	THGU	<i>Larus thayeri</i>			X	X				
<u>HIRUNDINIDAE (Swallow & Martin)</u>										
Bank Swallow	BANS	<i>Riparia riparia</i>						X		
Barn Swallow	BARS	<i>Hirundo rustica</i>			X	X		X		
Cliff Swallow	CLSW	<i>Hirundo pyrrhonota</i>				X		X		X
N. Rough-Winged Swallow	NRWS	<i>Stelgidopteryx serripennis</i>			X	X				
Purple Martin	PUMA	<i>Progne subis</i>			X			X		
Tree Swallow	TRES	<i>Tachycineta bicolor</i>			X	X				
<u>ICTERINAE (Blackbirds, etc)</u>										
Common Grackle	COGR	<i>Quiscalus quiscula</i>			X	X				
Red-Winged Black Bird	REDW	<i>Agelaius phoeniceus</i>								X
<u>MIMIDAE(Mocking & Thrasher)</u>										
Brown Thrasher	BRTH	<i>Toxostoma rufum</i>			X	X				X
Northern Mockingbird	NOMO	<i>Mimus polyglottos</i>				X				
<u>MUSCICAPIDAE (Kinglets)</u>										
American Robin	AMRO	<i>Turdus migratorius</i>			X					
Rudy-crowned Kinglet	RCKI	<i>Regulus calendula</i>						X		
<u>PARIDAE</u>										
Black-capped Chickadee	BCCH	<i>Parus atricapillus</i>			X					
<u>PELECANIDAE (Pelicans)</u>										
Brown Pelican	BRPE	<i>Pelecanus occidentalis</i>						X		

GEN. FAMILY GROUPINGS (120 identified species)	ALPHA CODE	SCIENTIFIC NAME	STATUS	COMMENTS	YEARS IDENTIFIED						
					2001	2002	2003	2004	2005	2006	
<u>RALLIDAE (Coot & Rail)</u>											
American Coot	AMCO	<i>Fulica americana</i>					X	X	X		X
Sora (Rail)	SORA	<i>Porzana carolina</i>				X	X				
Virginia Rail	VIRA	<i>Rallus limicola</i>						X			
<u>SCOLOPACIDAE (SANDPIPER)</u>											
Baird's Sandpiper	BASA	<i>Calidris bairdii</i>	SB			X	?	X		X	X
Curlew Sandpiper	CUSA	<i>Calidris ferruginea</i>		Breeds in Siberia		X					
Dunlin	DUNL	<i>Calidris alpina</i>				X	X	X	X	X	X
Greater Yellowlegs	GRYE	<i>Tringa melanoleuca</i>					X				
Lesser Yellowlegs	LEYE	<i>Tringa flavipes</i>					X	X			
Hudsonian Godwit	HUGO	<i>Limosa haemastica</i>					X				
Least Sandpiper	LESA	<i>Calidris minutilla</i>				X	X	X		X	X
Marbled Godwit	MAGO	<i>Limosa lapponica</i>					X				
Pectoral Sandpiper	PESA	<i>Calidris melanotos</i>					X	X		X	
Red Knot		<i>Calidris canutus</i>				X		X			X
Ruddy Turnstone	RUTU	<i>Arenaria interpres</i>						X	X		X
Sanderling	SAND	<i>Calidris alba</i>				X	X	X	X		X
Short-billed Dowitcher	SBDO	<i>Limnodromus griseus</i>					X	X			X
Semi-palmated Sandpiper	SESA	<i>Calidris pusilla</i>				X	X	X	X	X	X
Solitary Sandpiper	SOSA	<i>Tringa solitaria</i>						X			X
Spotted Sandpiper	SPSA	<i>Actitis macularia</i>				X	X	X	X	X	X
Stilt Sandpiper	STSA	<i>Calidris bimantopus</i>						X			
Whimbrel	WHIM	<i>Numenius phaeopus</i>				X					
White-rumped Sandpiper	WRSA	<i>Calidris fuscicollis</i>				X					
Willet	WILL	<i>Catoptrophorus semipalmatus</i>					X	X		X	X
<u>STURNIDAE (Starlings)</u>											
Eastern Starling	EUST	<i>Sturnus vulgaris</i>				X					

