INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. ARMY GARRISON
FORT KNOX, KENTUCKY

NATURAL RESOURCES BRANCH
ENVIRONMENTAL MANAGEMENT DIVISION
DIRECTORATE OF PUBLIC WORKS

June 2018

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. ARMY GARRISON
FORT KNOX, KENTUCKY

APPROVAL

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 USC. 670a *et seq.*) as amended in the National Defense Authorization Act of 2012; Department of Defense Instruction 4715.03 (*Natural Resources Conservation Program*); and Army Regulation 200-1, Environmental Protection and Enhancement, 13 Dec 07.

Patrick N. Kaune
Colonel, U.S. Army
Garrison Commander

25 JUNE 2018
Date

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. ARMY GARRISON
FORT KNOX, KENTUCKY

U.S. Fish and Wildlife Service
Kentucky Field Office
Frankfort, Kentucky

CONCURRENCE

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Virgil Lee Andrews, Jr.
Field Supervisor
U.S. Fish and Wildlife Service

Virgil Lee Andrews
6/26/18
Date

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U.S. ARMY GARRISON
FORT KNOX, KENTUCKY

Kentucky Department of Fish and Wildlife Resources
Frankfort, Kentucky

CONCURRENCE

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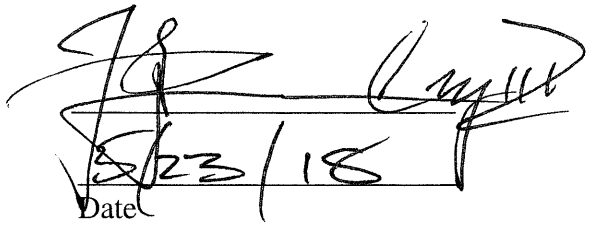
Frank Jemley, III
Interim Commissioner
Kentucky Department of Fish and Wildlife Resources



INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. ARMY GARRISON
FORT KNOX, KENTUCKY

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PREFACE

For over 100 years, Fort Knox (including Camp Knox) has trained Soldiers and other members of the United States Armed Forces in the skills needed to win on the battlefields of the world for the protection of our nation's people. The training opportunities provided at Fort Knox are first rate today, just as they have been over the decades. The U.S. Army Garrison, Fort Knox, Kentucky, is proud of its contribution to the defense of the United States of America.

The land and its natural resources are vital to the well-being of Fort Knox. A significant stewardship responsibility came with these public lands and Fort Knox is committed to that stewardship role. The land and its natural resources have improved over the years, and they will continue to do so. Our lands are critical to our military mission, the well-being of our community, and the nation's environmental health.

This Integrated Natural Resources Management Plan is Fort Knox's plan of action for the care and wise use of the lands entrusted to us. Fort Knox is committed to using an ecosystem management approach to its natural resources program. This approach will help us protect biological diversity and make smart decisions about using renewable natural resources to support both our military mission and the needs of our region.

Maintenance of abundant and diverse natural resources and a healthy environment is a commitment of Fort Knox, Kentucky.

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EXECUTIVE SUMMARY

PURPOSE

This Integrated Natural Resources Management Plan (INRMP) guides the implementation of the natural resources program for the U.S. Army Garrison, Fort Knox, Kentucky. The program helps to ensure the conservation of Fort Knox's natural resources while maintaining/emphasizing compliance with related environmental laws and regulations. This INRMP contains a 5-year work plan designed to meet goals and objectives outlined in the plan. This plan also helps to maintain quality training lands to accomplish Fort Knox's critical military mission.

SCOPE OF THE INRMP

This plan applies to organizations internal and external to Fort Knox that are involved with, or interested in, managing or using Fort Knox's natural resources. This includes active duty units, National Guard and Reserve Components, directorates, private groups, and individuals. This INRMP is intended to be an integral part of the Fort Knox Installation Master Plan.

RELATIONSHIP TO THE MILITARY MISSION

Fort Knox provides approximately 109,000 acres of high-quality, realistic training lands for the Army, Air Force, Navy, Marine Corps, National Guard, Coast Guard, Reserve forces, and military units of other nations. Fort Knox's training mission with regard to land use has changed as new weapon systems and tactics have been developed.

This INRMP is designed to support the military mission by protecting and enhancing the training lands upon which the mission is critically dependent. This INRMP also provides recreational opportunities associated with natural resources to the Fort Knox community. This supports the Fort Knox commitment to the Quality of Life and Communities of Excellence programs.

This INRMP includes impacts of the military mission on natural resources and a strategy to mitigate these impacts. However, this INRMP is not designed to evaluate Fort Knox's military mission nor is it intended to replace any need for environmental documentation of the military mission at Fort Knox.

ENVIRONMENTAL COMPLIANCE

The Sikes Act (16 USC. 670a *et seq.*) as amended in the National Defense Authorization Act of 2012, Department of Defense Instruction (DoDI) 4715.03 (*Natural Resources Conservation Program*), and Army Regulation (AR) 200-1 (*Environmental Protection and Enhancement*), 13 Dec 2007, require the preparation and implementation of this INRMP. In addition, this INRMP helps to ensure that the installation complies with all applicable federal and state laws related to natural resources.

This INRMP was developed in cooperation with, and has signatory approval of, the U.S. Fish and Wildlife Service (USFWS) and the Kentucky Department of Fish and Wildlife Resources (KDFWR), and in accordance with Department of Defense Manual (DoDM) 4715.03 (*INRMP Implementation Manual*). As a signatory, the USFWS acknowledges that this INRMP is in compliance with the Endangered Species Act.

This plan describes how Fort Knox will implement provisions of AR 200-1 and local regulations, most notably FK Reg 200-3 (*Fort Knox Hunting and Fishing Regulation and Procedures*), and AR 420-1 (*Army Facilities Management*).

ECOSYSTEM STATUS

Fort Knox is primarily an oak/hickory forest ecosystem interlaced with scattered grasslands, narrow streams, and broad river riparian ecosystems. In addition, the area's karst topography has created a system of underground tunnels and caves, many of which are unique aquatic ecosystems. Fort Knox has a wide variety of flora and fauna, including three federally-listed animal species.

PARTNERSHIPS

This INRMP cannot be implemented by Fort Knox alone. In accordance with an ecosystem management philosophy, Fort Knox is forging partnerships with various agencies to manage its natural resources. Partners in the implementation of this plan are the USFWS; KDFWR; U.S. Department of Agriculture, U.S. Forest Service; Kentucky Natural Lands Trust (KNLT), and Kentucky Division of Forestry (KDF). Other partners in this effort include the Lincoln Trail Area Development District (LTADD), The American Chestnut Foundation, The Nature Conservancy (TNC), various universities, and other federal and state agencies, as well as contractors and private citizens. Fort Knox will also actively pursue regional partnerships to sustain the environment needed for military training.

PLAN COMPONENTS

This INRMP describes Fort Knox's military mission in general terms, including the mission's impacts on natural resources. The plan describes Fort Knox's climate, land base, facilities, and natural resources, including a brief history of natural resources management on Fort Knox. It includes internal and external responsible or interested parties for managing natural resources, emphasizing Fort Knox's signatory partners, the USFWS and the KDFWR.

This INRMP emphasizes an ecosystem management approach to natural resources management. Ecosystem management allows natural resource decision makers to look at a broader picture when prescribing changes to the land without the pressure of generating revenue to support the programs. This change is consistent with current laws and Department of Army policies. Ecosystem management will continue to allow for the use of natural resources on Fort Knox for both military and other human-related values and purposes. However, ecosystem management has an overriding goal of protecting the properties and functions of natural

ecosystems. Since these ecosystems often extend beyond installation boundaries, management of Fort Knox's natural resources will include more emphasis on partnerships with its neighbors.

This INRMP is organized to promote ecosystem management. Ecosystem management chapters (3.0 through 5.0) deal with aspects of overall natural resources management: inventory and monitoring; protection and damage prevention; soil, water, and forest management; wildlife population management; research; enforcement; and awareness. Within these chapters are programs involving Integrated Training Area Management (ITAM), forest management, general fish and wildlife management, grounds maintenance, endangered species, noxious animal control, natural resources law enforcement, research programs, and overall conservation education. Additional chapters involve providing outdoor recreation associated with natural resources (emphasizing hunting and fishing), protecting cultural resources during natural resources management activities, using the National Environmental Policy Act (NEPA) to ensure wise use of our natural resources, and integrating natural resources within the Fort Knox environmental program. Chapter 5 discusses specific measures necessary to implement this plan.

This INRMP has been documented using NEPA procedures and policies. The attached Record of Environmental Consideration (REC) documents the overall effects of updating Fort Knox's INRMP (Appendix A).

PLANNED MAJOR INITIATIVES

This INRMP includes a description of ongoing natural resources programs and projects. Most of these programs will either be continued or completed (Appendix B). These include the following:

- Develop Forest Management prescriptions to convert stands/land management units of less desirable species to an oak/hickory forest type where appropriate and permitted by the trainers/G3/DPTMS.
- Manage timber volume through selective harvests to improve the quality of remaining desired trees.
- Improve the forest inventory process to capture data and information which will enhance the existing Geographic Information System (GIS) layer and ultimately enhance decision making.
- Enhance the prescribed burning program to reduce fuel loads, control/reduce the encroachment of undesirable species on training lands, improve wildlife habitat, encourage the oak/hickory component, and aid in the recovery of the native flora that occurs on the limestone hillside glade system and other early successional habitats.
- Reduce grounds maintenance to both improve wildlife habitat and reduce maintenance costs.
- Continue to monitor populations of endangered bats and improve bat habitat on the installation.
- Implement an urban tree planting program (Urban Forest Management Plan)
- Develop additional GIS layers or themes.

BENEFITS

Environmental Benefits: Implementation of this plan provides the basis to conserve and protect natural resources, reduce soil erosion and vegetation loss due to military activities, reduce the potential for environmental pollution, and improve water quality in riparian and aquatic ecosystems. Implementation will focus on improving the health of the forest ecosystem which in turn will enhance other adjoining ecosystems to support a wider diversity of plants and animals. Through annual surveys and ongoing research, managers will be able to stay abreast of changing conditions within the ecosystem and adjust strategies accordingly.

Military Mission Benefits: Implementation of this INRMP is designed to improve the quality of training lands while enhancing existing ecosystems. It will enhance mission realism through more options for training as well as more intensive planning of missions. It will improve the ability for long-range planning at Fort Knox.

Other Benefits: Troop environmental awareness will be enhanced while training at Fort Knox. Both community relations and Fort Knox's environmental image, internal and external to the DoD, will be enhanced. Plan implementation will decrease long-term environmental costs and reduce personal and installation liabilities caused by environmental non-compliance.

INRMP FUNDING

This INRMP identifies the natural resources management and conservation requirements necessary for sustaining viable ecosystems, the military mission, and compliance with relevant environmental laws (i.e., Endangered Species Act, National Environmental Policy Act, etc.). However, implementation of this INRMP is contingent upon the availability of funds. All requirements set forth in this INRMP requiring the expenditure of funds are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 U.S.C. Section 1341). No obligation undertaken by Fort Knox under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose. If funding does not meet the level needed for full implementation, projects and efforts will be prioritized based on importance for mission sustainability and statutory compliance.

SUMMARY

This INRMP presents a workable plan which will comply with environmental laws, conserve and enhance Fort Knox's natural resources, improve Fort Knox's relationship with the public, and enhance the military mission. This plan will not resolve all existing and/or future environmental issues. It does, however, provide a road map on the philosophy, personnel requirements, and means to minimize and work toward resolution of such issues.

1.0 OVERVIEW

"The Army will apply an ecosystem-based approach to manage natural resources and will collaborate with stakeholders to protect ecosystems"†

The Army's commitment to natural resources management is reflected in *The Army Strategy for the Environment: Sustain the Mission – Secure the Future* (2004) and AR 200-1 (*Environmental Protection and Enhancement*). The Army Strategy for the Environment establishes a long-range vision for a sustainable Army and outlines the goals required to achieve the vision. The Strategy is based on the principles of sustainability and transitions the Army's compliance-based environmental program to a mission-oriented ecosystem approach. AR 200-1 sets forth current Army policies, procedures, and standards for the conservation, management, and restoration of natural resources, while supporting the military mission.

The purpose of the Fort Knox INRMP is to comply with environmental laws and to conserve and protect Fort Knox's natural resources while supporting the military mission. Additionally, the plan serves as a planning tool for future projects and initiatives. This INRMP is a "snapshot" of current natural resources management and future initiatives to reach the installation's desired future condition. The INRMP is a living document and is intended to be reviewed and updated on a regular basis.

†Excerpted from *The Army Strategy for the Environment, "Sustain the Mission – Secure the Future"*.

1.1 Goals

Stewardship **-** To manage natural resources on Fort Knox to assure stewardship of the public lands entrusted to the care of the Army.

Military Readiness **-** To provide quality natural resources upon which to accomplish the military mission of Fort Knox.

Quality of Life **-** To improve the quality of life of the Fort Knox community through high quality natural resources based recreational opportunities.

Compliance **-** To comply with laws and regulations that pertain to the management of Fort Knox's natural resources.

Integration **-** To integrate the elements of natural resources which, in turn, are integrated into the Fort Knox environmental program and installation master plan.

1.2 Policies

The policies presented below represent general installation policies to attain each of the goals presented in Section 1.1. These policies also serve as a broad checklist to monitor the success of the plan. Finally, many policies presented below belong under more than one category. When this occurs, the most fitting category was chosen.

1.2.1 Stewardship

- Manage ecosystems to protect, conserve, and enhance native fauna and flora with an emphasis on increasing native biodiversity.
- Monitor and manage soils, vegetation, and wildlife on Fort Knox considering all biological communities and the values associated with these resources while making decisions.
- Provide economic and valued products of renewable natural resources when such products can be produced in a responsible and sustainable fashion without negative impacts on the military training mission or the ecosystem.
- Provide professional enforcement of natural resources related laws.
- Consider the surrounding community when making decisions within the Fort Knox natural resources program and involve them where possible.
- Ensure the Fort Knox natural resources program is coordinated with other agencies and conservation organizations with similar interests.

1.2.2 Military Readiness

- Sustain, enhance, and improve installation lands to support existing and projected military missions on Fort Knox.
- Maintain quality training lands through damage minimization, restoration, and mitigation.

1.2.3 Quality of Life

- Provide high quality opportunities for hunting and fishing within the biological and recreational carrying capacity of the resources.
- Provide for non-consumptive recreational uses of the natural resources.
- Provide conservation education opportunities.
- Support and enhance Fort Knox's Community of Excellence program.

1.2.4 Compliance

- Manage natural resources within both the spirit and letter of environmental laws, particularly the Sikes Act, as amended in the National Defense Authorization Act of 2012, upon which this INRMP is predicated.
- Emphasize the protection, restoration, and management of threatened and endangered species and wetlands.
- Use procedures within the National Environmental Policy Act (NEPA) to make informed decisions that include natural resources considerations and mitigation, when applicable.
- Implement this INRMP within the framework of Army policies and regulations.

1.2.5 Integration

- Ensure the implementation of this INRMP is in concert with the installation master plan and fully supports the military mission plans.
- Ensure the integration of, and consistency among, the various activities identified within this INRMP.
- Ensure this INRMP is consistent with and supports principles involved with Integrated Pest Management programs at Fort Knox.
- Coordinate the implementation of this INRMP with the operation of the overall Fort Knox environmental program.
- Use the natural resources program to support and enhance other elements within the Fort Knox environmental program.
- Provide command elements with the information needed to make decisions which include natural resources related values.

1.3 Responsible and/or Interested Parties

1.3.1 U.S. Army Garrison, Fort Knox, Kentucky

1.3.1.1 Commanding General

The Commanding General is directly responsible for the overall management of Fort Knox and for successfully carrying out Fort Knox's mission.

1.3.1.2 Garrison Commander

The Garrison Commander directs the overall management of Fort Knox's facilities and is responsible for implementing and enforcing this INRMP. As such, the Garrison Commander manages the installation's support agencies such as the Directorate of Public Works (DPW), Directorate of Emergency Services (DES), Logistics Readiness Center (LRC), Directorate of Human Resources (DHR), Directorate of Family and Morale, Welfare, and Recreation (DFMWR), Network Enterprise Center (NEC), and the Directorate of Plans, Training, Mobilization, and Security (DPTMS).

1.3.1.3 Directorate of Public Works

The DPW for Fort Knox is responsible for managing land, forest, and fish and wildlife resources. This directorate manages land to conserve flora and fauna, maintains training lands, and is responsible for installation compliance with federal and state environmental laws and regulations. DPW is the primary organization responsible for implementing this INRMP.

The DPW, Environmental Management Division (EMD) includes the Natural Resources Branch, which has the major responsibility for implementing this plan by managing the forestry and fish and wildlife programs.

1.3.1.4 G3/Directorate of Plans, Training, Mobilization and Security

The DPTMS is responsible for managing range complexes, coordinating military training, and releasing range areas for forest management, land rehabilitation, and recreational use.

The adoption of a conservation ethic into the overall military operations at Fort Knox is critical to successful natural resources management. The DPTMS will provide the control measures of military activities permitted in the training complex that are needed to conserve and protect natural resources. The ITAM program (Section 4.8) is responsible for maintaining the land to help the Army meet its training requirements by providing quality training lands. Range Branch, Training Division will be responsible for controlling access in order to implement this plan, to accomplish natural resources management, and to allow wildlife-related recreation.

EMD personnel gain access to the training areas via a daily clear-in/clear-out procedure. This process requires personnel to call (624-2125) the Firing Desk for access to a desired training area. The Firing Desk records the name of personnel requesting access, how many in his or her party, time, type of communications, and initials of the Firing Desk official. The process is repeated to clear-out the training area.

1.3.1.5 Directorate of Family and Morale, Welfare, and Recreation

The DFMWR promotes the organization and development of outdoor recreation activities such as shooting, camping, walking, running, and playground/picnic areas.

1.3.1.6 Directorate of Emergency Services

The Director of Emergency Services serves as the Chief Conservation Law Enforcement Officer on the installation and is responsible for enforcing hunting and fishing regulations and assisting in domestic animal control functions. The Director is supported by 2 full-time Conservation Law Enforcement Officers.