GEN. FAMILY GROUPINGS (120 identified species)	ALPHA CODE	SCIENTIFIC NAME	STATUS	COMMENTS	YEARS IDENTIFIED						
					2001	2002	2003	2004	2005	2006	
TERNES											
Arctic Tern	ARTE	<i>Sterna paradisaea</i>			x						
Black Tern	BLTE	<i>Chlidonias niger</i>	IL-E				x				
Caspian Tern	CATE	<i>Sterna caspia</i>			x	x	x	x	x	x	
Common Tern	COTE	<i>Sterna hirundo</i>	IL-E		x	x	x	x	x	x	
Forster's Tern	FOTE	<i>Sterna forsteri</i>	IL-E		x	x	x	x	x	x	
Least Tern	LETE	<i>Sterna antillarum</i>	IL-E; Fed-E		x	x					
TROGYLODYTIDAE (Wrens)											
Carolina Wren	CARW	<i>Thryothorus ludovicianus</i>							x	x	
(Long-Billed) Marsh Wren	MAWR	<i>Cistothorus palustris</i>								FO	
TYRANNIDAE (Flycatchers)											
Eastern Wood Pewee	EAWP	<i>Contopus virens</i>			x						
TYTONIDAE (Owls)											
Short-Eared Owl	SEOW	<i>Asio flammeus</i>	IL-E	Migratory stop?	x						
VIREONIDAE (Vireos)											
Common Yellowthroat	COYE	<i>Geothlypis trichas</i>				x		x			
Warbling Vireo	WAVI	<i>Vireo gilvus</i>				x					
					Total Identified Species:	62	63	50	34	22	51
Abbreviations											
F = Federal		IL = Illinois		WF = Water Fowl							
E = Endangered		T = Threatened		SB = Shore Bird							
FO = First Observed				UL = UpLand							

Table D.2 Common Tern (*Sterna hirundo*) nesting summaries for Illinois (IL-DNR, 2006)

Year	Site	Maximum Tern Number	Maximum Nesting Attempts	Maximum Eggs Laid	Total Young Fledged
1936	Waukegan		5		
1937	Midwest Generation				0
1938	Midwest Generation				0
1939	Midwest Generation				0
1948	Midwest Generation		4		0
	Johns-Mansville	30		36	33
1975	Unknown- Chicago area				
1976	Johns-Mansville		2		0
	Midwest Generation		8		0
1977	Waukegan Harbor	16	9		0
	Waukegan Island		12		9
1978	Waukegan Harbor		16		0
1979	Midwest Generation	43	15		35
1980	Midwest Generation	60	29	52	0
1981	Midwest Generation	70	33	98	0
1982	Midwest Generation	50	25	70	16
1983	Midwest Generation	64	32	87	21
1984	Midwest Generation	22	17	41	0
1997	Midwest Generation	26	10		0
	Johns-Mansville	6	3	9	0
1998	Midwest Generation	17	9		7
1999	Midwest Generation	35	8		0

Year	Site	Maximum Tern Number	Maximum Nesting Attempts	Maximum Eggs Laid	Total Young Fledged
2000	Midwest Generation	7	1	1	0
	Naval Training Center	42	12	27	0
2001	Naval Training Center	49	54	109	0
2002	Naval Training Center	49	18	44	26
2003	Naval Training Center	49	46	129	43
2004	Naval Training Center	66	26	67	32
2005	Naval Training Center	96	23	67	6
2006	Naval Training Center	63	38	99	2

APPENDIX E TERMS AND DEFINITIONS

E.1 Terms and Definitions

Adaptive Management or Adaptive resource management (ARM) is an iterative process of optimal decision-making, in the face of uncertainty, with an aim to reducing that uncertainty over time via system monitoring. In this way, decision-making simultaneously maximizes one or more resource objectives and, either passively or actively, accrues information needed to improve future management.

Agricultural Outleasing. Use of non-excess DOD lands under a lease to an agency, organization, or person generally for growing crops or grazing domestic animals. The term “agriculture” includes activities related to producing, harvesting, processing, or marketing an agricultural, aquaculture, maricultural, or horticultural commodity, including the breeding, raising, shearing, feeding, caring for, training, and management of livestock, bees, poultry, fish, shellfish, and fur-bearing animals and wildlife, and the planting, cultivating for harvest, or processing short rotation (less than 15 years) forest products.

Annual Increment. An INRMP addendum prepared annually, to facilitate implementation of the INRMP.

Best Management Practices (BMP). Within the scope of this chapter, BMPs are practical, economical and effective management or control practices that will reduce or prevent water pollution. Usually BMPs are applied as a system of practices based on site-specific conditions rather than a single practice. State agencies usually prepare BMPs for land disturbing activities related to agriculture, forestry, and construction.

Biodiversity. The variety of life and its processes; it includes the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting.

Biological Assessment (BA). A biological evaluation conducted by the action agency as part of the interagency consultation process under the Endangered Species Act (ESA). The purpose of the assessment is to determine whether or not the proposed action is likely to: (1) adversely affect listed species or designated critical habitat; (2) jeopardize the continued existence of species that are proposed for listing; or (3) adversely modify proposed critical habitat.

Biological Opinion (BO). A document stating the opinion of the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) about whether or not a Federal action, described in a BA, is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat.

Bird Aircraft Strike Hazard (BASH) Prevention Program. An integrated program, based on a BASH Plan, to support the Navy’s flying mission. This program promotes land management practices to minimize bird attractants, and safety procedures to recognize,

control, and avoid hazardous bird concentrations. A critical part of the BASH Program involves disciplined reporting of bird strikes.

Candidate Species. Any species being considered by the Secretary of Interior or Commerce for listing under ESA as an endangered or a threatened species, but not yet the subject of a proposed listing.

Coastal State. A State of the United States in, or bordering on, the Atlantic, Pacific, or Arctic Ocean, the Gulf of Mexico, Long Island Sound, or one or more of the Great Lakes. The term also includes Puerto Rico, the U.S. Virgin Islands, Guam, and American Samoa.

Coastal Zone. An area specifically identified or otherwise delineated by a coastal State in its approved Coastal Zone Management Plan (CZMP). It is an area of coastal waters and adjacent shorelines strongly influenced by each other and in proximity to the shorelines of the several coastal States, including islands, transitional and intertidal areas, salt marshes, wetlands, and beaches.

Conservation. The prudent care, protection, and management of natural resources that best reflect sound resource stewardship for present and future generations.

Cooperative Agreement. A Cooperative Agreement is used to acquire goods or services or stimulate an activity undertaken for the public good. Cooperative agreements assume substantial involvement between the Federal agency and recipient during performance of the activity. Cooperative agreements may be used to accomplish work identified in the INRMP, and may be entered into with States, local governments, non-governmental organizations, and individuals to provide for the maintenance and improvement of natural resources on, or to benefit natural resources research on DOD installations. Agreements authorized by the Sikes Act (22-2.5) are not subject to the provisions of the Federal Grant and Cooperative Agreement Act, but must comply with the procedural requirements of the DOD Grant and Cooperative Agreement Regulations, reference (b). Funds approved for a particular fiscal year may be obligated to cover the costs of goods and services provided under a cooperative agreement during any 18-month period beginning in that fiscal year in accordance with the Sikes Act Improvement Act of 18 November 1997.

Critical Habitat. The geographic area on which are found those physical or biological features essential to the conservation of a species listed and published by the USFWS or NMFS under the authority of the ESA.

Ecological Reserve Areas. Those areas dedicated primarily or exclusively to preserving examples of ecosystems and genetic diversity and to scientific research and education on ecological and environmental problems.

Ecological Risk Assessment. A quantitative and/or qualitative appraisal of the actual or potential effects of a hazardous waste (HW) site on plants and animals other than people or domesticated species.

Ecosystem. A system formed by the interaction of a community of organisms with each other and the environment.

Ecosystem Management. Ecosystem management in DOD draws on a long-term vision of desired future ecological conditions, integrating ecological, economic and social factors. The goal of ecosystem management is to maintain and improve the sustainability and native biological diversity of ecosystems while supporting human needs, including the military mission.