1.3.1.7 Other Installation Organizations

Implementing this INRMP also requires the assistance of other installation directorates and groups. These other directorates will have a lesser role than those identified above. Such support organizations include the LRC (supply and transportation), Directorate of Resources Management (budget, personnel, and equipment authorizations), Directorate of Contracting (purchasing), Public Affairs Office (PAO, public awareness programs), and Staff Judge Advocate (legal assistance).

1.4 Other Defense Organizations

1.4.1 Installation Management Command

The Installation Management Command (IMCOM) was activated October 2002 to standardize and streamline the management system utilized to manage U.S. Army installations.

IMCOM is divided into five functionally-aligned directorates and is designed to increase efficiency and improve mission command through unity of purpose, a smaller number of garrisons to manage, and similar demographics of communities. It also helps solve functional challenges for garrison commanders, coordinate IMCOM HQ support, and drive/assess garrison execution of service delivery. Fort Knox is aligned under the Training Directorate.

1.4.2 Army Environmental Command

The Army Environmental Command (AEC) is a subordinate command of IMCOM and provides installations and commands the knowledge, tools, and programs to support ready and resilient Soldiers by balancing military training with sound environmental practices. IMCOM and AEC reviews Fort Knox's natural resource programs every 3 years through the Environmental Performance Assessment and Assistance System (EPAAS).

1.4.3 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE), Louisville District assists Fort Knox with timber sales. The USACE prepares and administers contracts for harvest upon receiving Timber Reports of Availability statements from Fort Knox. Fort Knox also works with the USACE, Huntsville Division, which is the home of the Mandatory Center of Expertise for Range Design. The Fort Knox Training Division is required to collaborate with the Center on all range designs, construction, and revitalization of lands.

1.5 Other Federal Agencies

1.5.1 U.S. Fish and Wildlife Service

In accordance with the Sikes Act, the U.S. Fish and Wildlife Service (USFWS) is a signatory cooperator in implementing this plan. Major cooperative efforts with the USFWS involve endangered species, migratory bird, and wetlands management. Fort Knox, the USFWS, and the Kentucky Department of Fish and Wildlife Resources (KDFWR) have signed a Cooperative Plan Agreement for managing Fort Knox's natural resources (Appendix C).

1.5.2 Additional Federal Agencies

Personnel from the Daniel Boone National Forest occasionally assist Fort Knox on issues related to cultural resources and forest management. Additional assistance has been in the area of prescribed and wildfire training.

1.6 State Agencies

1.6.1 Kentucky Department of Fish and Wildlife Resources

In accordance with the Sikes Act, the KDFWR is a signatory cooperator in implementing this plan. It is also the primary state agency that provides assistance in the management of fish and wildlife on Fort Knox.

1.6.2 Kentucky State Nature Preserves Commission

The Kentucky State Nature Preserves Commission (KSNPC) performed field investigations on Fort Knox for rare, threatened, and endangered species of plants and animals and developed a management plan for a limestone hillside glade system on Fort Knox in 1993. KSNPC also provides occasional botanical expertise on the installation.

1.6.3 Kentucky Division of Forestry

Best management practices (BMPs) for timber harvest operations to protect water quality have been developed by the KDF. Fort Knox utilizes these practices when performing timber harvests. The KDF also participates in the annual Fort Knox Arbor Day and Earth Day Programs. KDF also provides wildfire control in extreme fire situations when requested by the installation.

1.7 Universities

The University of Kentucky, University of Tennessee, Virginia Polytechnic Institute and State University, University of Louisville, and Murray State University have assisted Fort Knox's natural resources program and have had cooperative research interests with Fort Knox. The University of Kentucky and University of Louisville also assist with the curation of installation cultural resources.

1.8 Contractors

Fort Knox uses contractors for many programs relevant to the INRMP. Services provided include natural resources assessment and documentation, NEPA documentation, endangered species surveys, aerial photography surveys, computer support, cultural resources surveys and management, and timber harvests. Contractors are also used for invasive species eradication, timber stand improvement, and range projects.

1.9 Other Interested Parties

The Kentucky Natural Lands Trust (KNLT) is the primary non-governmental conservation organization with interests in the Fort Knox natural resources program. KNLT, in partnership with the USFWS, provides services and funding through the Imperiled Bat Conservation Fund to conserve and restore summer and winter bat habitat and for research and monitoring.

The Nature Conservancy (TNC) assists with prescribed burning training for EMD Natural Resources Branch, Range Branch, and DES personnel.

Fort Knox has cooperated with The American Chestnut Foundation to provide American chestnut seedlings for their chestnut restoration program. The long-term goal of the program is the establishment of self-sustaining populations of American chestnuts which once covered approximately 200 million acres of eastern forests.

2.0 CURRENT CONDITIONS AND USE

2.1 Location

Fort Knox is located in north-central Kentucky, approximately 31 miles south of Louisville, Kentucky and 17 miles north of Elizabethtown, Kentucky. The town of Radcliff is located on the southwestern boundary of the installation, Lebanon Junction on the southeastern boundary, Shepherdsville to the northeast, and Muldraugh to the northwest. Fort Knox is located in portions of Bullitt, Hardin, and Meade Counties (Appendix D, Figure 1).

2.2 Acreage and Facilities

Prior to military ownership, the Fort Knox area consisted of primarily prairie and woodland. Timber was cleared by landowners and harvested and the areas most suitable for agriculture were extensively farmed. When the U.S. became involved in World War I, approximately 40,000 acres south of West Point, Kentucky were purchased in June 1918 to establish Camp Knox, an artillery training center. In 1940, the Armored Force was created and headquartered at Fort Knox. During the 1940s, approximately 60,000 additional acres were acquired to accommodate the growing training needs of the installation.

Today, Fort Knox encompasses approximately 108,715 acres (169.9 square miles), with 6,400 acres of cantonment area and other improved grounds, 1,000 acres of semi-improved grounds, and 100,000 acres of range land (maneuver and impact areas). The training complex is comprised of approximately 56,000 acres of range and impact areas and 45,000 acres of maneuver training areas. The installation also has a 405-acre ammunition storage area.

Fort Knox has a well-developed road system, with 175 miles of paved roads and 79 miles of unpaved roads (Appendix D, Figure 2).

2.3 Projected Changes in Facilities

Few changes in facilities are projected that will have major negative impacts on natural resources management during the next 5 years. Future projects that may take place in the cantonment area are: renovation and/or demolition of barracks, demolition of old family housing, and construction of new family housing.

2.4 Installation History

In 1918, during World War I, Camp Knox was established as an artillery training center. From 1922 through 1931 Camp Knox was used primarily as a training center for the 5th Corps, reserve officers, Citizens' Military Training Camps, and National Guard. In 1925 the area was designated as Camp Henry Knox National Forest. This status was terminated in 1928 when two infantry companies were assigned to the camp. In 1931, the first elements of Mechanized Cavalry came to Camp Knox for training. The post became a permanent installation as Fort Knox the following year.

In 1940, the Armored Force School and Armored Force Replacement Center were established and Fort Knox remained the “Home of Cavalry and Armor” for seven decades. The Cold War helped secure the Armor Branch’s role in the Army and the Armor Center continued to fulfill the role of producing capable and highly trained armor personnel. By the late 1960s, more than one million trainees had completed one or more training programs in the Fort Knox Training Center since its inception in 1940. Today, after the 2005 BRAC transformation its mission includes the U.S. Army Cadet Command, Human Resource Center of Excellence (HRCoE), Army Recruiting Command, 3rd Expeditionary Sustainment Command, and the 19th Engineer Battalion. These units, along with the 84th Training Command, 11th Aviation Command, Ireland Army Community Hospital, and other "Partners in Excellence" make Fort Knox the most multi-functional military base in the United States Army. The post has a daytime population of about 23,100 soldiers, civilian employees, and family members.

2.5 Neighbors

Fort Knox’s neighbors are small communities and numerous private landowners. The neighboring towns include Radcliff, Muldraugh, West Point, Lebanon Junction, Colesburg, Shepherdsville, and Vine Grove. A small portion of the installation boundary is shared with Otter Creek Outdoor Recreation Area, which is owned by the KDFWR. These small private landowners and numerous small towns add to the complexities of an integrated natural resources management approach.

2.6 Jurisdiction

As related to natural resources, Fort Knox has 100 percent (%) exclusive jurisdiction. Natural resources law enforcement on the installation can only be performed by enforcement officers with federal commissions.

2.7 Satellite Installations

Fort Knox provides assistance and support to government Reserve Centers within the Region, including, Indiana, Ohio, Tennessee, and Kentucky. This INRMP does not address these Reserve Centers.

2.8 Natural Resources

The Fort Knox area has a temperate, continental climate of the dry, sub-humid type. Rapid changes in temperature, humidity, cloud cover, wind, and precipitation are common. Changes between seasons are usually gradual. Winters are generally mild. Spring, the most variable season, brings the heaviest rainfall and the greatest number of severe local storms. Summers are long with maximum temperatures only occasionally reaching above 100 degrees Fahrenheit (ºF) and humidity is generally high. Fall is normally a season of sunny days and cool nights. Severe storms occasionally occur in September and October. Strong winds are significant from late winter through early summer.

The topography of Fort Knox ranges from flat, alluvial floodplains along rivers to rugged knobs and broad ridge tops, narrow valleys, and steep to sloping cliffs. Bottomland along rivers

and creeks is level to gently sloping. Most of the installation lies within a rolling to hilly landscape featuring a karst topography of intermittent sinkholes, outcropping knobs, and narrow steep ridges, sinking streams, caves, and other karst features. A steep escarpment, known as Muldraugh's Hill, runs northwest to southeast through Fort Knox. Elevations on Fort Knox vary from 380 feet along the banks of the Ohio River near Hughes Landing to 990 feet at Dawson Knob (Dames and Moore 1979).

The Knobstone Escarpment and the area of Fort Knox falling northeast of Salt River are capped with St. Louis limestone but are underlain by the Borden Formation, which is composed of erodible shales (Kepferle 1977). Narrow ridges and knobs of the area further east are capped with an acidic siltstone of the Borden Formation (Kepferle 1977). Floodplains of the Ohio and Salt Rivers are composed primarily of fine to coarse alluvial and lacustrine deposits, 10 to more than 80 feet in depth (Kepferle 1977).

Landscape west of the escarpment is composed primarily of rolling uplands with numerous sinkholes and depressions (Quarterman and Powell 1978). The St. Louis and St. Genevieve limestone formations are the predominant bedrock in this region.

2.8.1 Soils

2.8.1.1 Soil Descriptions

A wide range of soil types are present on Fort Knox due to the size of the military installation, the varied topography, and the diverse geology of the parent materials from which the soils developed.

There are two primary soil associations that make up the Bullitt County portions of the installation. These soil associations include McGary-Markland and Garmon-Crider (Whitaker and Waters 1986). Most of the soils developed from weathering of the underlying limestone, shale, and siltstone units and are typically fine-grained. The soils of this area are moderately deep, with the thickest soils found on gently sloping or undulating uplands. In general, the soils that characterize the Bullitt County area are susceptible to erosion due to the steep slopes and complex drainage patterns. Nolin-Otwell-Sensabaugh and Trappist-Lenberg-Carpenter soil associations are found in small areas on the far northern and southeastern boundaries of the installation in Bullitt County (Whitaker and Waters 1986).

The primary soil associations found in Hardin County on the installation include Crider-Vertrees-Nicholson, Garmon-Caneyville-Lenberg, and McGary-Markland-Nolin (Arms et al. 1979). The Crider-Vertrees-Nicholson association is made up of wet soils with limited root depth penetration and susceptibility to erosion. Parts of the association are karsts, where water is funneled into sinks and depressions. The Garmon-Caneyville-Lenberg association is made up of steep slopes and moderate depth of bedrock. This association consists of very steep to moderately steep soils on narrow ridges and valley walls. Some of the soils are located on the Muldraugh Escarpment. The McGary-Markland-Nolin association is made up of wet soils which are susceptible to flooding and soil erosion. These soils are located on broad flats on stream terraces, in narrow strips of rolling topography, and on narrow flood plains (Arms et al. 1979).

Meade County has three soil associations found on Fort Knox. These soil associations include Elk-Huntington-Wheeling, Riney-Lily-Gatton, and Baxter-Hammack-Crider (Haagen 2001). Elk-Huntington-Wheeling association is made up of soils with a high potential of erosion on steeper slopes and susceptibility to flooding on terraces. The soils are on nearly level to sloping stream terrace flats, moderately steep to very steep stream terrace side slopes, and nearly level flood plains. These soils are found along the Ohio River and its major tributaries. Riney-Lily-Gatton association is made up of soils which are moderately steep and have a high potential for woodland growth. They are found on steep to sloping side slopes dissected by intermittent drainage ways and gently sloping, narrow ridgetops. These soils have a potential for erosion. The Baxter-Hammack-Crider association is the most common soil association found on Fort Knox in Meade County. These soils are very deep and well drained, have a potential for erosion, and shrink-swell is common. The topography is undulating to steep karst, and most of the drainage goes into sinkholes (Haagen 2001).

2.8.1.2 Soil Erosion and Sediment Component

Fort Knox soils, in general, are susceptible to erosion when cleared of vegetation. The installation's topography and complex drainage systems contribute to erosion and sedimentation issues on the installation. Training areas that are of particular erosion concern are regularly used bivouac sites, commonly used firing points or other assembly areas, unimproved creek crossings, and roads and trails in shallow rocky soils. Timber harvesting operations also contribute to erosion issues, however, harvesting is conducted in accordance with all applicable U.S. Army regulations, federal and state laws, and forestry BMPs to ensure erosion is prevented to the greatest extent possible and that water quality is preserved.

The ITAM program has a training area management plan (Appendix J) that is updated annually and emphasizes applying effective BMPs and conservation practices to control erosion and sedimentation on the installation. Under the ITAM program, maneuvering land is being rehabilitated with the goal of controlling excessive erosion on affected acreage in training areas to provide safe and effective training lands. Grading, seeding, mulching, and BMP installation (check dams, rock-lined channels, etc.) are the primary means of controlling erosion. Construction and maintenance of low-water crossings on Maneuver Access Trails and/or other areas within the training areas, as determined through unit training scenarios and maneuver patterns, is also being conducted. Crossings are constructed primarily with CC70 or CC45 cable concrete or suitable, like material(s).

2.8.2 Water Resources

2.8.2.1 Surface Water

Fort Knox is drained by the Salt River, Otter Creek, and small streams that flow directly into the Ohio River at the northwestern end of the installation (Appendix D, Figure 3). With the exception of the Salt River, Rolling Fork River, Mill Creek, Otter Creek, and Cedar Creek, most streams on Fort Knox flow intermittently. Uplands on both sides of the Salt River are drained by numerous streams, most of which are small with undeveloped watersheds. There are 32 ponds/lakes and 55 miles of streams on the installation.

A number of small impoundments have been built on Fort Knox. Ponds and lakes range in size from 1 to 75 acres. Important lakes and ponds include Lower Douglas (75 acres), Duck Lake (41 acres), Sanders Spring (16 acres), Upper Douglas (12 acres), and Carlson (14 acres). Fort Knox drainages, including lakes and ponds, have been digitized for GIS use and are available via the Geo-Spatial Lab, DPW.

2.8.2.2 Groundwater Resources

Dames and Moore (1979) report large quantities of groundwater available at Fort Knox. Alluvial deposits in the Ohio River floodplain produce the most groundwater from Quaternary sand and gravel, which are 80 to 150 feet thick. Recharge is from infiltration of Ohio River water.

Another important source of groundwater is interbedded limestone and dolomite in the St. Louis Limestone. This formation is more than 230 feet thick in the Fort Knox area. Recharge is mostly from precipitation and subsequent infiltration into subterranean solution channels through sinkholes.

Small quantities of water are available from a diverse lithologic unit made up of the Mooretown Sandstone, Salem and Harrodsburg Limestones, and several members of the Borden Formation. This 300- to 600-foot thick unit is recharged by precipitation and infiltration of surface water.

Meager quantities of groundwater are available from thin alluvial deposits along major stream valleys. These clay and silt deposits are well drained and retain little or no water.

2.8.2.3 Wetlands

An on-site survey of potentially jurisdictional wetlands, exclusive of the impact area, was conducted by the USFWS in 1994. The report generated from the USFWS survey, *The Wetlands of Fort Knox Military Reservation* (Merritt and Carter 1994), describes the wetlands identified on-site and provides recommendations for the protection and enhancement of Fort Knox wetlands. The report also notes that a major threat to wetlands, streams, and rivers is erosion and resulting sedimentation caused by mounted maneuver training activities. Additional wetland surveys have been conducted for individual range construction projects on Cedar Creek, Yano, and Boydston Ranges. Data from the National Wetlands Inventory (NWI) mapping and the 1994 on-site survey are discussed in more detail in the Section 2.8.5.1 of this INRMP and in the REC (Appendix A).

2.8.2.4 Floodplains

Fort Knox is located in portions of Bullitt, Hardin, and Meade Counties. Bullitt and Hardin counties participate in the National Flood Insurance Program and have the location and extent of the 100-year flood plains identified on the Flood Insurance Rate Maps. Both Bullitt and Hardin counties show 100-year flood plains as occurring within Fort Knox (Appendix D, Figure 3). According to Executive Order 11988 (*Floodplain Management*), Executive Agencies, including

the military departments, are required to determine whether a proposed action will occur in a flood plain.

The Salt River is a major drainage that enters the Ohio River just northwest of the installation. The 100-year flood plains of the Salt River, Mud Creek, Pond Creek, and Cedar Point Branch which are tributaries of the Salt River, traverse portions of the installation (Bullitt County 1997). Also, the 100-year flood plains of Mill Creek, Rolling Fork, and Flat Lick traverse portions of the installation (Hardin County 1997). The flood plains of the Salt River and its major tributary, the Rolling Fork River, intersect the impact area. These low lying flood plain areas are subject to flooding. This can be severe when flooding of the Ohio River causes upstream flooding along the Salt and Rolling Fork Rivers. In flood conditions, some training areas are not useable or have restricted accessibility.

2.8.3 General Habitat

Generally, flora on Fort Knox indicates a history of disturbance-related activities. Historically, Fort Knox was comprised of woodland traversed by a series of ravines and stream drainages. A mosaic of prairie grasslands and oak-hickory forests covered a portion of the Fort Knox area referred to as the "Big Barrens" (Quarterman and Powell 1978). Today, only scattered remnants of this former prairie persist. Prior to military occupation, landowners harvested the best commercial-grade timber, and most areas suitable for agriculture were cleared and farmed. As a result of high grading, different shade tolerances of trees, and forest fire prevention, many forested areas on the installation have succeeded to more shade tolerant and currently less commercially valuable species such as sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*).

Predominant plant species of the cantonment area are Kentucky bluegrass (*Poa pratensis*) and fescue (*Festuca* spp.). On lands outside of the cantonment area, vegetation types vary widely. Many species of shrubs, forbs, and vines, as well as a combination of introduced species such as tall fescue (*F. arundinacea*), Korean lespedeza (*Lespedeza stipulacea*), sericea lespedeza (*L. cuneata*), and ladino clover (*Trifolium repens*), provide ground cover for disturbed or unseeded areas on level to rolling sites.

The mixed upland hardwood forest comprises at least 60% of the current woodland area. This forest type occurs almost entirely on ridge tops and south-facing slopes. Other hardwood forest types are found primarily in coves and on north-facing slopes. Primary species in order of highest volume from the last forest inventory include, yellow-poplar (*Liriodendron tulipifera*), white oak (*Quercus alba*), red oaks (*Q. rubra*), sugar maple, sycamore (*Platanus occidentalis*), black oak (*Q. velutina*), white ash (*Fraxinus americana*), hickory (*Carya* spp.), red/silver maple (*A. rubrum/saccharinum*), black cherry (*Prunus serotina*), black walnut (*Juglans nigra*), chestnut oak (*Q. prinus*), eastern red cedar (*Juniperus virginiana*), chinkapin oak (*Q. muehlenberghii*), American beech, eastern cottonwood (*Populus deltoides*), and numerous other species with minimal volumes.

Pertinent literature includes *Floras of Meade and Hardin Counties* (Davis 1955 and Cranfill 1991, respectively) and a *Floristic study of Fort Knox* (Johnson et al. 1991). *Reidentification and Verification of the Fort Knox Vascular Plant Collection compiled by the Oklahoma Biological*

Survey, 1990-1992, by Max Medley, Associate Curator of Davies Herbarium, University of Louisville, May 1994. Other studies include Holbert (1937), Lovell (1946), and Krumholz (1971). Bryan and MacGregor (1982) conducted a rare species survey of Fort Knox in 1982 through 1983 (White et al. 1994).

2.8.4 Threatened, Endangered, and Other Sensitive Species

2.8.4.1 Plants

Following a preliminary literature review, KSNPC performed a survey in 1992 through 1993 to locate sensitive plant species on the installation. The survey did not identify any federally-listed species, however, nine KSNPC special-concern plant species were found (Table 2-1). Seven species that potentially occur on Fort Knox due to their presence near the reservation or similarities in habitats to those that do occur on the reservation were also discussed in the survey (Section 2.8.4.3). A threatened and endangered plant survey was updated in 2004 and 2005 by the Environmental Laboratory, U.S. Army Engineer Research and Development Center, Vicksburg, MS. The survey revealed no new species from those found in the KSNPC report in 1994. Management considerations for rare, threatened, or endangered plant species are discussed in Section 5.4.2.

Table 2-1. Rare, threatened, or endangered plants found on Fort Knox.

Common Name	Scientific Name	Confirmed on Fort Knox	KSNPC Status‡
Butternut/White walnut	*Juglans cinerea*	Yes	T
Blue mud-plantain	*Heteranthera limosa*	Yes	S
Eggleston's violet	*Viola septemloba var. egglestonii*	Yes	S
Alleghany stonecrop	*Sedum telephioides*	Yes	T
Compass plant	*Silphium laciniatum var. laciniatum*	Yes	T
Great plains ladies'-tresses	*Spiranthes magnicamporum*	Yes	T
Large sedge	*Carex gigantea*	Yes	E
Drooping bluegrass	*Poa saltuensis*	Yes	E
Tall beaked-rush	*Rhynchospora macrostachya*	Yes	E

‡State ranks are determined by the Kentucky State Nature Preserves Commission: E—endangered; T—threatened; and S—special concern.
Sources: White et al., 1994, Martin et al. 2005, and listings provided by the Kentucky State Nature Preserves Commission, May 1996.

2.8.4.2 Animals

An endangered species survey was performed during 1992 through 1993 by KSNPC (White et al. 1994). This survey identified several federally- and state-listed species of animals on Fort Knox (Table 2-2). As required by AR 200-1, a threatened and endangered species survey was conducted in 2004 and 2005 by the Environmental Laboratory, U.S. Army Engineer Research and Development Center, Vicksburg, MS. There were no species found that were not previously known to exist on the installation.

Table 2-2. Rare, threatened, and endangered animals found on Fort Knox.			
Common Name	**Scientific Name**	**State Status**	**Federal Status**
Northern long-eared bat	*Myotis septentrionalis*	Endangered	Threatened
Gray bat	*M. grisescens*	Endangered	Endangered
Indiana bat	*M. sodalis*	Endangered	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Threatened	---
Henslow's sparrow	*Ammodramus henslowii*	Special Concern Species	---
Cerulean warbler	*Dendroica cerulea*	----	---
Sharp-shinned hawk	*Accipiter striatus*	Special Concern Species	---
Northern cavefish	*Amblyopsis spelaea*	Special Concern Species	---
Cave crayfish	*Orconectes inermis*	Threatened	---
Gray treefrog	*Hyla versicolor*	Special Concern Species	---

Sources: White et al. 1994, Martin et al. 2005, and listings provided by the Kentucky Nature Preserves Commission, May 2012.

In 2010-2011, a mussel survey was conducted on the Salt and Rolling Fork Rivers and 19 species were collected. A fossorial relic of the federally endangered snuffbox mussel (*Epioblasma triquetra*) was collected, however, no live federally threatened or endangered species were found. The presence of these species in the Salt, Rolling Fork, and Ohio River watersheds indicate that initiatives that improve or maintain water quality on the installation could benefit these species. The species that have a potential to exist on Fort Knox include the fanshell (*Cyprogenia stegaria*), northern riffleshell (*Epioblasma torulosa rangiana*), pink mucket (*Lampsilis abrupta*), ring pink (*Obovaria retusa*), orangefoot pimpleback (*Plethobasus cooperianus*), clubshell, (*Pleurobema clava*), and fat pocketbook (*Potamilus capax*).

Management initiatives that are outlined in this plan that may benefit these species include maintaining 70-foot vegetative buffers along rivers, streams, creeks, and sinkholes; land reclamation projects; forestry BMPs; and Stormwater Pollution Prevention Plans.

2.8.4.3 Other Significant Species

The northern dropseed (*Sporobolus hetrolepis*) (KSNPC listed endangered), barrens silky aster (*Symphyotrichum pratense*) (KSNPC special concern species), small white lady's-slipper (*Cypripedium candidum*) (KSNPC listed endangered), starflower false Solomon's seal (*Maianthemum stellatum*) (KSNPC listed endangered), Crawe's sedge (*Carex crawei*) (KSNPC special concern species), and snow trillium (*Trillium nivale*) (KSNPC listed endangered) are important species because of the occurrence of populations near or adjacent to the reservation. These species may occur on Fort Knox in similar habitats to those harboring populations outside the reservation. Another unconfirmed species, hairy fimbristylis (*Fimbristylis puberula*) (KSNPC listed threatened), occurs in the state in similar habitats as those found on Fort Knox.

Several other notable occurrences of plants on Fort Knox include narrow-leaved wild leek (*Allium burdickii*), blue false indigo (*Baptisia australis*), side-oats grama (*Bouteloua curtipendula*), purple prairie-clover (*Dalea purpurea*), and prairie sunflower (*Helianthus pauciflora spp. pauciflora*). Narrow-leaved wild leek was formerly KSNPC listed, but the discovery of several large populations delisted this species. The occurrence of blue false indigo may have been due to an introduction. The remaining species are being reviewed because of small populations and shrinking and degraded habitats.

Rare or uncommon fish species that could occur on Fort Knox include the blue sucker (*Cycleptus elongatus*), eastern sand darter (*Etheostoma (Ammocrypta) pellucidum*), northern madtom (*Noturus stigmosus*), and paddlefish (*Polyodon spathula*); however, they have not been confirmed on the installation.

The occurrence of bald eagles on Fort Knox from late fall through early spring has been noted for the past 15 to 20 years. Golden eagles have been seen on the installation during winter, but sightings are very rare. Bald eagles have been seen more regularly during the summer in recent years on the installation and a nest was documented in 2017 in Hunting Area 2, located near the northwestern boundary of the installation. The nest sits on the crest of the Muldraugh escarpment overlooking the Ohio River and railroad track. Its location, surrounding steep terrain, and the absence of roads and other infrastructure in the immediate area make it highly unlikely that the eagles would be disturbed by the current or projected military training mission. The most likely potential disturbance to the nest would be from aircraft, as this area has frequent military and nonmilitary flight activities along the Ohio River. The location of the nest and activities around it indicates the eagles have developed a tolerance to a certain level of disturbance, which also includes river barge traffic, recreational boaters, trains, and the occasional hunter.

Since being delisted in 2007, bald eagles are no longer protected under the Endangered Species Act (ESA); however, they are still protected under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (MBTA). Fort Knox protects foraging areas and potential nesting and roosting sites by minimizing potentially disruptive activities and development; using pesticides and herbicides in accordance with Federal and state laws; and by retaining and managing for mature trees within ½ mile of large bodies of water, as set forth in the Bald and Golden Eagle Protection Act. In cooperation with the USFWS, additional protection measures were adopted which include:

- Maintain a distance of 330 feet from nest during the nesting season (1 December – 30 June) for non-motorized human activities.
- Maintain a distance of 330 feet from nest during the nesting season for off-road vehicle use.
- Maintain a distance of 660 feet from nest during the nesting season for construction and development activities.
- Avoid clear-cutting and removal of overstory trees within 330 feet of active and alternate nests at any time.
- Avoid timber harvesting operations during the nesting season within 660 feet of nest.
- Conduct prescribed burning outside of the nesting season if possible; if not, conduct burns only when adult eagles and young are absent from the nest tree (i.e., at the beginning of, or end of, the nesting season, either before the particular nest is active or after the young have

fledged from that nest). Rake leaves and woody debris from around the tree to prevent fire climbing the tree.

- Do not fly aircraft within 1,000 feet of the nest. (A Notices to Airmen has been issued by the Fort Knox DPTMS, Range Branch)

Other sensitive, rare, or uncommon birds that occur, or potentially occur, on Fort Knox include the Henslow's sparrow, cerulean warbler, hooded merganser (*Lophodytes cucullatus*), the yellow-crowned night-heron *(Nyctricorax violaceus*), and the barn owl (*Tyto alba*).

A northern scarlet snake (*Cemophora coccinea copei*) was found during the 1992-1993 surveys. It was captured on the reservation and represents the first record for Hardin County. This species was formerly considered a species of special concern by KSNPC. Three other species of reptiles, which are state-listed species or a species of special concern, have potential to be found on Fort Knox. They are the copperbelly water snake (*Herodia erythrogaster neglecta*), Kirtland's snake (*Clonophis kirtlandii*), and eastern slender glass lizard (*Ophisaurus attenuatus longicaudus*).

DoD and Army policy is to implement conservation and management efforts to further the conservation of State-listed species when such action is practicable and does not conflict with legal authority, military mission, or operational capabilities.

2.8.5 Significant Natural Areas

Fort Knox contains several areas of significant natural quality or that are of particular ecological importance to the occurrence of rare species. Many of the species listed in Table 2-2 occur within areas considered by Fort Knox to be significant natural areas. These areas are not off limits to military training, however, topography and location generally make them unsuitable for training, especially mechanized training. Management considerations for these significant natural sites are discussed in Sections 4.5 and 5.4. Significant areas include wetlands, the Cedar Glades, the Otter Creek Corridor, the Ohio/Salt River Tributary Ravines, certain karst pond sites, endangered species habitats including caves, and the Ohio River Bottomland Hardwood Swamp.

2.8.5.1 Wetlands

NWI maps (1982) are available for the installation. In addition, Fort Knox contracted with the USFWS (Merritt and Carter 1994) to perform a wetlands survey. The USFWS survey indicated that 2,310 acres of wetlands exist on Fort Knox (about 2% of the installation). Additional wetland surveys have been conducted for individual range construction projects on Kennedy, Cedar Creek, Yano, and Boydston Ranges.

Approximately 738 acres (32%) of Fort Knox's wetlands are Riverine (Cowardin et al. 1979), associated with Salt and Rolling Fork Rivers. Another 237 acres (10%) are Lacustrine and are associated with man-made lakes. Much of the remaining wetlands (1,335 total acres) acreage is Palustrine, with 978 acres being forested (42% of total wetlands). This forested category has increased since the 1982 NWI survey. Remaining Palustrine wetlands include 22 acres of emergent, 155 acres of scrub-shrub, 173 acres of unconsolidated bottom, and 7 acres of unconsolidated shore (Merritt and Carter 1994).

2.8.5.2 Cedar Glades

The limestone slope glade system near the southern part of the installation (Hunting Areas 83, 84, 89, and 90) encompasses about 2,200 acres. This glade system is part of a larger complex of glades and xeric woodlands that is one of the highest quality examples of this community type remaining in Kentucky. This site is important to the great plain's ladies'-tresses (KSNPC threatened species) and Eggleston's violet (KSNPC special concern species). It is also important to side-oats grama and purple prairie-clover, both of which are being reviewed because of small populations and shrinking and degraded habitats

2.8.5.3 Ohio River Bottomland Hardwood Swamp

The Ohio River Bottomland Hardwood Swamp lies to the west of the railroad track in Training Area 12 (Hunting Area 1). This is one of few remaining floodplain forests along major rivers in Kentucky. The site contains an exceptional stand of overcup oak (*Q. lyrata*), an important floodplain tree that has become uncommon in the state. The site is also important to the cerulean warbler.

2.8.5.4 Otter Creek Ravines

Otter Creek Ravines comprise about 1,500 acres within Training Area 12 (Hunting Area 3 and 5). Three ravines within this site have intermittent streams that empty into Otter Creek; the center of this site is called Hog Hollow. This site is one of the best large, continuous tracts of rich forest in the area. It significantly contributes to water quality in lower Otter Creek. It harbors cave crayfish, is used by northern long-eared and Indiana bats, and is important to neotropical birds, including the cerulean warbler. The Otter Creek Ravines site is also a significant area for butternut (*Juglans cinerea*), a KSNPC threatened species.

2.8.5.5 Otter Creek Corridor

The Otter Creek Corridor includes about 2,400 acres, with about 400 acres being within the Otter Creek Ravines area (Section 2.8.5.4). This corridor may have been the primary foraging area for the maternity colony of endangered gray bats that were once present at Grahamton Cave. It is used by northern long-eared bats (federally threatened) and possibly Indiana bats (federally- and state-listed endangered). It is also in this area that blue mud-plantain was found in temporary pools formed by tire tracks near a crossing of Otter Creek. A threat to this area is degrading water quality caused by sediment and nutrient run-off resulting from off-post development and military training.

2.8.5.6 Grahamton Cave

Grahamton Cave is located in Training Area 10, north of U.S. Hwy 60, within the Otter Creek Corridor discussed above. The cave is 1 of only 18 known locations for the KSNPC listed special concern species northern cavefish, and the population of cave crayfish (a KSNPC listed threatened species) is the best on Fort Knox. It was historically used by gray bats as a maternity colony, based on ceiling staining, however, it is not known when or what caused abandonment

by the gray bat. At present, it appears that Grahampton is mostly used by non-reproducing females and males during the warmer months and as a transient cave during the spring, summer, and fall months by gray bats. However, juveniles and reproductive females were caught in July and August 2007, but capture at this time of year may occur after colony breakup. It is also considered a P3/P4 Indiana bat and northern long-eared bat hibernaculum. Under the guidance of the USFWS, Fort Knox installed a fence at the entrance of the cave which allows bat passage but restricts human passage, thereby precluding direct human disturbance. Integrity concerns are primarily sedimentation and water quality.

2.8.5.7 Karst Ponds West of Otter Creek

The area west of Otter Creek (1,200 acres) has a large number of karst ponds, primarily in Training Areas 9 and 10 (Hunting Areas 7, 8, 9, 10, 11, 12, 13, and 14). This area is the core of the area used by the gray treefrog (a KSNPC special concern species) breeding population. It also contains sites for restoration of native vegetation, including blue mud-plantain (a KSNPC special concern species). A concern with this area is erosion caused by vehicles and destruction of vegetation around ponds.

Karst ponds may provide a direct connection to cave stream systems and as such are a potential direct route for surface pollutants to contaminate cave streams. Also, the 1994 USFWS report (Merritt and Carter 1994) noted problems with sediment karst ponds and causing them to hold water and eventually fill-in. They noted the uncertainty regarding effects of this on cave systems and the threatened or endangered species associated with these cave systems.

2.8.5.8 Godman Army Airfield

The ecological boundary of the Godman Airfield site is grassland to the north and west of the runway that runs southwest and northeast. The area is important biologically due to a summer population of Henslow’s sparrow (a KSNPC special concern species). Threats include regular mowing and encroachment by woody species, particularly eastern red cedar and black locust.

Airfield clearance and force protection issues dictate vegetation restrictions within the airfield. The Wildlife Aircraft Strike Hazard (WASH) Plan outlines measures taken to reduce wildlife hazards on and around the airfield (Appendix H). Mowing of the airfield except for the turf adjacent to the runways and other structures is done outside the nesting season of the Henslow's sparrow (1 April- 15 August).