Endangered or Threatened Species. A species of fauna or flora that has been listed by the USFWS, NMFS or the State for special protection and management under the ESA.

Environmentally and Economically Beneficial Landscaping. Landscaping, construction and design practices which support EO 13148, Greening the Government through Leadership in Environmental Management.

Essential Fish Habitat. (EFH) means the water and substrates necessary to fish for spawning, feeding, or growth to maturity.

Fish and Wildlife Management. Actions designed to preserve, enhance and regulate indigenous wildlife and its habitats, including conservation of protected species and non-game species, management and harvest of game species, BASH reduction, and animal damage control.

Forest Products. All plant materials in wooded areas that have commercial value.

Game Species. Fish and wildlife harvested per applicable Federal and State hunting and fishing laws.

Geographic Information Systems (GIS). An organized collection of computer hardware, software, and geographic data designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced data.

Global Ranking (G2). The Nature Conservancy, Natural Heritage Program Global and State Ranking System. G2 (G = global, 2= imperiled) identifies an ecosystem as imperiled because of rarity or because other factors demonstrably making it very vulnerable to extinction (typically 6-20 occurrences worldwide).

Grounds. All land areas not occupied by buildings, structures, pavements, and other facilities. Depending on the intensity of management, grounds may be classified as improved, as those near buildings, semi-improved, or unimproved.

Habitat. An area where a plant or animal species lives, grows, and reproduces, and the environment that satisfies its life requirements.

Installation Pest Management Coordinator The individual who has been appointed the responsibility of implementing the Integrated Pest Management Plan.

Integrated Pest Management Plan (IPMP) The IPMP is a long term planning document to guide the installation commander in the management of pesticide use and pest management operations to support the installation mission, while reducing the use of pesticides and adhering to regulatory requirements.

Integrated Natural Resources Management Plan (INRMP). The INRMP is a long term planning document to guide the installation commander in the management of natural resources to support the installation mission, while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity. The primary purpose of the INRMP is to ensure that natural resources conservation measures and military operations on the installation are integrated and consistent with stewardship and legal requirements.

Land Management. Programs and techniques to manage lands, wetlands, and water quality, including soil conservation, erosion control and nonpoint source pollution, surface and subsurface waters, habitat restoration, control of noxious weed and poisonous plants, agricultural outleasing, range management, identification and protection of wetlands, watersheds, floodplains management, landscaping, and grounds maintenance.

Military Housing Privatization Initiative Congress established the Military Housing Privatization Initiative (MHPI) in 1996 as a tool to help the military improve the quality of life for its service members by improving the condition of their housing. The MHPI was designed and developed to attract private sector financing, expertise and innovation to provide necessary housing faster and more efficiently than traditional Military Construction processes would allow. The Office of the Secretary of Defense has delegated to the Military Services the MHPI and they are authorized to enter into agreements with private developers selected in a competitive process to own, maintain and operate family housing via a fifty-year lease.

Multiple Use. The sustainable use of natural resources for the best combination of purposes to meet the long-term needs of the DOD and the public.

Natural Resources. Landforms, soils, waters, and their associated flora and fauna.

Natural Resources Manager. An individual who has been delegated the responsibility for implementing the INRMP.

Natural Resources Damage Assessment. The process of collecting and analyzing information to determine injury to, or destruction of, or loss of, natural resources, and the assessment of damages for that injury, including the costs of assessing the injury, loss or destruction resulting from a past or present hazardous substance (HS) release or oil spill.

Natural Resources Management Procedural Manual (NRMPM). Reference (a), which provides comprehensive guidance for implementing requirements of pertinent laws, EOs, and Federal regulations, DOD directives, SECNAV and OPNAV instructions.

Natural Resources Management Professional. Individual with an undergraduate or graduate degree from an accredited university in a natural resources-related science and who has the responsibility for managing natural resources on a regular basis.

Non-game Species. Fish and wildlife species not classified as game species and that are not harvested for recreation or subsistence purposes.

Nonpoint Source (NPS) Pollution/Polluted Runoff. Pollution caused by diffuse sources that are not regulated as point sources; normally associated with runoff from construction activities, urban, agricultural and silvicultural runoff, and other land disturbing such as military training and operations that disturb lands, soils, and waters. NPS pollution can result from stormwater runoff, precipitation, atmospheric deposition, or percolation.