2.8.5.9 Ohio/Salt River Tributary Ravines

The Ohio and Salt River Tributary Ravines system east of U.S. Hwy 60/U.S. Hwy 31W has about 600 acres of steep topography in Training Areas 14 and 15 (Hunting Area 16, 17, and 18). These three ravines (Bee Branch, Tioga Creek, and Poplar Spring Branch) have a rich diversity of plant and animal species. This site is important to cave crayfish, northern long-eared bat, the Indiana bat, neotropical birds, and the tree species butternut. The main threat to this area is erosion runoff entering the drainage.

2.8.5.10 Floodplains and Lower Slopes along Salt River, Rolling Fork, and Lower Mill Creek

The extensive floodplain and lower slope area along Salt River, Rolling Fork, and Lower Mill Creek are almost completely located within the Fort Knox impact area. Rural settlement and agriculture have eliminated most of this habitat in Kentucky.

2.9 Land Management Units

Land Management Units (LMUs) on Fort Knox are based on training use and were not delineated for the purpose of natural resource or ecosystem management. Historically, the land has been divided in different ways for management purposes. EMD, Natural Resources Branch managers utilize a delineation of hunting areas, while compartments and stands are used for forest inventory purposes. However, hunting areas may be utilized for forestry activities with information stored by compartments and stands used for supplemental purposes. To disregard these units and convert to strictly a training LMU system would not be in the best interest of ecosystem and natural resource management. For the purposes of this section though, training units are described below.

2.9.1 Impact Areas, Training Ranges, and Training Areas

2.9.1.1 Range and Impact Areas

Fort Knox has range and impact areas that comprise approximately 56,000 acres. Due to Unexploded Ordnance (UXO) contamination in these areas and proximity to firing ranges, approximately 35,000 acres are not available for active natural resource management, and access to these areas is very limited. Due to the extreme high cost, impact to the ongoing mission, and need for future UXO containment, there are no plans to clear UXO from most of the permanently dudded impact area. However, UXO clearance actions are initiated with regard to range construction and upgrade projects. These actions then may make these lands available for management of the natural resources once cleared of UXO.

There is one exception to the impact area closure. On Memorial Day the public is permitted to travel on roads to old cemeteries within this area. All roads and cemeteries are cleared of UXO prior to Memorial Day visits.

2.9.1.2 Range Course Facilities

Fort Knox has 27 small arms ranges, 13 firing points, 11 multipurpose ranges, and 10 other ranges. Many ranges within these areas are mowed regularly and have herbicides applied around moving targets and bleacher areas. Most ranges contain buildings and expensive equipment. Ranges that have live-fire exercises are prone to starting down-range fires which can turn into wildfires.

2.9.1.3 Training Areas

Fort Knox is divided into 18 training areas for assignment to military units for field training (Table 2-3).

Table 2-3. Training Area descriptions.

Training Area	Acreage	Location	Training Conducted
1	769	Southeastern Border	Range and Impact Area
2	3,253	Southern Border	Primarily mounted maneuver training, artillery firing points
3	3,044	Southern Border	Artillery firing points
4	1,924	Southern Border	Limited mounted maneuver training
5	1,710	Southwestern Border	Limited mounted and dismounted maneuver training
6	1,366	Southwestern Border	Mounted maneuver training
7	2,579	South-central Border	Concrete driving course (north); mounted cross country driving (south)
8	2,991	West	Mounted maneuver training north of Vine Grove Road. Dismounted maneuver training south of Vine Grove Road
9	2,610	Western Border	Mounted maneuver training
10	3,515	Western Border	Mounted maneuver training
11	143	Adjacent to U.S. Highway 31W	Limited dismounted activities
12	5,324	Northwestern Border along the Ohio River	Mounted, dismounted, and vehicle recovery maneuver training
13	559	Adjacent to Main Range Rd. and the CD Landfill	Mounted maneuver training
14	3,476	Northern Portion	Mounted maneuver training
15	918	Northern Portion	Dismounted maneuver training
16	3,285	Northern Border	Dismounted maneuver training
17	5,278	Northern Border	Mounted and dismounted maneuver training
18	4,049	Northern Border	Mounted and dismounted maneuver training
Total	**46,022**		

Training Area 1

The topography of this area ranges from gently sloping to flat floodplain of the Rolling Fork River, to steep forested knobs. Vegetation in the open areas is predominantly tall fescue with scattered native grasses and forbs; there is a significant amount of the area composed of old field habitat. The woody vegetation is predominantly mixed upland hardwoods on the knobs with mixed bottomland hardwoods in the floodplain areas along the Rolling Fork River. Soil erosion is limited in this area as very little tracked vehicle training is conducted here.

Training Area 2

The topography of this training area varies from the nearly level floodplain along Cedar Creek to very steep and gently rolling uplands on the ridges. Vegetation in the open field areas is primarily tall fescue with scattered broomsedge (*Andropogon* spp.) and other native, warm-season species. The woody vegetation is predominantly mixed upland hardwoods which provide good erosion control and good wildlife habitat.

Training Area 3

Topography in Training Area 3 ranges from nearly level floodplains along Cedar Creek and Dorrets Run to very steep hills and rolling uplands. Open areas contain tall fescue and other warm-season species. The woody vegetation is pine and mixed upland hardwoods which provide good erosion control and wildlife habitat. Soil erosion occurs in actively used training fields and is generally sheet and rill, and gully erosion. Sediment from Training Area 3 enters Cedar Creek, Dorrets Run, and Mill Creek.

Training Area 4

Topography in the floodplain of Mill Creek is nearly level, with steep hills to gently rolling uplands in other areas. Mill Creek flows south to north through this training area. Most of Training Area 4 is mixed upland hardwood and old field and provides good erosion control and wildlife habitat. Most open field areas are barren with occasional tall fescue and native, warm-season plants. The major sources of erosion in this area are tank trails. Sediment from this area enters Mill Creek and to a lesser extent, Upper and Lower Douglas Lakes and Mill Creek.

Training Area 5

Topography of this training area is rolling to hilly uplands, and the vegetation is predominately mixed upland hardwoods and cedar. Open fields have tall fescue and native, warm-season species. Erosion occurs mainly on roads and tank trails. Sediment from Training Area 5 enters Mill Creek, which flows south to north and is the main drainage route.

Training Area 6

The topography in Training Area 6 varies from gently rolling uplands to steep hills. Sanders Spring Branch, a tributary of Mill Creek, crosses the area south to north. Sanders Spring Lake

and several sinkhole ponds occur within Training Area 6. Parts of the training area have mixed upland hardwoods, with scattered pine and red cedar which provide fair to good erosion control and wildlife habitat. The primary erosion issues from past tracked training in this area have been reclaimed to native grassland and approx. 50 acres of tree planting. Disturbance from training activities are far less than during use by the armor school (moved to Fort Benning 2011). There are still areas that show sheet, rill, and gully erosion that will be addressed as resources are available. Sediment from this training area may enter the below-ground water system directly through swallowholes that are adjacent to training locations. A swallowhole is a surface depression with a bottom opening that allows surface runoff to pass rapidly into the subsurface water system. Sediment may also directly enter Sanders Spring Lake and Mill Creek as a result of surface runoff.

Training Area 7

The topography in Training Area 7 varies from nearly level bottomlands along Mill Creek to very steep hills and rolling uplands. Open fields are barren except for scattered cedars, tall fescue, and native warm-season species. Woody vegetation is mixed hardwood and cedar. Soil erosion on some mounted maneuver trails and critical areas is severe, and many of these trails are eroded beyond use. Sediment from this training area enters the subsurface water system via swallowholes and Mill Creek.

Training Area 8

The topography of this area ranges from rolling uplands to hilly areas. Many sinkholes occur in the rolling uplands. Water resources within Training Area 8 are Dry Branch and Gander Branch (which drain to Otter Creek) and Tobacco Leaf Lake, a constructed lake used for military training and for recreation. Wooded areas are mixed upland hardwood and cedar with some pine plantations. Open areas have cedar with native, warm-season species and widely distributed stands of tall fescue. Sediment from this training area enters the surface streams and Tobacco Leaf Lake. The many sinkholes in the area also receive sediment.

Training Area 9

The topography in Training Area 9 ranges from very steep hills and nearly level bottoms along Otter Creek to karst uplands with many sinkholes. McCracken Springs Lake, which is used as a water source is located in this training area. This actively used training area contains many open, barren areas. Most of the previously severely eroded training areas have been reclaimed although there are continuing areas of concern as well as continued disturbance from training that will cause moderate erosion concerns. Wooded areas are mixed upland and bottomland hardwoods and cedar. Sediment from Training Area 9 enters Otter Creek and McCracken Springs Lake through surface runoff and the underground drainage system. The water quality of many of the sinkhole ponds is degraded as a result of years of sedimentation, although these ponds should recover somewhat due to reclamation actions and decreased intensity of tracked vehicle disturbance.

Training Area 10

The topography in Training Area 10 ranges from karst uplands with many sinkholes to very steep hills along Otter Creek. This area historically had the highest number of eroding acres of all of the training areas. The majority of these areas have been reclaimed since 2001, although approximately 65 acres remain and will be addressed as the mission permits and resources become available. Scattered vegetation includes cedar, tall fescue, and native warm-season species. If woody vegetation is present, it is mixed upland hardwoods which provides limited erosion control and wildlife habitat. Sediment from Training Area 10 enters Otter Creek and into the below ground water system through sinkholes.

Training Area 11

Training Area 11 consists of rolling uplands which drain into Dickerson Lake in the north and into a small perennial stream in the south. The woody vegetation in this training area is primarily immature mixed upland hardwoods. A portion of this training area has been cleared to expand the airfield approach clear zone.

Training Area 12

Topography in Training Area 12 ranges from nearly level in the Ohio River floodplain to very steep hills and rolling uplands. Most of this area is wooded with mixed upland hardwoods and a small percentage of mixed bottomland hardwoods. The heavily eroded tank recovery training sites in this area were reclaimed in 2015 and 2016. Sediment from Training Area 12 enters lower Otter Creek and the Ohio River.

Training Area 13

The topography of Training Area 13 is rolling landscape. The Fort Knox landfill, covering about 185 acres, is located here. Woody vegetation is a mostly mixed upland hardwoods. Severe sheet and rill, and gully erosion occur, especially associated with the borrow sites and engineer training sites on the eastern portion of this training area. There are no distinct surface drainages in the training area. Drainage is via swallowholes or sinkhole ponds, both of which can directly enter the subsurface water system.

Training Area 14

The topography of Training Area 14 varies from steep hills to rolling uplands. The uplands are a karst plain and contain many sinkholes. Tioga, Poplar, and Dripping Springs are located within this area. The ammunition storage facility, covering about 531 acres, is also located here. Other open areas have scattered clumps of tall fescue and native warm-season species. Woody vegetation consists of pines and mixed upland hardwoods. The high volume of training in this area led to severe erosion in some areas, however, the majority of these sites have been reclaimed since 2011. Many of the heavily eroded tank trails have been stabilized and graveled to support Cadet training and the remaining tracked vehicle training areas have been reclaimed to native grasses and forbs. Sediment from this training area enters the subsurface water system

through the many sinkholes. Small, perennial streams near the area's perimeter also receive sediment from surface runoff.

Training Area 15

The topography of Training Area 15 ranges from rolling uplands to steep hills. Most of the vegetation consists of mixed upland hardwoods. Open areas are associated with roadsides and firebreaks, and are vegetated with tall fescue. There is relatively little erosion and sediment that exists enters the subsurface water system through sinkholes. Surface drainage also occurs into Bee Branch and Tioga Creek.

Training Area 16

The topography of Training Area 16 ranges from nearly level in the floodplains along the Salt River and Cedar Point Branch to very steep hills and rolling uplands. Woody vegetation, both pine and mixed upland hardwoods, makes up most of the groundcover. Since this area is generally used for dismounted training, there is little erosion.

Training Area 17

The topography of Training Area 17 ranges from nearly level on the floodplains of Salt River, Cedar Point Branch and other small streams to very steep hills and rolling uplands. Rogers Hollow Test Facility, Mount Eden Demo Pit, and Zussman Urban Combat Training Site are located here. Pines and mixed upland hardwoods make up the majority of the vegetative cover. This provides good erosion control and wildlife habitat. Since this area is generally used for dismounted training, erosion is present only in a few scattered locations.

Training Area 18

Training Area 18's topography varies from wide and level Salt River floodplains to very steep hills and rolling uplands. Zazios Pond, Woods and Hudic Lakes are located in the Salt River floodplains. Pines and mixed upland and bottomland hardwoods make up the majority of the vegetative cover. Two areas have active erosion on the streambanks and the road banks are also eroding in a few areas. Woodland Creek drains much of the uplands north of the Salt River, while Marcum, Wilcox, and Duck Lakes receive runoff from further south.

2.9.2 Cantonment Area

The main cantonment area of Fort Knox covers about 6,856 acres. DPW oversees the grounds maintenance through a private contractor, which includes mowing improved grounds (grass mowed regularly) and semi-improved grounds (grass mowed occasionally). Housing assets on the installation have been leased to Knox Hills and management of these areas is their responsibility. Other improved and semi-improved lands are managed by non-appropriated fund activities (mainly the golf course). Grass mowing within the cantonment area has been reduced with some areas receiving a reduced frequency of mowing and other areas having no mowing. Financial considerations have caused most mowing reductions.

2.9.3 Hunting Areas

Fort Knox is divided into 95 Hunting Areas that are used primarily for hunter and fisherman control (Appendix D, Figure 4). They are used to control hunter densities for both harvest control and safety considerations. These areas have been delineated for many years and are commonly used as units of reference for a variety of purposes such as timber sale locations and conservation law enforcement. Hunting Areas are also used to provide a spatial location for much of the wildlife data collected on the installation.

Of the 108,715 acres on Fort Knox, approximately 67,000 acres (62%) are available for hunting and fishing when not being used for military training. The remaining portions are closed due to the presence of UXO or their close proximity to firing ranges, which has resulted in creating an unmanaged refuge for game species. There is some mortality from firing, shelling, and bombing in this "refuge," but this is thought to be insignificant compared to harvest under normal hunting conditions.

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3.0 ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

Fort Knox's primary mission is to develop leaders and train Soldiers. Fort Knox uniquely boasts the sole responsibility for all Soldier career management, from swearing in to departing service.

3.1 Training Missions

Fort Knox's training mission with regard to land use has changed as new weapon systems and tactics have been developed. Fort Knox provides approximately 109,000 acres of high-quality, realistic training lands for the Army, Air Force, Navy, Marine Corps, National Guard, Coast Guard, Reserve forces, and military units of other nations.

3.1.1 Maneuver Training

Maneuvering is the most common type of training on Fort Knox. Maneuver training includes both mounted and dismounted training. For more detailed information on the number and type of vehicles, please refer to the Army Stationing Installation Plan (ASIP). This document is updated quarterly.

3.1.2 Live Weapon Firing

Fort Knox has 61 live-fire ranges. These ranges include 27 small arms ranges, (up to 50 caliber), 13 firing points, 11 multipurpose ranges (all weapon systems), and 10 other ranges (i.e., aerial gunnery, anti-tank weapons, artillery, grenade, mortar, and multiple launch rocket system). These ranges are arrayed around impact areas and live fire is directed into the impact areas. Large portions of the impact areas are contaminated with UXO and are classified as extreme hazard areas with restrictions to limit access. Consequently, these areas require wavier authority to grant access.

3.1.3 Aviation Training

Fort Knox has one official airfield, Godman Army Airfield, situated within the cantonment area, and six other soft airstrips located within the training complex. Two of these airstrips are in the range and impact area and have been abandoned (Section 3.1.1). There are 32 designated helicopter landing zones on the post, 18 of which are active. The types of aircraft used in training exercises include the C130, F16, F18, and helicopters including the Apache, Blackhawk, and Chinook, as well as Unmanned Aircraft Systems (UAS). Fort Knox has two Forward Area Rearming and Refuel Points (FARRPs) available for use in the training complex and are positioned to support aviation activities in the northern and southern areas of the training complex. The southern FARRP also doubles as a UAS launch and recovery strip.

3.2 Effects of Military Mission on Natural Resources

The *Unit Leader's Handbook for Environmental Stewardship* (Department of Army, 1994) states that intensive and continuous use of Army training lands within the U.S. has resulted in the

following types of environmental damage:

- The loss of historical sites, vegetation, water resources, and wildlife
- Diminished quality of available realistic training areas
- Diminished operational security
- Ineffective tactical operations
- Safety hazards to personnel and equipment
- An increase in training and maintenance costs, as well as litigation

All items on this list have occurred to varying degrees at Fort Knox, but most may be considered minor. However, the loss of historical sites, vegetation, water resources, and wildlife and the diminished quality of available realistic training areas can be significant concerns for Fort Knox.

When evaluating the military mission's impacts to natural resources, the numbers of personnel and equipment using those resources must be considered. As of January 2016, the Fort Knox daytime population was:

• Active-duty military	6,000
• Reserve component	1,800
• Civilian employees (DoD and contractor)	10,600
• Dependents on active-duty military on post	4,700
Total	**23,100**

Military training has a direct effect on natural resources. There are two primary effects of the military mission on Fort Knox's natural resources: maneuver damage and impact damage.

3.2.1 Maneuver Training

Maneuver training effects on natural resources include (1) the loss of vegetation and soils in regularly used areas such as bivouac sites, (2) physical disturbance of wildlife due to troops in the field with equipment, and (3) noise-related disturbance. Effects are mostly confined to locations outside the range areas (Appendix D, Table 3). Tracked vehicles tend to be the most disruptive to natural resources at Fort Knox.

Major impacts appear to be vegetation and soil loss as opposed to wildlife disturbance. With the exception of physical disturbance by the presence of on-the-ground troops in certain critical areas, there is little evidence of significant disturbance to wildlife over time.

3.2.2 Live Weapon Firing

Fort Knox conducts both inert and live firing. There is no known environmental damage associated with inert firing; however, live-weapon firing damage does occur within the range and impact areas. Vegetation, wildlife, and soils are directly damaged by small arms, artillery, and bombs. The most significant monetary loss is the value of timber due to ordnance damage. Mission-related wildfires also occur in these areas and damage or kill the trees resulting in

further monetary loss. However, the damage and monetary loss cannot be measured or mitigated due to lack of access.

3.2.3 Aviation Training

Helicopter training typically includes hovering and landing exercises, as well as weapons firing exercises. The main environmental effect caused by aviation training is noise. Damage to soils and vegetation is limited due to the fact that helicopters hover at tree top level.

3.2.4 Positive Effects of the Military Mission on Natural Resources

A major benefit from an ecosystem standpoint is the virtual elimination of former negative land-use practices such as draining wetlands (tiling) for agriculture, overgrazing domestic livestock, grazing in woodlands, and private owner forestry practices. It is much easier and practical to manage a large piece of federal land for ecosystem integrity than it is to manage many small, mostly private ownerships. Other positive effects of the military mission on natural resources include a reduction of illegal activities that may adversely affect wildlife (e.g., poaching). Littering is also noticeably absent, except for localized problem areas.

A very significant, positive effect of the mission is the frequency of fire in the range and impact areas. Although most of these fires are not controlled due to potential dud contamination, these mission-related fires have the potential to re-introduce fire into the system in much the same manner that fire may have occurred prior to European settlement. Many problems that occur in upland forests, especially oak-hickory forests, is the absence of fire which is required to maintain and regenerate the forests. As previously stated, these fires may not be prescribed but their frequency often limits severity and there are examples of forest settings in these areas that are important for understanding forest systems to use for application in areas managed for such forest types.

Another positive benefit of the military mission is the Fort Knox commitment to natural resources management. This is achieved through implementation of the INRMP. This natural resources commitment is beneficial for both natural resources in general and for consumptive and non-consumptive users of natural resources products. Fort Knox's natural resources directly and indirectly support the overall quality of life for the entire region. Of equal importance, is the INRMP helps to ensure the sustainability of training lands capable of supporting the military mission.

3.3 Natural Resources Needed to Support the Military Mission

The health of Fort Knox's natural resources is crucial to provide realistic training for military troops. The availability of training areas with stable soils is essential to provide troops with an adequate training environment. Stable soils support training activities, such as establishing bivouac areas, command posts, and supply routes. Stable soils also support land navigation, maneuvering, patrolling, and reconnaissance missions. Additionally, soils that are severely eroded present safety hazards to heavy equipment. Trucks and mounted maneuvers can become stuck in gullies, costing time and money. Vegetation is also crucial to training because it provides cover for troops and adds to training realism. Other natural features, such as the steep

hills, provide rugged terrain in which to practice mountain warfare. Streams, rivers, ponds, and hills also provide realistic training and obstacles for troops. All of these natural features are used for mobility and counter mobility, as well as concealment from opposing forces.

3.4 Natural Resources Management Constraints on the Military Mission

The Army and Fort Knox cannot train without considering environmental constraints on training. Various laws, policies, and regulations that protect the environment and natural resources conservation affect training. They are identified throughout this INRMP. Some are traditional (e.g., hunting and fishing considerations), while others are relatively new (e.g., biodiversity protection). These laws, policies, and regulations include the following:

- NEPA documentation and procedural requirements
- Cultural resources protection requirements
- Endangered species legal and management requirements
- Consideration of needs for outdoor recreation
- Wetland protection requirements
- Consideration of the needs of special places (Sections 4.4 and 5.4)
- Consideration of the need to produce game species
- Consideration of the need to restore and/or maintain the forest ecosystem
- Sedimentation stabilization requirements
- Protection of biological diversity

The Army and Fort Knox have been protecting the environment informally for decades. Since the passage of major environmental laws in the early 1970s, this effort has been formalized. It affects the military mission, but environmental protection and military readiness are not “either-or” propositions.

Other environmental considerations also affect the implementation of the military mission at Fort Knox. These environmental considerations include steep slopes and tributary ravines, sinkholes and other karst features, wetlands, habitat supporting threatened and endangered species, and sensitive natural areas such as the cedar glades. However, these considerations do not significantly affect the capability of Fort Knox to conduct its military mission.

3.5 Future Military Mission Impacts on Natural Resources

The 2005 BRAC recommendations have transformed the installation into a multi-functional installation that serves as the home to various Headquarters, Operational Army units, and Field Operating Agencies. This transformation has resulted in a decreased amount of internal unit training and an increased external unit training load each year.

At this time, the force structure plan shows minimal growth for Fort Knox and it will continue supporting training proportionate to the amount of resources allotted. Foreseeable negative impacts to natural resources are anticipated to be minimal.

3.6 National Environmental Policy Act Implementation

NEPA is a federal law that requires the review and analysis of all federal projects with the potential to impact the environment. This review must be documented and the public has a legal right to be involved. NEPA is intended to be used as a decision-making tool and 32 CFR Part 651, Environmental Analysis of Army Actions: Final Rule (March 29, 2002) implements NEPA requirements and recommends mitigation to limit damage to the environment. The purpose of NEPA is designed to identify environmental problems and attempt to resolve them using planning at early stages of project development.

3.6.1 NEPA Responsibilities and Implementation

3.6.1.1 Responsibility

The Natural Resources Branch assists with this mission as required. The responsibility of NEPA compliance lies with the project proponent. In many instances the proponent may be unaware of the relevance of NEPA compliance to the proposed project. Proponents should contact the EMD, DPW to assist in both assessing the need for NEPA analysis and assisting in preparation of appropriate NEPA documentation and review.

Army regulations require the proponent to prepare and fund NEPA documentation. In some cases, the proponent prepares NEPA documentation at Fort Knox, but personnel within EMD also prepare documents for other organizations on Fort Knox.

3.6.1.2 NEPA and this Integrated Natural Resources Management Plan Update

The attached Record of Environmental Consideration (REC) in Appendix A provides an evaluation of the effects of implementing this INRMP and other alternatives. Future actions covered within this plan, particularly on-the-ground actions, will be evaluated to determine the appropriate level of NEPA documentation in accordance with the NEPA regulations, the Council on Environmental Quality's regulations, and 32 CFR Part 651, Environmental Analysis of Army Actions: Final Rule (March 29, 2002). This INRMP and its associated REC may reduce the effort involved in and the documentation needed to support future compliance with NEPA. At a minimum, both this INRMP and its REC can be referenced with regard to description of the affected environment to reduce verbiage in future NEPA documentation.

An Environmental Assessment (EA) was prepared for the original development and implementation of the INRMP at Fort Knox.

3.6.1.3 NEPA Documentation

The most common NEPA document prepared for projects is a Categorical Exclusion (CX). The list of approved CXs can be found in 32 CFR Part 651, Environmental Analysis of Army Actions: Final Rule (March 29, 2002). An REC is required for some CXs if the action is covered in an existing NEPA document or if it qualifies for a CX.

An EA is prepared for actions that do not fit the requirement for a CX and if the proponent does not know if there will be a significant effect on the environment. An EA results in a Finding of No Significant Impact (FONSI) or a Notice of Intent (NOI). An NOI is prepared if it is determined during the preparation of the EA that there are significant impacts and an Environmental Impact Statement (EIS) must be prepared. An EIS results in a Record of Decision (ROD). Actions that may require an EA or an EIS include major construction projects, LRAM projects or range construction, and fielding of major weather monitoring systems.

Fort Knox has NEPA documentation on the effects of its training mission entitled, *Final Environmental Assessment of the Master Plan and Ongoing Mission, U.S. Army Armor Center and Fort Knox* (USACE 1995) and *Implementation of Base Realignment and Closure Recommendations and Other Army Transformation Related Actions at Fort Knox, Kentucky (August 2006)*. These NEPA documents can provide information on existing conditions for future NEPA documents.

3.6.1.4 Mitigation

Mitigation is used to reduce the adverse environmental impacts of an action. Mitigation actions are identified in the FONSI or the ROD of NEPA documentation, which are legally binding documents. Proposed mitigation actions are described in the EA and/or EIS. Commitments made in these documents become legal requirements and must be monitored and documented. These become high funding priorities in the non-recurring environmental funding process. EMD will track mitigation commitments made in NEPA documents for compliance purposes.

At the time of this INRMP, Fort Knox has only the Indiana Bat Management Area and its associated management activities listed in the ROD for the Northern Training Complex (2002) as a mitigation action.

3.6.2 NEPA and Natural Resources Management

EMD will use NEPA to ensure that its activities, as described in this INRMP, are appropriately planned, coordinated, and documented. EMD will also review the NEPA documents prepared by others to identify potential natural resources impacts. This requires coordination of project proponents with EMD to allow EMD the opportunity to conduct the required review of the NEPA document.

EMD personnel may assist with the decision as to where the proposed action will take place. Appropriate siting can eliminate unnecessary, potential environmental impacts so that only unavoidable impacts remain. Discussion regarding the actual location of the proposed action is crucial and should occur early in the planning process, even before a draft NEPA document is begun.

Projects are often enhanced by the NEPA process. Siting is one of the most common examples of such project enhancement. When natural resources managers understand mission and project requirements in terms of land features and requirements, they often not only offer

more potential site options to mission and project planners, but also alternatives to avoid future environmental conflicts.

The Natural Resources Branch will take the following steps to improve the application of NEPA as a decision making tool, to protect and conserve Fort Knox's natural and cultural resources:

- Enhancement of the system whereby NEPA documents are reviewed by the Natural Resources Branch during early planning phases whenever possible.

- Provide that mitigation be included in projects that damage natural resources. If mitigation is included, ensure that it is entered in the annual budget process.

- Use Natural Resources Branch personnel expertise and capabilities to provide mitigation, including LRAM, special area protection, and wetland management.

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4.0 PROGRAM ELEMENTS

Natural resources management at Fort Knox historically was centered on timber management and game species management. Early game species projects included enhancing the fishing program, limited predator control, and improving habitat.

Timber harvests were very limited in the early years of Army ownership. In 1962, timber harvesting was significantly increased and managed on an acreage basis. The fundamental objective of this management philosophy was to set annual goals for the number of acres treated with a silvicultural prescription. From 1962 to 1988, 42 MMBF of timber was harvested on 17,051 acres.

In 1989, the installation moved to a sustained-yield timber harvest planning system whereby no more than 1,200,000 board feet of timber (80% of annual growth based on the 1989 installation forest inventory) would be harvested annually. This was the first step in transitioning to a sustainable forest management program designed to restore the forest ecosystem at Fort Knox to a more historically natural and productive condition. After a 1993 group selection sale in HA2, timber harvesting to meet silvicultural prescriptions was suspended while salvage harvests for construction and range projects continued as needed.

Timber harvests to meet silvicultural prescriptions resumed in 2008 with a set of group selection cuts in HA 33 and 34, followed by another set in HA 17, 29, and 33 in 2009. Since 2010, harvesting in hardwood stands has been based on the shelterwood harvest method, in which merchantable timber is selectively harvested in two or more partial cuttings spread over several to many years. This even-aged system of timber harvesting and stand regeneration is versatile and particularly beneficial to moderately shade tolerant species such as oaks (*Quercus* spp.) and hickories (*Carya* spp.).

The Fort Knox Fish and Wildlife Program began in 1952 with the creation of a Fish and Game Board. In 1963, a cooperative plan for the development of fish and wildlife resources at Fort Knox was initiated between Fort Knox, USFWS, and the KDFWR. Technical assistance was provided to Fort Knox, and new management techniques were incorporated into the program.

A civilian wildlife biologist was hired in 1966 to supervise the Fish and Wildlife Management Program. Since then, many notable accomplishments have taken place. These include the following:

- Wild turkeys were restored.
- Three new lakes were built, and some existing lakes were improved.
- Triploid grass carp were stocked for aquatic weed control.
- The trout program was enhanced and fishing pressure was increased.
- An annual deer hunt and supporting data collection system were established that are nationally recognized for their excellence.
- The wildlife food plot system was improved.
- Baseline data on songbirds, sensitive species, and other non-game species were collected.

- Efforts to restore ruffed grouse to the area were initiated.
- Initiation of a non-native grass eradication program and restoration of native warm-season grasses.

4.1 Forest Management

Fort Knox consists of mostly forested habitat with approximately 81,000 acres of the installation's 108,715 acres in some stage of forest vegetative cover. The range and impact areas are predominantly forested and cover roughly 35,000 forested acres. However, due to high training and range use, potential for the presence of UXO, and probable metal contamination of the timber, these areas are off-limits and considered unavailable for any active forest management activities. Subtracting another 1,000 acres of forestland located in and around the Cantonment Area leaves approximately 45,000 acres of installation forestland potentially available for active commercial forest management.

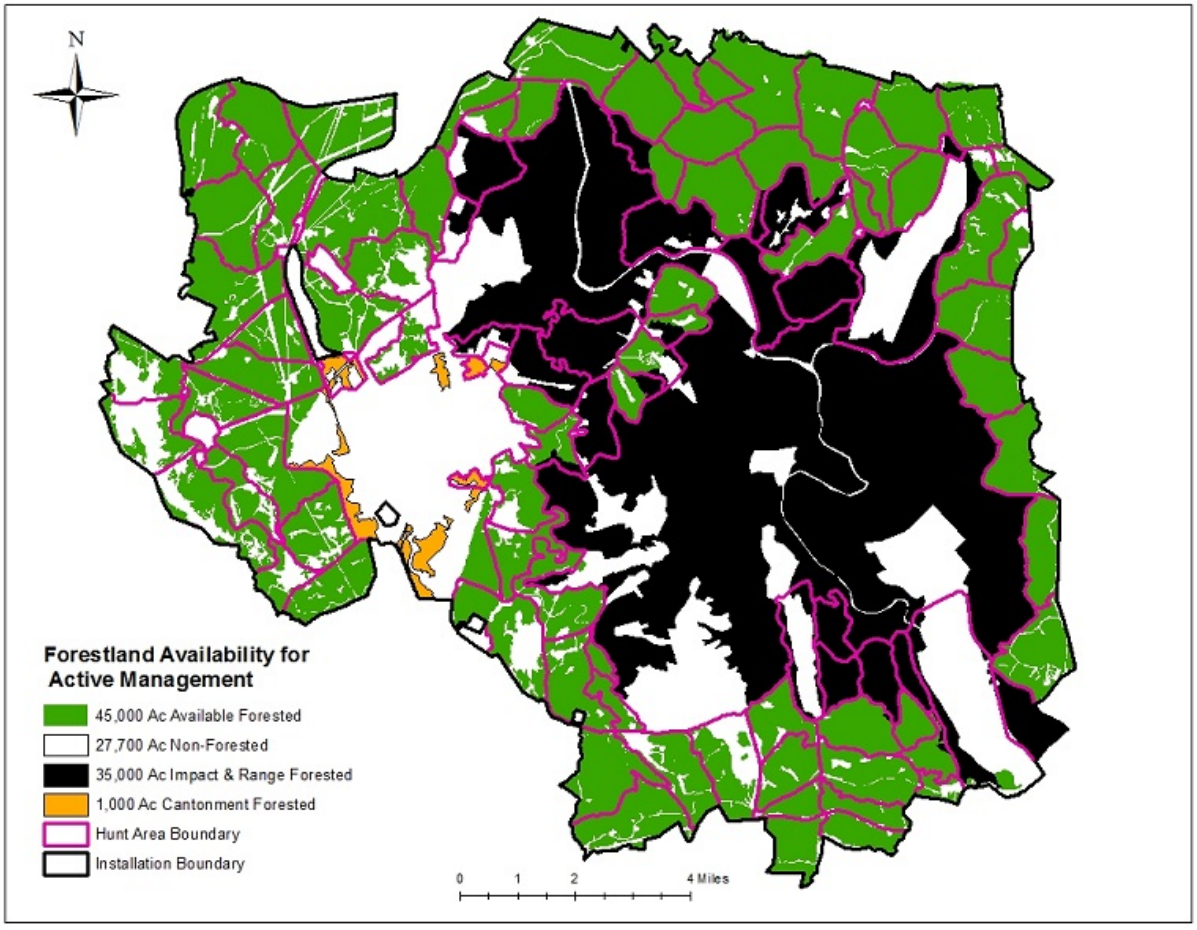

Figure 4-1.

4.1.1 Forest Resources and Forest Inventory

Forest inventories on Fort Knox have been completed at varying intervals from the 1960's

through the late 1980's and have primarily focused on commercial sawtimber volumes. In 1989, Fort Knox DEH staff completed what was intended to be a Continuous Forest Inventory (CFI) utilizing permanent plots with the main focus still on sawtimber volumes.