Noxious Weeds. Plant species identified by Federal or State agencies as requiring control or eradication.

Off-road Vehicle. A vehicle designed or used for recreational travel on natural terrain. The term excludes a registered motorboat confined to use on open water and a military, emergency, or law enforcement vehicle during use by an employee or agent of the government or one of its contractors in the course of carrying out their tasks.

Outdoor Recreation. Program, activity, or opportunity dependent on the natural environment. Examples are picnicking, bird-watching, hiking, wild and scenic river use, hunting, fishing, and primitive camping that will not impair or degrade natural resources.

Outdoor Recreation Management. Management of natural resources to provide recreation opportunities that are sustainable, within the military mission, within established carrying capacities, and consistent with the natural resources upon which they are based.

Projects, INRMP-related. Includes studies, plans, surveys, inventories, and land/water treatments as well as physical improvements, minor construction, and public relations described in the INRMP.

Proposed Species. Any species of fish, wildlife or plant that is proposed in the Federal Register to be listed under section 4 of the ESA.

State Listed Species. Any species of fish, wildlife, or plant protected by an appropriate State agency as issued in a State's endangered species law and other pertinent regulations.

Stewardship. The responsibility to inventory, manage, conserve, protect, and enhance the natural resources entrusted to one's care in a way that respects the intrinsic value of those resources, and the needs of present and future generations.

Sustainable Yield. Production of renewable natural resources at a level such that harvest or consumptive use does not exceed net growth.

Watchable Wildlife Program. A national program designed to promote viewing areas for the American public to observe, experience and enjoy native North American wildlife and habitat.

Watershed. The ridge or crestline dividing two drainage areas; the area drained by a river or stream.

Wetlands. Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, such as swamps, marshes, and bogs.

APPENDIX F AGENCY COMMENTS

F.1 United States Fish and Wildlife Service Comments



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chicago Ecological Services Field Office
1250 South Grove Avenue, Suite 103
Barrington, Illinois 60010
Phone: (847) 381-2253 Fax: (847) 381-2285

IN REPLY REFER TO:
FWS/AES-CIFO/7-FA-0163

November 20, 2006

Mr. Bob Vanbendegom
NAVSTA Environmental Division
605 Clark Avenue
Great Lakes, Illinois 60088-2801

Thank-you for the opportunity to review the preliminary draft (2006) of the Integrated Natural Resource Plan (INRP) for the Naval Station Great Lakes (NSGL). Under the Sikes Act Improvement Act of 1997 (SAIA), the Secretary of each military department is required to prepare and implement an integrated natural resources management plan for each military installation in the United States. The purpose is to provide for effective stewardship and management of land and water resources, and to promote outdoor recreation and education under the requirements of SAIA, while meeting the needs of the military mission of NSGL.

We have reviewed the preliminary draft (2006) of the INRP for the NSGL and it provides a thorough assessment of the natural features and amenities within NSGL. In addition, this document constructs the framework for measuring success of the target management actions at NSGL.

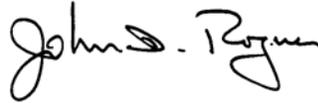
A review of impacts of invasive species within the urban forest was included. In the discussion of biological means to control gypsy moths, several alternatives are suggested one of which is the use of *Bacillus thurengiensis* var. *kurstaki*. This biological pesticide is not specific to gypsy moths. Using this method may affect unknown populations of the Karner blue butterfly (*Lycaeides melissa samuelis*), a federally listed species, or the known pollinator (*Sphinx eremitus*) of the federally threatened eastern prairie fringed orchid (*Platanthera leucophaea*). If the need arises for this biological method to be implemented to control gypsy moth larvae, you should coordinate with us early so we can work together to minimize impacts to listed species and comply with section 7 of the Endangered Species Act.

Mr. Bob Vanbendegom

2

If you have any questions, please contact Ms. Cathy Pollack at 847/381-2253 ext. 20, or Ms. Karla Kramer at 847/381-2253 ext. 12.

Sincerely,

A handwritten signature in black ink that reads "John D. Rogner". The signature is written in a cursive style with a large, stylized "J" and "R".

John D. Rogner
Field Supervisor

F.1.1 NSGL Response to USFWS

NSGL will coordinate any Gypsy Moth suppression projects with USFWS.

F.2 Illinois Department of Natural Resources Comments

-----Original Message-----

From: KEITH SHANK [<mailto:KEITH.SHANK@illinois.gov>]

Sent: Friday, December 15, 2006 15:32

To: Vanbendegom, Robert N CIV

Subject: INRMP Revision

Hi, Bob,

I finally got around to reviewing the INRMP plan. I have the following comments/corrections to offer; otherwise it looks really good. What else do you need from me?

Section 2.8.1 Endangered and Threatened Species

Table 2-1, Also in Appendix B

1. The Pied-Billed Grebe was de-listed by Illinois in 2004.
2. The Brown Creeper was de-listed by Illinois in 2004.
3. The Cerulean Warbler was listed by Illinois as "Threatened" in 2004.
4. Note: Table B-6 documents the Cerulean Warbler as a migrant at NSGL. It is doubtful the Station contains suitable breeding habitat for this species.
5. Table B-6 lists the Black-Crowned Night Heron, *Nycticorax nycticorax*, as breeding at NSGL. This species is listed by Illinois as "threatened" and so should appear in Table 2-1. Documentation supporting the breeding record should be submitted to the Natural Heritage Database Manager at IDNR so an occurrence record can be established in Springfield. This species is not currently shown in IDNR records as breeding at NSGL.

Table 2-2 Also in Appendix B

6. Green Sedge, *Carex viridula*, is listed by Illinois as "threatened" rather than "endangered."
7. Note: IDNR has a 2001 record for the State-listed endangered Richardson's Rush, *Juncus alpinoarticulatus*, in the panne community at NSGL. This species is missing from the table.

Invertebrates

8. The specific host plant for the Karner Blue Butterfly is the Lupine. You might wish to note whether this plant species is present or absent from NSGL floral surveys when discussing the probability of occurrence of the Butterfly on-station. The Appendix B inventory does not include any lupines.

Mammals

9. The Gray Wolf, *Canis lupus*, is federally-listed as "endangered" in all counties of Illinois, and is listed by Illinois as "threatened." The FWS has proposed de-listing the Gray Wolf north of Interstate-80, but under the 2006 proposal it would remain listed as "endangered" south of I-80 in Illinois. Because Illinois law does not provide for differential listing within the State, it would remain State-listed as "threatened" (or perhaps be upgraded to "endangered") in Lake County even if de-listed by the FWS.

On February 18, 2005, a Gray Wolf was road-killed in Lake County on Rt. 173 at the Fox River, within 20 miles of NSGL. This was an adult male wolf dispersing from Wisconsin origins. In March 2006, another wolf was shot in Pike county, IL, more than 200 miles south of Wisconsin. A third wolf was shot in Marshall County in 2002, about one hundred miles south of the State line. Wisconsin wolf numbers have increased by about 10% per year over the last few years, and at any given time 10-15% are thought to be individual dispersing animals, so occasional dispersing wolves can be expected to occur in Lake County from time to time. However, given the location of NSGL along the coast east of a highly-developed corridor, no wolves would be expected to occur there.

10. The River Otter was de-listed by Illinois in 2004.

Aquatic Species/Reptiles

11. The Longnose Sucker, *Catostomus catostomus*, State-listed as "threatened," has been documented within two miles of the NSGL harbor in Lake Michigan. This species ascends creeks to spawn, but has not been detected in the Harbor or Pettibone Creek, and the description of conditions in Pettibone Creek makes it appear unlikely this species would be present within the boundaries of the NSGL.

12. The State-listed threatened Cisco, *Corygonus artedi*, has been documented in Lake Michigan waters off Lake County, but it, too would be unlikely to enter the Harbor at NSGL.