The Fort Knox Forest Inventory (FKFI) is the current effort to complete a forest inventory of the accessible forestland on the installation, and has been progressing since 2006 as funding has allowed:

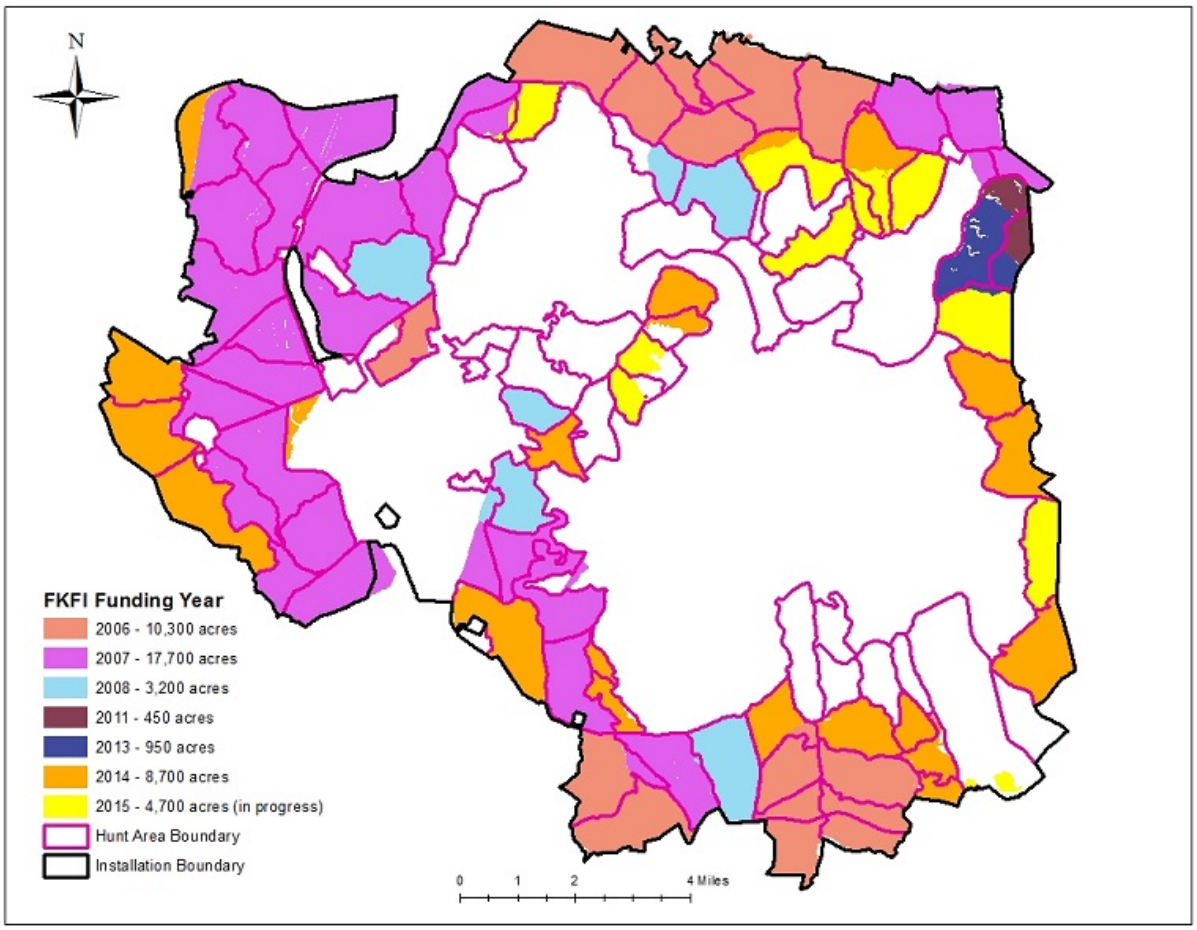

Figure 4-2.

The FKFI differs from previous inventories in that it utilizes variable point sampling at a considerably greater sampling rate instead of fixed area plots and includes data on poletimber volumes and understory composition. Additional information related to forest health, invasive species, and snags is also collected.

The last complete forest inventory prior to embarking on the FKFI in 2006 occurred in 1994 and was essentially a re-inventory of the 1989 CFI plots (Table 4-1). The 1994 CFI made several general determinations that remain valid:

- Forestlands on Fort Knox are mostly fully or over stocked.

- Stands that have a low basal area in relation to total carrying capacity are indicating a need for timber stand improvement.
- A lack of advanced oak regeneration is indicated by the large numbers of shade tolerant species in the understory of the various oak forest types present.
- Average annual growth for yellow poplar is lower than for other species; however, it has the highest volume of any species.

The CFI data provided insight into the general trends and broad makeup of Fort Knox's forest resources, but lacked the intensity to provide the detailed information necessary to implement management projects within specific areas to meet defined goals.

Table 4-1. Forest Inventory estimates at Fort Knox.

	1989 CFI	**1994 CFI**	**2006-2014 FKFI**
Inventoried Acres	30,600	37,400	40,300
# of Plots/Points	142 1/5ac plots	??	~5,000 points
Total Sawtimber Vol (bf)	65,672,876	223,896,000	210,245,000
Sawtimber/Acre Vol (bf/ac)	2,149	5,987	5,208
Maximum Sustainable Annual Harvest Volume *	1,200,000 bf	Not calculated	3,800,000 bf potential+

* 80% of Annual Growth (merchantable sawtimber only), using an average 2.3% annual growth rule-of-thumb for mixed hardwood species.
+ potential harvest limit based on same annual growth rate, however the maximum allowable harvest will remain for the time being at the 1989 level while the FKFI is analyzed and updated to determine accuracy of the 2.3% average.

The greater intensity and detail of the FKFI format will enable the NRB to manage the forest resources at the forest stand level with greater efficiency and better accuracy.

Beginning in 2017, Fort Knox will re-inventory approximately 4,500 acres annually to keep the FKFI updated on a 10 year rotation. Over time this will provide more accurate information on actual annual growth rates to better calculate annual sustainable harvest volumes instead of relying on a general average. The type and amount of data collected as well as sampling density will be periodically reviewed and adjusted should data analysis determine a need to doing so.

4.1.2 Forest Insect and Disease Detection and Response

Historically, insects and disease have not normally caused serious forest health problems on Fort Knox. There have been occasional localized die-backs and infestations, but they were typically small and dispersed, and the affected forest stands recovered without special treatment.

Unfortunately this has changed with the confirmed arrival of the Emerald Ash Borer (EAB) on the extreme northern edge of Hardin County in 2014. Kentucky established a quarantine in 2009 that limited the movement of ash material and hardwood firewood from affected counties, however, ended it in 2014 because it was determined the spread of EABs was moving too fast to

control. In an effort to prevent additional artificial spread of the EAB the USDA also has established quarantines that prohibit the movement of EAB regulated articles out of States where EABs are known to exist (7 CFR 301.53). Kentucky lies within the federal quarantine area and is surrounded by states under the quarantine, with the exception of western Tennessee.

The FKFI indicates a total of 11,744,000 bf of Ash sawtimber and an additional 35,831 tons of Ash poletimber on 41,300 acres of the installation, comprising 5% of the total hardwood sawtimber and poletimber volumes currently inventoried. It is expected that virtually all existing Ash saw and poletimber will be killed over the next 3 to 15 years as the EAB continues to spread. Fort Knox has already encountered an extensive amount of ash tree mortality and has begun salvaging ash trees in timber harvest areas and potential hazard trees along roadways, trails, bivouac areas, rights-of-way, and military training facilities.

There is at present no known ecologically or economically feasible treatment to protect Ash trees across the broad forested landscape from infestation and eventual mortality to the EAB. Effective short-term (1-2 years) preventative treatments have been developed for high value Ash trees in the urban forest environment, however those treatments are not operable on a large scale across large acreages. Fort Knox will continue to manage its forests using silvicultural techniques that will promote a healthy forested ecosystem capable of supporting the military training mission and meeting natural resource conservation requirements.

Fort Knox cooperates with the Forest Health Protection, USDA Forest Service, Southern Region to monitor for gypsy moths. NRB personnel have been putting out traps for over 20 years, but no gypsy moths have been captured to date. This is most likely due to a combination of successful application of various control practices and evolving natural predators and disease, that has significantly slowed the advance from previous estimates.

Fort Knox NRB is also concerned about other insect and disease problems that could have major impacts on the forested environment such as sudden oak death and the thousand cankers disease of walnut. As of today, these (and other) problems have not been detected on Fort Knox. If the Forest Service or other partnering agency produces a monitoring system, Fort Knox would like to participate. When and as needed, treatment and management of forest pests will follow the guidelines of the Integrated Pest Management Program.

4.1.3 Forest Best Management Practices for Water Quality

The *Field Guide to Best Management Practices for Timber Harvesting in Kentucky* (March 1998, revised 2016) and training through the Kentucky Master Logger program provide BMP guidelines for silvicultural treatments at Fort Knox. Fort Knox NRB Forestry personnel continue to implement and monitor these recommended BMPs, including the following:

- Specifications for forest access road construction
- Guidelines for revegetation of silviculturally disturbed areas
- Fire line specifications
- Prescribed burning specifications and considerations
- Site preparation considerations

- Machine planting specifications
- Pesticide application specifications
- The establishment of streamside management zones (SMZs) 30 to 50 feet wide on relatively flat ground and at least 50-to 90-feet wide on steeper ground. This requirement is expanded on Fort Knox to a minimum of 70-feet wide to meet water quality recommendations by the USFWS.
- Silviculture in wetland area considerations

SMZs are particularly important on Fort Knox due to runoff from damaged training areas. Timber practices in SMZs will carefully follow recommendations in the BMPs. Special consideration will be given to the cold water trout fishery in Otter Creek.

4.1.4 Timber Disposal for Construction Projects and Training Use Conversions

Merchantable timber located in the footprint of construction projects or within areas identified for clearing and conversion for training purposes shall be measured, marked, and disposed of pursuant to Army regulations and comply with all federal and state laws. Fort Knox NRB should be informed of all such projects as soon as possible in order to manage required consultations and timber sales in an efficient and effective manner.

If it is determined that an insufficient volume of merchantable timber exists to justify a commercial timber sale, NRB will provide instruction and guidance for disposal of the timber to various sites or uses on the installation.

4.1.4.1 Timber and Woody Debris Disposal for Firewood Use

Wood and tree debris suitable for firewood use from installation sources may be deposited in the installation firewood lot with approval from NRB. Sources may include hazardous tree removals, storm damage, and small tree clearing projects. Junk wood, small limbs, chippings, and other miscellaneous woody debris such as pallets and crates must be appropriately disposed of at the landfill or other reutilization sites.

4.1.5 Civilian and Unit Use of Forest Products for Firewood

A cut-your-own firewood lot is located on the installation and is open to anyone employed, stationed, or residing on Fort Knox. Permits are required to remove any firewood material from the lot and are available at the Fort Knox Hunt Control Office for a nominal fee. Permits will not be approved to obtain firewood from previous timber harvest areas and log decks in the training areas due to potential conflicts with training area access and use.

Firewood for use by units in training will be addressed on an as-needed basis. A request memo or email must state when and where the wood will be utilized and an estimated amount of wood needed (pieces or cords). NRB will determine whether to allow salvaging of only downed trees near the bivouac or range area, allow use of wood from nearby past harvest site logging decks, or wood left in the installation cut-your-own firewood lot. Cutting live or dead standing trees for firewood use is strictly prohibited.

4.1.6 Prescribed Burning

Wildfires are a natural occurrence, and fire is an essential part of ecosystem management, however, prescribed burning is a more favorable alternative. In fact, fire is essential to maintaining much of Fort Knox's native vegetation and restoration of the desired forest ecosystem.

Prescribed burning can, if used properly, be utilized to obtain multiple desired results. Prescribed fire can be used to prepare seed beds and stimulate the seedbank, improve forage for wildlife, increase nutrient availability, promote plant diversity, and improve seed and insect availability. Some species of plants are fire dependent and require fire for germination. Burning also is used to reduce fuel loads accumulated from timber harvest operations or natural buildup. The use of fire in hardwood forests requires considerably more care than in pine forests since repeated or hot fires can damage and kill many hardwood species. Burning also can be used to facilitate land rehabilitation tasks.

Opportunities to prescribe burn are weather and fuel condition dependent. Most prescribed burns on Fort Knox are conducted from January through early April when weather conditions are more conducive for burning. Late growing-season or fall burns may be used to reduce woody encroachment in native grass fields, early successional habitat, and forests and woodlands. Even with adequate soil moisture, high winds can and should prevent burning. Burning parameters that need to be followed closely are relative humidity, wind speed, and direction. The Natural Resources Branch prepares fire prescriptions designed for habitat management purposes. These prescriptions outline the goals of the burn, acceptable fire behavior, and method of conduct of the burn.

Frequency and timing of wildfires on Fort Knox are more often dissimilar to the historic naturally occurring fires under which the ecosystem evolved. Military-related fires happen virtually year-round, and some areas repeatedly burn while others seldom burn. It is not easy to determine which wildfires, if any, are beneficial to overall ecosystem health and which are detrimental. The following are general guidelines about fire at Fort Knox:

- Fires may be useful in areas that seldom burn, regardless of time of year
- Slow burning, cool fires are useful in areas with high fuel loads as a means to prevent catastrophic fires
- Open areas dominated with grasses can be burned more frequently than forested areas, especially if fires are cool season
- Dry-season fires with the possibility of moving toward boundaries during periods of high winds should be suppressed as soon as possible; if necessary, back burns should be used
- Fast-moving ground fires are often less damaging to snags and den trees since fires quickly move past trees rather than slowly catching them on fire
- Back burning under cool conditions often reduces the risk of later, more damaging fires

Prescribed fire is most effective in areas where the likelihood of wildfires is greatest. Fire is utilized at Fort Knox for fuel reduction and vegetation management. These actions are important to maintain biodiversity through the maintenance and enhancement of native warm season

grasslands, old field habitats, and forestland. The NRB plans to burn up to 2,500 acres in each of the next 5 years. The use of prescribed fire for the management of forest habitats will be in accordance with accepted forest management practices with the goal of enhancing oak-hickory regeneration. Fort Knox has developed an Integrated Wildland Fire Management Plan (IWFMP) (Appendix F) to integrate how wildland fire is managed on the installation. The Natural Resources Branch Chief serves as the Integrated Wildland Fire Manager. Sections 4.5 and 5.4 contain provisions for prescribed burning in Special Areas.

4.1.7 Wildfire Prevention

Wildfires are of significant concern at Fort Knox. Most start within range and impact areas, although some do occur within the training areas. In 1987, a training-related wildfire burned more than 30,000 acres and another in 2010 burned approximately 13,000 acres. Wildfire prevention implies reducing the start of wildfires, containing their spread, and their actual suppression. The military mission must occur year-round, so there are limited options to reduce the number of wildfires, especially those within impact areas. Therefore, this INRMP emphasizes containment and suppression on a continuing basis. The Fort Knox IWFMP provides guidance for all wildland and prescribed fire management activities at Fort Knox and will be integrated with and support this INRMP.

There are approximately 51 miles of boundary and interior firebreaks and fire access lanes on the installation. About 14 miles are within or on the boundary of impact areas (Appendix D, Figure 3). The NRB is responsible for firebreak/firelane maintenance. Firebreak maintenance uses Forestry and Operations and Maintenance Army (OMA) funds.

4.1.7.1 Wildfire Suppression

Wildfire suppression is the responsibility of the Fire Chief, Directorate of Emergency Services, DPW. Range Branch evaluates fires outside the impact area for possible intervention, but fires within impact areas are only fought if there is reason to think they might extend beyond the impact area. The Fire Department works with Range Branch to suppress most wildfires. If necessary, they may contact the NRB for assistance in wildfire suppression. Fort Knox currently has several personnel that have completed wildland fire training. Fort Knox should provide continuous training opportunities for wildland fire staff to remain up-to-date on wildland fire-fighting tactics and to encourage wildland firefighter certification.

This system allows Fort Knox to use its NRB personnel as needed for larger wildfires. It also gives these personnel the opportunity to provide input into decisions of whether or not to suppress fires.

4.1.8 Urban Forest Management

Fort Knox has thousands of mature trees adjacent to developed sites within the cantonment area which constitutes an urban forest, typical of most cities. Management of this urban forest, exclusive of the Knox Hills family housing lease and non-appropriated programs, is the responsibility of the Natural Resources Branch within DPW.

The Natural Resources Branch provides for day-to-day guidance and short-term projects with respect to the Fort Knox urban forest. NRB personnel also provide recommendations with regard to tree species to be planted within the cantonment area, as well as determination of whether a tree should be removed or trimmed. For more information on Fort Knox urban forestry management, please refer to the Fort Knox Urban Forestry Management Plan (UFMP) and the Knox Hills Natural Resources Management Plan (Appendix I).

The urban landscape of the Fort Knox Cantonment Historic District contributes to the overall setting of this historic resource. The locations and varieties of trees and other vegetation were important considerations in the original design of the cantonment area, especially the design of family housing neighborhoods. Standard operating procedures include ongoing monitoring of the urban forest in the Historic District and replacing deteriorated or damaged trees in kind in an effort to maintain the historic landscape. Please refer to the Fort Knox UFMP and the Knox Hills Natural Resources Management Plan for urban forestry management in the Historic district.

4.1.8.1 Urban Forest Management in Housing Areas

Family housing on Fort Knox has been privatized and managed by Knox Hills, Inc. Knox Hills has a 50-year lease with the option for 25 additional years, with approximately one-third of the Fort Knox cantonment area under this lease agreement. The document that outlines urban forestry management for this area is the Knox Hills Natural Resource Management Plan. Knox Hills is required to notify the NRB when they receive a request or observe a tree that potentially needs to be removed for safety or other needs. NRB inspects the tree for health, safety, and potential endangered species use and either approves removal or recommends other alternatives.

When housing demolition or construction of new housing facilities require the removal of trees, the NRB will be contacted to evaluate and determine the fair market value of the timber and ensure that it is disposed of pursuant to Army regulations.

4.1.8.2 Urban Habitat Management

Emphasis on urban wildlife management has opened a new avenue for resource management. An emerging awareness that urban areas can be managed for wildlife and still be attractive, combined with reduced funding for grounds maintenance, has created new opportunities for habitat management within the Fort Knox cantonment area.

Some trees within the urban area could be roosting and/or maternity habitat for the federally endangered Indiana bat and the threatened northern long-eared bat. In order to reduce direct impacts to protected bats, and after informal consultation with the USFWS Kentucky Field Office (KFO), trees slated for removal are evaluated by qualified Natural Resources Branch personnel as to their suitability prior to removal, in accordance with the terms outlined in the Fort Knox Cantonment Area Tree Removal Policy Biological Opinion (USFWS 2012-B-0318, Appendix G). Personnel will determine bat usage through the presence of exfoliating /loose bark, staining, guano deposits, and listening for bat vocalizations. If the tree exhibits potential roosting habitat, and must be removed the tree is monitored for emerging bats at dusk through complete darkness. If the tree has no emerging bats then it can be removed the following day only. If a situation occurs where bats, or evidence of bats, are observed the NRB will coordinate

with the USFWS (KFO) regarding the tree removal process. In addition, if a tree is removed, and bats are observed, the NRB will also notify the KFO for additional consultation. All work orders for removal of trees are approved by the NRB prior to completion of the work.

As noted in the UFMP trees that die or are on the decline on post are evaluated on their having a target nearby. If the trees are in no danger of hurting persons or property if they fall (hazard trees), they are left for wildlife purposes.

Reduced grounds maintenance over the years has provided areas that have been able to revert back to forested, prairie, or wildflower areas.

4.1.8.2.1 No-Mow Areas

"No-mow" is the elimination of an area from the grass-mowing cycle. These areas are best accepted by the public when they are natural extensions of existing "wild" lands, such as narrowing of a mowed road shoulder or extension of a woody area into a field.