13. The Eastern Massasauga Rattlesnake, *Sistrurus catenatus catenatus*, is a candidate for federal listing. It is listed by Illinois as "threatened." This species was last documented from Lake County in 1994 at a site along the Des Plaines River within ten miles of the NSGL. An extant population was documented in 2006 along the Des Plaines River in Cook County within 15 miles of the NSGL. Suitable wet grassland habitat is unlikely to be found anywhere on NSGL except for the golf course, but no Massasaugas have been reported along the Skokie River within the last 50 years or more.

Section 2.8.4 Fish and Wildlife

Mammals.

14. White-Tailed Deer. The discussion contains a reference to Elk and Moose. Hofmeister (1989) does not list Moose as an ungulate mammal that was ever indigenous to Illinois in historical times, and Elk were fairly eliminated from Illinois by the 1830's. The only Elk remaining in Illinois today are raised domestically as livestock. An associated reference to Michigan seems to indicate this part of the discussion is a cut-and-paste error from some other work. References to Moose and Elk should be deleted.

15. A photograph in the Plan shows a deer with an ear tag, indicating that some sort of study or management regime is in place, but this is not discussed. Because deer overpopulation is a well-known factor in the suppression of native vegetation from over-browsing, and deer management has become a pressing issued in many Lake County municipalities due to landscaping damage (and because at certain times of the year deer can attack people, enter buildings through windows and glass doors, and be involved in damage to vehicles through collisions) the management of the

number of deer present at NSGL warrants discussion. If no control is currently underway, the point at which control might be warranted (and its costs) may be an appropriate topic.

16. Coyote, *Canis latrans*. The Plan contains no discussion of the Coyote.

A recent study of urban coyotes in Cook County found high numbers of this animal in completely developed areas with very little cover where they were completely unexpected. The Village of Lincolnshire in Lake County recently let a contract for nuisance control of coyotes due to concerns generated by attacks on household pets. This animal is undoubtedly present at NSGL, and may pose a threat to the tern colony, along with Raccoon, Skunk, and Opossum, all of which deserve at least a brief mention if known to be present, perhaps in that context.

2.8.5. Vegetation.

17. The Illinois Noxious Weed Law lists Giant Ragweed and Common Ragweed as noxious within the limits of "any incorporated village, city, or town" and compels their eradication. NSGL clearly is not an incorporated municipality of the State of Illinois, so technically these plants are not noxious where present at NSGL but, in keeping with the general tenor of the plan, they may be worth discussing in terms of abundance and control, just as Canada Thistle is discussed. It is the ragweeds, not the goldenrods, primarily responsible for hayfever.

18. Poison Ivy, while not currently listed by Illinois as noxious, nevertheless certainly has a potential impact on the recreational suitability of natural areas at NSGL, as well as the potential to create "casualties" among unwary or unknowledgeable military personnel which may require medical attention, affecting fitness for duty and achievement of military missions. Therefore a discussion of its prevalence, threat, or control may be warranted.

4.1 RTE Species Goals

19. The second paragraph at the bottom of p. 82 repeats the 4+ 4 statement from earlier. The Gray Wolf has been documented in Lake County after 1999 and the Massasauga candidate species should be mentioned. (I could not locate the web-page listed; it may have been discontinued).

There need not be any goals relative to these two species, since no packs whose territories include Lake County exist and only the occasional "lone wolf" may be present in the County. The Massasauga has been documented in the last decade only from Cook County and appropriate habitat for it exists only in proximity to the golf course wetlands. Chances are very slim that any of these snakes exist on station.

4.3 Fish and Wildlife

20. Objective 7. I recommend you pay particular attention to species which can pose a threat to human health, become a nuisance, or pose a threat to the RTE Species: Norway Rat, Black Rat, Skunk, Raccoon, Coyote, Feral Cats. This may overlap with pest control programs, since action to reduce or control these populations may be warranted.

4.10 Migratory Birds

21. Recognizing that the Cerulean Warbler is now State-listed and was recently considered for federal listing (see listing decision at http://www.fws.gov/midwest/eco_serv/soc/birds/cerw/cerwFR12mnth.pdf) it might be appropriate to discuss habitat for this species.

I suspect it is unlikely that there is breeding habitat for this species on-station, and that individuals observed there are migrants moving along Lake Michigan.