This "growing wild" phase of reduced grounds maintenance is not without its problems. During the first few years, some areas may be somewhat unsightly due to growth of undesirable plants. Chemicals may be needed to eliminate early invader exotic species and to promote faster recovery of native vegetation. Chemical use, particularly spot treatment, may cause some temporary eyesores. There are also increased pest problems such as ticks and rodents associated with wild areas near buildings. However, experience on other installations has shown that these problems are relatively minor.

Some areas set aside for prairie must be mowed at least every other year after bird nesting season (1 April – 15 August) to keep woody vegetation from encroaching. This is especially true of natural areas associated with Godman Airfield approaches. However, due to the presence of the Henslow's sparrow in these areas, it is critical that mowing in this area be closely coordinated with the NRB.

4.1.8.2.2 Urban Habitat Development

No-mow, in itself, creates habitat, but better habitat can be created if management is applied to these areas. If the goal is grassland habitat, the major treatment is usually control of exotic grasses and invader forbs. If the goal is forest habitat, tree planting often improves species composition as well as the rate of forest habitat development. In this case native mast producing species should be planted. Ornamental trees will not be planted unless they are native. Wetland habitat development in urban areas is more difficult. Five-year and annual plans for urban forest management are outlined in Fort Knox's UFMP and the Knox Hills Natural Resources Management Plan. A carbon sequestration study was completed by the Northeast Forest Experiment Station of the U.S. Forest Service on Fort Knox, and explains the importance and need for increased funding for tree planting in the cantonment area.

4.2 Wildlife Management

4.2.1 Habitat Management

Habitat management is accomplished on the installation through the use of various methods including timber harvest, timber stand improvement activities (TSI), prescribed burning, wildlife plots, mowing, fallow disking, invasive species removal, and herbicide application. The objective of the management action and the attributes of a particular habitat determine the type of management that is initiated in an area.

4.2.2 Wildlife Plots

The wildlife plots planted on the installation can be broken down into two main types; warm-season annual and cool-season annual/perennial. Cool-season plots generally consist of a mixture of wheat or winter oats along with perennial legumes such as ladino clover, red clover, and alfalfa. These plots are generally late-summer plantings or can be early-spring planted with spring oats instead of the wheat or winter oats. The warm-season annual plots consist of a variety of plantings to include millets, wild game sorghum, sunflower, and buckwheat. The focus of plot plantings has been in perennial plots of clovers that last for 3 to 5 years and only require annual maintenance through mowing, fertilize/lime, and herbicide treatment for grass weeds. Fields are planted/maintained as the military mission and access allows.

4.2.3 Native Warm-Season Grasses

Nwsg are planted mid-April through early June with a Truax no-till seed drill. Establishment of nwsg is generally concentrated in tall fescue dominated fields. This is usually accomplished by eradicating the tall fescue by prescribed burning and then using herbicides such as Glyphosate and Imazapyr; then seeding the area with high quality mixture of native grasses and forbs. Establishment of native grasses and forbs will continue to be the focus for reclamation projects, reseeding of non-turf areas, and management of areas to enhance suitability for pollinators.

4.2.4 Terrestrial Brush Piles

Brush piles provide cover for many wildlife species, with the cottontail rabbit being the target species on Fort Knox. Brush piles are constructed on a “time as available” basis during winter months. They are generally built in areas that may lack this type of overhead cover and along "hard" edge habitats between grasslands or old field habitats and forest stands. Old logs are often used to support the piles and provide access to small mammals. Trees (cedar, locust, sassafras, and other undesirable species) are either cut and piled or hinge-cut.

4.2.5 Artificial Roosting and Nesting Structures

Artificial roosting structures and nests are a recognized management tool for bats, wood ducks, geese, certain other waterfowl species, osprey, purple martin, bluebird, American kestrel, and gray squirrel. These structures are placed and maintained as time and materials permit.

4.2.6 Fish Habitat Structures

Sunken brush piles provide places for fish to hide from predators, nesting and spawning habitat, shade, and places for fish foods to grow. The structures also concentrate larger predator fish for anglers. Most ponds and lakes at Fort Knox have considerable structure, particularly old standing timber, which alleviates the need for a major pond structure program. However, on a "time as available" basis, cedars and other brush are placed in waters where there is less structure and weighted with cement blocks and sunk.

4.2.7 Fallow Disking

Fallow disking has been used to promote forb growth and provide travel lanes in primarily grassland areas. Fallow strips are done in the late winter and during fall food plot planting in August through October.

4.2.8 Prescribed Burning

Prescribed burning is an integral part of the ecosystem management on the installation. Varied and skillful application of fire under prescribed conditions is essential for managing the targeted oak-hickory forest types and native grassland habitats on the installation.

The Natural Resources Branch conducts burns for habitat management purposes with the goal of each burn varying depending upon the habitat type. Prescribed fire will be used as a cost effective and efficient method to manage early successional stage habitats important for many game and non-game species. Areas that are in these grasslands and old-field habitats must be manipulated on a 2- to 5-year rotation to reduce woody invasion. Prescribed fire is a very efficient method of maintaining and managing areas seeded to native grasses to remove woody vegetation, promote forb growth to enhance species diversity, and prepare the site for follow up herbicide applications to remove invasive species, such as tall fescue, kudzu, and sericea lespedeza. The Natural Resources Branch has conducted fuel reduction burns adjacent to firing ranges to reduce fuel levels and decrease the chances of a severe wildfire. Prescribed fire will continue to be used as an integral part of ecosystem management on the installation. Sections 4.5.2, 4.5.5, and 5.4.7 contain provisions for prescribed burning in Special Areas.

4.3 Game Management

4.3.1 Deer and Turkey Population Trends

A considerable effort has been made to monitor white-tailed deer on Fort Knox since military occupation; the population probably peaked in 1965 through 1966. Between that peak and 1990, the deer population was reduced and maintained within range carrying capacity using hunting. Since 1991, over one-third of the installation has been off-limits to hunting, and the deer herd is once again well above range carrying capacity in the central part of the off-limits impact areas. Without access to these areas for hunting the population cannot be managed. In the areas open to hunting a troubling trend began to occur in the deer harvest beginning in the 1990s. Under the bag limit of one either sex deer the buck:doe harvest ratio was increasing each year. In 1992 the harvest ratio was 53% bucks and 47% does. By 1998 the ratio had increased to 61% bucks and

39% does. This trend continued even with the addition of bonus antlerless deer permits in many areas. Beginning with the 2001 deer season Fort Knox implemented Quality Deer Management (QDM) throughout the installation and during all hunting seasons. This management strategy resulted in the following basic changes:

- Two deer tags issued with each archery deer permit and each gun deer permit: one either sex deer tag and one antlerless deer tag. Additional antlerless tags are also available.

- Hunters in all seasons shall not take antlered deer with an overall antler spread less than 12 inches.

Data collected from two full harvest seasons at Fort Knox indicated that the implementation of a 12-inch outside spread limit will protect virtually all yearling bucks and a small percentage of the 2.5-year-old bucks. As a general rule a bucks ears are generally 14-15 inches tip-to-tip in the relaxed state. Hunters use the width of the ears as a guide and select bucks that have antlers that are about as wide as their ears or wider. Using this method allows for a few inches of error in judging the spread of a deer in the field.

The primary goals of QDM are to produce healthy deer (bucks, does, and fawns), improve the sex ratio of the deer herd, and provide quality hunting experiences. Selective harvest is required in order to accomplish these goals, particularly, to refrain from harvesting young bucks and harvest an approximately equal number of bucks and does. In the initial years of QDM it is necessary in some cases to harvest more does than bucks to balance the sex ratio in the population. This is accomplished by issuing additional antlerless deer tags and the implementation of antler spread limits to protect yearling (1.5 years old) bucks and some of the 2.5 year olds.

One of the most challenging aspects of this management approach is to reduce the number of fawn bucks or "button bucks" harvested, although some harvest of button bucks is unavoidable. Below is a chart depicting the harvest averages during the Quota Gun Deer Hunt from 1997 through 2000 compared to harvest averages from 2001 through 2016 under QDM management:

1997 through 2000
1,102 Total Harvest Average
60% Bucks
40% Does
47% of antlered deer harvested were 1.5 year old bucks
Average antlered deer harvest = 527
17% of antlered deer are 3.5 years old or older

2001 through 2016
747 Total Harvest Average
49% Bucks
51% Does
Average annual antlered deer harvest = 256
50% of antlered deer harvested are 3.5 years old or older

Wild turkey numbers on Fort Knox have risen rapidly since the stocking of 49 wild turkeys in 1989. Recent harvest results indicate that the turkey population on Fort Knox is well distributed and currently is stable to slightly increasing. Variations in the turkey harvest are based primarily on gaining access to areas not being utilized for training and on the success of the hatch in the two preceding years.

4.3.1.1 Game Harvest Strategies

The Natural Resources Branch has considerable data on harvest and recreation trips involved with hunting. Deer harvest data collection began in 1965. There are limited data on fishing trips, since they do not always require area checkout as with hunting.

Harvest goals are based on the previous year's check station and survey data. The strategy to achieve these harvest goals is to place an appropriate density of hunters in the areas, within the constraints of safety, in order to achieve harvest objectives. Over harvest is seldom a concern.

4.3.1.2 Turkey Harvest

Success of the turkey program is evidenced by a rise in harvest from about 20 birds per year through 1990, to 80 birds in 1995, and 120 and 144 in 2005 and 2006, respectively. Turkey populations have leveled out in most areas within the installation, and the harvest of turkey gobblers each spring will most likely be limited by area availability and weather conditions. Turkey harvest is monitored by hunting area during the season and specific areas are closed to further harvest should the need arise to maintain a sustainable population of adult gobblers in future years.

Fort Knox's spring turkey season is generally one weekend prior to the state season and then concurrent with the state season through the first weekend of May, which roughly coincides with the spring mating season. The bag limit is two gobblers or turkeys with a visible beard.

4.3.1.3 Fish Harvest

Fort Knox has seven lakes and ponds that are managed, primarily for bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), and channel catfish (*Ictalurus punctatus*).

Fish harvest control is important on Fort Knox; with an estimated 5,000 anglers using primarily seven managed lakes, harvest becomes a major population factor.

Channel Catfish: There is no length limit for channel catfish. The creel limit allows five fish daily.

Largemouth Bass: Largemouth bass are greatly affected by angler pressure. Ponds and lakes are highly susceptible to overfishing if controls are not imposed and enforced. The average Fort Knox angler is not an effective agent for controlling bass abundance or size, but serious bass anglers are very effective population influencing agents. Biologically, bass generally are found in

adequate or even excessive numbers in smaller length classes. Often, however, there are inadequate numbers of larger bass to keep prey species from overpopulating small ponds and lakes. Fort Knox uses a 15-inch minimum length limit on largemouth bass on managed lakes, with a 5 fish creel limit.

Smallmouth and Kentucky Spotted Bass: Smallmouth bass (*Micropterus dolomineui*) and Kentucky spotted bass are found primarily in Cedar, Mill, and Otter Creeks on Fort Knox. These game fish have a 12-inch minimum size limit with a daily creel of 5.

Rainbow Trout: Trout are stocked in Otter Creek during spring through early summer (Section 4.3.4.2.1) and the season is open year-round on this species which does not reproduce on Fort Knox. The creel limit is six daily with no size limit. Anglers are required to have state trout permits in addition to fishing licenses and Fort Knox fishing permits. Fort Knox cooperates with KDFWR on a delayed harvest trout program on designated reaches of Otter Creek. KDFWR stocks fish the first week of October and these reaches are designated as catch and release, artificial lure only areas to increase fishing quality during October through March. The entire reach is open to catch and keep during 1 April through 30 September.

Other Game Fish: There is a 20 fish per day limit on bluegill, redear, and sunfish; a 30 fish limit on crappie; a 15 fish limit on rockbass; and a 15-inch size limit and 5 fish creel limit on hybrid white bass. However, there are very few controls on harvest of other game and non-game fish beyond general state regulations on fishing.

4.3.2 Game Monitoring

Absolute numbers are seldom needed to manage game species, as long as general trends are known. The following techniques are designed to provide such trend data.

4.3.2.1 White-Tailed Deer

Deer herd health is monitored using check station harvest data as well as six 1,500 acre camera survey areas. Half of the camera surveys are conducted each year pre- and post-harvest. This data along with harvest data is used to make decisions on harvest goals and population dynamics. Deer harvested during gun season are weighed, aged, and antler measurements are taken from males. Primary parameters used to determine overall herd condition attained from harvest data include the following:

- Mean yearling female dressed weight
- Mean male fawn dressed weight
- Mean female fawn dressed weight
- Percentage of fawns in harvest

4.3.2.2 Turkey

Turkey abundance has significantly increased since about 1989. It is important to monitor the size of the turkey flock, since it has become a popular game species. (Section 5.2.10.1) Turkey harvest is monitored during the spring turkey season to ensure that an individual area is not over-

harvested. Cursory visual surveys of brood success is monitored during the summer and fall to determine if spring turkey harvest should be curtailed due to abnormally low nest success the prior year. Overall the nesting success of wild turkeys at Fort Knox has been sufficient to maintain or slightly increase the population in recent years.

4.3.2.3 Other Game Species

Other game species are monitored using harvest data. Harvest generally reflects relative population size, and this information is adequate to manage other Fort Knox game species.

4.3.2.4 Game Fish Monitoring

All major fishable impoundments have been inventoried during the past 30 years. Species accounts are well known. Inventory techniques include seining and electroshocking.

Seining: Seining is sometimes used to sample fish populations on Fort Knox. Generally coves, shorelines, or other shallow areas are sampled using seines as short as 20 feet long and as long as a 100-foot pocket seine. These surveys are done as they are needed. Target species include yellow bullheads, golden shiners, carp, and green sunfish.

Electroshocking: The monitoring system of choice at Fort Knox is electroshocking. KDFWR conducts these surveys. Shocking generally begins shortly after dawn when fish are found in shallow water. Shocking effectiveness is best in water less than 6 feet deep. The standard "route" for each pond is one trip around the shoreline unless enough fish are caught to calculate population parameters sooner, as sometimes happens in larger ponds and lakes. Electroshocking can meet most of Fort Knox's fish census needs.

Data collected include the total weight of each species within each length class. Average weights per length class are calculated for largemouth bass, bluegill, and redear, as are numbers of fish of each species captured per unit of time shocking. Other data include numbers of other species caught.

4.3.3 Non-game Species

Traditionally, only game species and a few other high-interest species (i.e., endangered species) have been monitored. Only in recent years have more comprehensive inventories been performed at Fort Knox (White et al. 1994, Martin et al. 2005). Since these inventories represent "snapshots" of recent conditions, their tracking value is limited and it is important that they be repeated to gain an accurate estimate of the species present on the installation.

Non-game populations are seldom directly managed at Fort Knox, with the exception of endangered species, however, most habitat restoration and management projects conducted on the installation are very beneficial to non-game species. Forest management and restoration, land rehabilitation, tall fescue eradication, nwsg establishment, TSI operations, prescribed burning, and water quality management are examples of these activities, and are also consistent with the ecosystem management strategies adopted at Fort Knox.

4.3.3.1 Migratory Birds

Fort Knox supports a wide variety of bird species; including neotropical, nearctic, and short-distance migrants, as well as year-round residents. A Monitoring Avian Productivity and Survivorship (MAPS) station was established by the Institute for Bird Populations on Fort Knox in 1994 (DeSante and Burton 1994) and included a capture and banding program that was targeted toward neotropical birds. The MAPS program documented 117 species of birds, 75 of which are known to breed on the installation, and another 42 that are considered migrants or out-of-range transients. The MAPS program on Fort Knox was discontinued by the Institute for Bird Populations in 2008.

Martin et al. (2005) documented 85 species of birds during morning point counts, to include 40 species of neotropical migrants, 7 short-distance migrants, and 38 species of year-round residents. Red-eyed vireo (*Vireo olivaceus*), indigo bunting (*Passerina cyanea*), and wood thrush (*Hylocichla mustelina*) were the most common species detected overall. During these surveys, 26 Partners in Flight (PIF) priority species were observed, the most common of which were the wood thrush, blue-gray gnatcatcher, and Acadian flycatcher. Other species of concern and state-listed species observed on the installation were the Henslow's sparrow, cerulean warbler, and great blue heron.

In addition to adhering to the MBTA, Executive Order 13186 (2001) requires federal agencies to implement conservation and management programs to benefit and to minimize impacts on migratory birds. The DoD entered into a Memorandum of Understanding with the USFWS in 2014 which promotes the conservation of migratory bird populations using a collaborative approach, while sustaining the use of military managed lands and airspace for testing, training, and operations.

In 2007, the DoD Migratory Bird Readiness Rule authorized incidental take of migratory birds during military readiness activities, but it does not, however, include routine installation support services, construction, or any industrial activities. In December 2017, the U.S. Department of the Interior issued Memorandum M-37050 which concluded the MBTA does not prohibit the incidental taking of migratory birds for otherwise legal activities. Fort Knox strives to protect and manage migratory bird and their habitats through its natural resources management activities and manage its lands and non-military readiness activities in a manner that supports migratory bird conservation, habitat protection, restoration, and enhancement.

Fort Knox promotes the conservation of migratory birds through its forest management actions, prescribed burning, TSI operations, invasive species removal, and wetland conservation, to the extent practicable, while supporting the military mission. However, it is important to note that some actions taken to benefit one migratory bird population may adversely affect other migratory bird population. Monitoring bird populations will occur as funding becomes available.

The Wildlife Aircraft Strike Hazard (WASH) Plan outlines measures taken to reduce wildlife hazards, including migratory birds, on and around the airfield (Appendix H).

4.3.4 Reintroduction and Stocking

Reintroduction and stocking are techniques used to enhance existing populations or to introduce new species to an area. Transplanting implies moving wild animals, while stocking implies putting pen-reared animals onto an area.

4.3.4.1 Wildlife Reintroduction and Stocking

In 1989, 49 wild turkeys were moved to Fort Knox to increase genetic diversity among the flock. It is believed the introduction of different genetic stock contributed to the recent increases in flock size as reflected in huge harvest increases.