4.11 Long Range Planning

22. The State Wildlife Plan does not address the effects of climate change, and the draft INRMP appears to assume no change in climatic conditions. I believe such assumptions are unwarranted, and that the allocation of resources to natural resource management should anticipate changes in climatic conditions which will affect management decisions.

I don't have a lot of company in IDNR on that score (so far) but we are seeing invasions of animals and plants from the south, and I think we will be seeing the departures of some from the north. One scientific paper I read four or five years ago anticipated a range shift in Illinois organisms on the order of 200 miles northward over the next century. That may be conservative, but even that is fast.

I think the greatest implication of such conclusions is that it is not worth trying to conserve species associated with the boreal forest ecosystem, because they will not be able to tolerate prevailing future climatic conditions. Best projections at this time are both hotter and drier, with perhaps harsher or highly-variable winters.

Many species in this category are already on the State endangered species list. I imagine they'll stay there until they disappear entirely, but the point is that attempts to conserve them will be wasted effort. I do not think that any of the panne species on station fall in this group, but such changes will affect the distribution of other wildlife, such as songbirds, and other trees and plants. When selecting landscaping species, for example, it might be wise to avoid plants which prefer cooler wetter climates in favor of those which do well in hotter drier ones.

If there is no climate change, having planed for it will cause no harm, whereas if it is considered, and does happen in some degree, managers and ecosystems on station will be better off. Just a thought.

23. It just occurred to me that the Giant Hogweed, *Heracleum mantegazzianum*, a federal Class A noxious weed, was found in Lake Forest this summer.

This is a really nasty exotic invasive plant whose sap produces severe burns and blisters on the skin when exposed to ultraviolet light. The Lake Forest plants were thought to be deliberately introduced as ornamentals at some time in the past, but the plant is classed as invasive and can produce tens of thousands of seed per season.

You might want to consider adding this for monitoring under the INRMP.

F.2.1 NSGL Response to Illinois Department of Natural Resources

1. Corrected table to reflect change.
2. Corrected table to reflect change.
3. Corrected table to reflect change.
4. Comment noted.
5. Changed status to threatened in the table. Documentation of the Black-Crowned Night Heron as breeding on NSGL does not exist. NSGL will remove breeding notation in table B.5 and will coordinate with the IL-DNR to determine if breeding stocks of the bird exist on the Station.

6. Corrected table to reflect change.
7. NSGL has no record of Richardson's Rush existing on the Station. NSGL will coordinate with IL-DNR to determine what records they have of the species' existence on the Station and will document the plant if it does exist.
8. The Karner blue butterfly is discussed in section 2.8.1. NSGL has no record of Lupine occurring in the plant inventory during any flora surveys.
9. Added a discussion of the Grey Wolf in section 2.8.1.
10. Corrected status of the River Otter in section 2.8.1.
11. Comment noted. If the Longnose Sucker is found in NSGL waters during future fish surveys the species will be addressed in a supplement to this Plan.
12. Comment noted. If the Cisco is found in NSGL waters during future fish surveys the species will be addressed in a supplement to this Plan.
13. Comment noted. If the Eastern Massasauga Rattlesnake is found on NSGL lands during future faunal surveys the species will be addressed in a supplement to this Plan.
14. Reference to moose, elk and Michigan were removed.
15. Comment noted. NSGL has no deer population survey or study underway. Ear tagged deer are believed to be deer involved in an IL-DNR survey that have migrated into the area. Current population levels of deer on NSGL are within acceptable levels. If future populations become problematic, NSGL will consult with IL-DNR on possible control strategies.
16. A discussion of Coyotes and other mammalian predators has been added to section 2.8.4.
17. A discussion of ragweed was added to section 2.8.5.
18. Comment noted. Poison Ivy is discussed as a pest management issue in the NSGL Integrated Pest Management Plan.
19. Corrected 4+4 statement. If new RT&E species are found on NSGL in the future the Station will address those species in a supplement to this Plan.
20. Comment noted.
21. Comment noted. If the Cerulean Warbler is found in NSGL during future bird surveys the species and its associated habitat will be addressed in a supplement to this Plan.

22. Comment noted.

23. NSGL will add Giant Hogweed to any future flora surveys.