In the case of the turkey, reintroduction has been beneficial to ecosystem restoration at Fort Knox. However, as experiences with both the ring-necked pheasant and pen-reared turkey prove, stocking is seldom successful for establishing wild terrestrial populations and could be a source of disease introduction to wild birds.

4.3.4.2 Fish Stocking

Stocking includes fish put into bodies of water to add to existing populations and species that are purely "put and take." This includes the rainbow trout stocking of Otter Creek. Additionally, stocking of channel catfish in the managed lakes increases the current population and increases any potential reproduction of this species. Infrequently, supplemental stockings of largemouth bass may be conducted in managed lakes to bolster the reproductive population of this species and increase predation on bluegill or undesirable species such as green sunfish. Hybrid white bass have been stocked in Lower Douglas and Sanders Spring Lakes to provide additional fishing opportunities and increase predation on undesirable species (i.e., gizzard shad) that exist in Sanders Spring Lake.

4.3.4.2.1 Rainbow Trout

Trout is the only pure "put and take" stocking conducted on Fort Knox since the trout do not reproduce. Trout are provided at no charge from a USFWS hatchery; approximately 3,000 (normally 12 inches long) are received at Fort Knox each year. Additional funding may be provided to USFWS to produce additional trout for stocking as funding is available. Fort Knox is cooperating with the KDFWR in their delayed harvest program on Fort Knox's section of Otter Creek. This program consists of placing catch and release/artificial lure only regulations on the stream during the months of October through March. The KDFWR stocks the stream with additional trout the first week of October, which allows them to grow prior to harvest in April through September timeframe.

4.3.4.2.2 Channel Catfish

Channel catfish are stocked annually based on available funds. About 5,000 pounds of catchable-sized channel catfish are purchased each year from commercial sources. These fish average 2 pounds each and cost about $1.20 per pound. KDFWR frequently provides additional 8- to 12-inch channel catfish for the managed lakes biannually. Stocking is generally done in the

spring and fall.

4.3.4.2.3 Largemouth Bass

Largemouth bass fingerlings are stocked in new or recently renovated ponds at approximately 100 per surface acre to start new populations. Remedial stocking of 7- to 10-inch bass is conducted on an as-needed basis in established lakes. Natural reproduction is dependent upon normal largemouth bass recruitment.

4.3.4.2.4 Bluegill and Redear

Bluegill and redear are stocked as basic forage species in selected ponds. Once stocked, natural reproduction normally maintains adequate population levels.

4.3.4.2.5 Grass Carp

Grass carp stocking is done exclusively for aquatic weed control. This program is discussed in Sections 4.7.1.2.3 and 5.5.2.2.

4.4 Endangered Species

Based on current surveys, Fort Knox has one federally threatened species (northern long-eared bat) and two federally endangered species (Indiana and gray bat). The close relationship between Fort Knox and the USFWS Kentucky Field Office helps to ensure compliance with the Endangered Species Act (ESA) and AR 200-1.

Indiana bats were first detected on Fort Knox in 1982, when a single male was discovered at the mouth of Dripping Springs Cave. The first maternity colony was discovered in 1999 during a pre-construction survey conducted for the Multi-Purpose Digital Training Range and Northern Training Complex. As mitigation for the construction of the range and subsequent loss of that colony, the 1,458 acre Indiana Bat Management Area (IBMA) was established in 2002 to create and enhance existing bat habitat and to increase the population of Indiana bats. In 2005, an Indiana bat maternity colony was documented in the IBMA and emergence counts in 2007 revealed 282 bats emerging from a single natural roost tree, the largest known Indiana bat maternity colony in Kentucky at that time and the second largest ever recorded for the species. In 2013, another Indiana bat maternity colony was discovered in Hunting Area (HA) 6 on the west side of the installation and in 2014, a third colony was discovered in the north-central part of the installation, near the confluence of Cedar Point Branch and the Salt River in the range and impact area. Emergence counts were conducted at roost trees in both colonies in 2014 with 451 and 475 bats counted, respectively; both were records for the species. With respect to winter habitat, the caves on Fort Knox are considered too warm for Indiana bat hibernacula and are thought to be used primarily as transitional roosts during migration between summer and winter habitats.

Management activities to improve bat habitat for forest-dwelling bats at Fort Knox include timber stand improvement activities that favor regeneration of oak-hickory forests, invasive species removal, selective herbicide application and girdling of trees to create roosting sites,

wetland management, forest management to provide and enhance quality foraging habitat, and the installation on artificial roost structures (see below). Maternity colonies are monitored through the use of mist netting, radio telemetry, and acoustical surveys as the military mission permits.

In an effort to improve and augment roosting habitat for forest-dwelling bats, two types of artificial bark were placed in six locations in the IBMA in 2007. Bats, including Indiana bats, were documented using the artificial bark the following year. With the success of that project more and larger pieces of artificial bark were installed over the next few years with similar results. In 2012, completely artificial roost structures were installed in the IBMA. To date, 22 completely artificial structures have been installed on the installation (10 in the IBMA and 12 in HA6), with 18 showing signs of bat use and 13 having been used as primary Indiana bat maternity roosts (8 in the IBMA and 5in HA6). In 2015, 6 smaller artificial roosts were installed in areas where northern long-eared bats had been captured in previous studies. To date, no northern long-eared bats have been documented using the structures, however, in HA6 Indiana bats were documented using them in 2016.

Gray bats were first detected on Fort Knox in 1982, when two adults where observed in Grahampton Cave. At that time a series of ceiling stains was also discovered which indicated past use by a large colony of gray bats (10,000 +), and based on temperatures in the cave, it is thought to have been a maternity colony. Human visitation and disturbance were also noted, and since Grahampton Cave was not gated at that time, it was thought that the high degree of human visitation reduced the likelihood of gray bats using the cave. In 1993, a bat-friendly gate was installed and since then the number of gray bats using the cave has increased. Recent surveys indicate it is being used primarily by males and non-reproducing females during the summer months; however, some juveniles and reproductive females were caught in July and August 2007, but capture at this time of year may occur after colony breakup. It is also used by a few individuals during the winter.

Gray bats also have been observed in McCracken Springs Cave (~50 in September 2000), however, the mouth of this cave frequently goes underwater during periods of high water. Surveys indicate that McCracken Springs Cave is used minimally by gray bats during the hibernation period and is considered too warm to support a colony of hibernating gray bats. The USFWS KFO considers it to be a transient cave for northern long-eared and gray bats and a potential transient cave for Indiana bats. Mist net and acoustical surveys indicate that gray bats are fairly common on Fort Knox and numerous individuals have been captured/detected along Otter, Mill, and Cedar Creeks.

Northern long-eared bats were once one of the most common bat species on the installation, with capture records from nearly every mist net survey. However, since white-nose syndrome was detected here their numbers have plummeted. Intensive mist net surveys in 2015 and 2016 in areas where northern long-eared bats had been captured before yielded none. In 2017, two northern long-eared bats were captured in the southern portion of the installation. Fort Knox will continue to survey in these areas, as well as other areas of the installation, and will also continue to monitor the artificial roost structures.

No critical habitat has been designated on the installation for any species and the approved

INRMP will provide adequate special management and protection to obviate the need for critical habitat designation by: 1) providing a conservation benefit to federally-listed species, 2) providing certainty that the management plan will be implemented, and 3) the plan will provide certainty that the conservation efforts will be effective at benefitting listed species.

4.5 Significant Natural Areas Protection

NEPA, as well as other corresponding laws and regulations (e.g., Clean Water Act, ESA), provides special consideration for significant natural areas. NEPA is well implemented at Fort Knox and the Natural Resources Branch's review of proposed projects and operations affords opportunities to identify concerns and recommend measures to minimize impacts. Examples include avoiding unmarked cultural resources, avoiding wetlands, filling excavations after exercises, and siting missions in areas both suited to the mission needs and environmental considerations.

4.5.1 Wetlands Management

Wetland data were collected from the USFWS survey (Merritt and Carter 1994) and additional wetland surveys have been conducted for individual range construction projects on Cedar Creek (2011), Boydston Ranges (2012), , and Yano (2014). Comparisons between 1982 (NWI), 1994, and future wetlands surveys will reveal trends in this critical area. Such comparisons can also form a basis for determining compliance with public laws, executive orders, and the implementing regulations related to wetlands and floodplains.

The Clean Water Act (Section 404), Executive Order 11990, and DoDI 4715.03 help to protect wetlands. The review of projects via the NEPA process is also used to evaluate projects for wetlands impacts. When necessary, the USACE is consulted to determine whether jurisdictional wetlands are involved.

On recommendations from the USFWS, vegetated buffer zones of 70 feet are used on the installation to protect wetlands from sedimentation and encroachment, however, depending on the surrounding slope and type of vegetation, they may be slightly smaller. The number of approved vehicle stream crossings has been reduced and hardened stream crossings have been installed along Otter and Cedar Creeks and on Cedar Creek Range. Better coordination between the Master Planning Division, Range Branch, and EMD has improved, along with the NEPA review process, allowing for better protection of wetlands and water quality on the installation.

Several sections throughout this INRMP have provisions to protect water quality and wetlands. These are found within the Forest Management (Section 4.1.3), Land Rehabilitation and Maintenance (Section 4.8.4), and Waterfowl Habitat Improvement sections.

4.5.2 Cedar Glades Monitoring and Management

Cedar glades are areas where burning is critical. White (1993) suggested dividing the glades into burn units and burning these units from late-March through mid-April on a 5-to 10-year cycle to mimic natural wildfires. Burning during this timeframe favors warm-season grasses and forbs at the expense of cool-season grasses. Natural wildfires could also be "let burn" if their

timing coincides with these burning cycles. Late growing-season and fall burns (August-September) also may be used, if needed, as they are more effective at reducing woody competition and occur at a time when the rattlesnake master borer moth, a candidate for federal listing, is underground. Although no rattlesnake master borer moths have been found on the installation, hundreds of their host plants, the rattlesnake master, have been found in the glade complex and other early successional habitats. If fire does not remove sufficient woody growth, manual removal is a recommended option. This, in turn, offers an option to create terrestrial brush piles from debris cut within glades. Some areas within these glades may be seeded using seed collected on site (White 1993).

In 1995, the Natural Resources Branch initiated a management program for the Cedar Glades which includes: prescribed burning, cut stump and stem injection herbicide treatments (as manpower and timing permits), and establishing restrictions on ground-disturbing training activities. Since these management actions have been implemented, there has been an increase in rare endemic species found on the glades and more work is planned on other smaller glades in this complex. The NRB is exploring the possibility of managing the inter-related forested areas around the glades that will return these forests to conditions that provide connectivity between the glades. The forests in these areas were historically maintained by wildland fire. The absence of fire in these systems, and only focusing management on the glade itself, has increased the isolation of the glades through unnaturally shaded and stagnant forest conditions. Application of forest management practices such as TSI, selective timber harvest, invasive species control, and particularly prescribed fire, will provide additional opportunities for softer transitional habitats (edge) and more sunlight penetration making them more diverse as sunlight dependent species encroach into these forests as would have occurred naturally. Active management in these inter-glade forests is important to provide the connectivity and ecological diversity of the overall glade complex.

4.5.3 Ohio River Bottomland Hardwood Forest Management

Management of this area largely consists of monitoring growth and encouraging regeneration of bottomland hardwood forest types. Past tank recovery training in localized portions of this area has resulted in a serious hardpan developing which is located in the 18- to 24-inch soil horizon. The largest area of training-impacted land was reclaimed in 2015 and 2016. This consisted of ripping, reshaping, and replanting in cool season legumes and 10 acres of bottomland hardwood species in the rips. This area is lightly used for mounted military training since wetlands are not well suited to such training and wetland protection requirements make training difficult to justify. Some of the heavily eroded track vehicle trails have been reclaimed and graveled to stabilize them and provided improve access to wheeled vehicles.

4.5.4 Otter Creek Corridor

Management efforts for the Otter Creek Corridor include rehabilitating land, reducing erosion, maintaining forest corridors between caves and the creek, and controlling pesticides and other chemicals that might contaminate the creek. This area provides habitat for the cerulean warbler and the gray bat.

Military vehicles are restricted to crossing Otter Creek at approved crossings only. Entrances to these crossings have been hardened with concrete to reduce the mud on tracks of vehicles entering the crossing. Drainage ditches associated with roadways leading to creek crossings have been improved to direct water flow to vegetated roadside areas. Driving up or down the creek is prohibited.

4.5.5 Caves

Fort Knox contains 12 known caves: Camp Ski Hi, Dripping Springs, Hog Hollow, 31W, Twin Caves (N and S), Siebolt, Unnamed cave near LG&E Compressor Station, Upper Bee Branch (1 and 2), Grahampton, and McCracken Springs.

Protection for caves on the installation includes vegetated buffer zones around sinkholes, creeks, streams, and rivers to protect watersheds and water quality in and around caves. There also is no recreational use of caves on the installation, pesticides are used according to manufactures recommendations, and decontamination procedures outlined in the National White-nose Syndrome Decontamination Protocol are used when entering caves for scientific purposes.

Grahampton is the only cave on the installation with a gate at the entrance, the other caves have relatively small passages and human disturbance is unlikely, and gates are not warranted.

4.6 Water Quality

All partners (Fort Knox, USFWS, and KDFWR) in this INRMP agree that water quality is the best indicator of overall ecosystem health on Fort Knox. Water quality at Fort Knox is affected by environmental pollution, including increased sedimentation caused by erosion. Water quality data collected by the Kentucky Department for Environmental Protection (KDEP) and Fort Knox personnel at the Salt River near Shepherdsville, KY and the Rolling Fork River as required by the Kentucky Pollutant Discharge Elimination System (KPDES) permit, provide the best information for describing general water quality of surface waters in the area. Observed data for temperature, pH, and dissolved oxygen were found to be typical of surface waters in the area. Chemical constituent concentrations were indicative of hard surface waters. While nitrogen levels were found to be generally low, phosphorus values were above eutrophic levels found in lakes and reservoirs. Total organic carbon concentrations were found at levels that are common in streams with forested areas in the watershed. Other concentrations such as total suspended solids, iron and aluminum were typically not high except during runoff events. Fecal coliform concentrations were generally at acceptable levels for designated uses.

Stormwater Pollution Prevention Plans (SWPPPs) are required by the Environmental Protection Agency (EPA) for land disturbing activities that affect more than 1 acre. Coverage under this general permit is for stormwater discharges from such disturbed areas. Some activities conducted by the Natural Resources Branch may require SWPPPs.

SWPPPs must include a complete description of activities planned, including timetables. Sediment control techniques and stabilization practices are emphasized. Care must be taken to avoid piecemealing as a way to bypass SWPPPs. A Notice of Intent is sent to EPA for

authorization of the SWPPP project. The SWPPP is kept on file at the site of disturbance for reference or inspection.

4.7 Pest Management

For detailed information on pest management refer to the Fort Knox Integrated Pest Management Plan (IPMP) at Appendix E.

4.7.1 Noxious and Invasive Plant Control

The Natural Resources Branch is currently responsible for noxious and invasive terrestrial plant control as well as herbicide use in silvicultural operations and aquatic weed control in managed lakes. Golf course personnel also apply herbicides. All personnel are certified to handle and apply herbicides and should report all use to the Pest Management Coordinator.

4.7.1.1 Terrestrial Plant Control

The primary species of terrestrial noxious and invasive plants on Fort Knox include kudzu (*Pueraria lobata*), giant foxtail (*Setaria glause*), tall fescue (*Festuca arundinacea*), johnsongrass (*Sorghum halepense*), Japanese stiltgrass (*Microstegium vimineum*), sericea lespedeza (*Lespedeza cunneata*), wild onion (*Allium canadense*), bermudagrass (*Cynodon dactylon*), Chinese privet (*Ligustrum sinense*), autumn olive (*Elaeagnus umbellata*), bush honeysuckle (*Lonicera* spp.) Tree-of-Heaven (*Ailanthus altissima*), Paulownia (*Paulownia tomentosa*), Canada thistle (*Cirsium arvense*), and bull thistle (*C. vulgare*). As resources become available the Natural Resources Branch will continue efforts to identify and reduce the occurrence of noxious and invasive plant species on the installation. Currently, the largest ecosystem threat is from Paulownia, tree-of-heaven, stilt grass, kudzu, autumn olive, privet, and bush honeysuckle. Management of these species will be a priority through cut stump, stem injection, and foliar herbicide treatments.

Stem injection on undesirable stems in forest stands managed for oak-hickory forest types is another priority mission of the NRB. This is the most effective treatment method with minimal herbicide used per unit area to remove shade tolerant species that reduce potential for regeneration of oak hickory stand types. This technique, in conjunction with timber harvests and prescribed burning, is utilized both pre- and post-harvest as needed to manage species such as sugar maple, beech, sassafras, and red maple.

4.7.1.2 Aquatic Weed Control

Aquatic weeds present greater problems to small pond management than any other factor. Some exotics are particularly troublesome since they not only interfere with fishing and pond management but have almost no wildlife benefits (e.g., waterfowl food). Many lakes and ponds are ringed with weed growth during warmer months unless these weeds are treated.

4.7.1.2.1 Herbicides

Herbicides directly kill aquatic weeds, however, herbicides have three problems:

(1) decaying weeds cause oxygen depletion which can result in a fish die-off; (2) the cost is high for approved chemicals, particularly since most lakes and ponds must be treated more than once each summer; and (3) many herbicides require closing ponds to fishing following each treatment.

Herbicides are used sparingly for aquatic weed removal at Fort Knox. They are primarily used to treat filamentous algae, coontail, pondweed, and primrose. NRB personnel are certified to apply herbicides (e.g., aquatic, rights of way, and terrestrial), and this certification is updated every 3 years.

4.7.1.2.2 Mechanical or Hand Removal

Weeds can be cut mechanically or pulled by hand. Mechanical removal with floating cutters and harvesters can easily cost more than $100,000 for equipment alone. This cannot be justified at Fort Knox. Hand removal has occasionally been used for very small areas for specific weed removal.

4.7.1.2.3 Biological Control

Biological control is also possible using weed-consuming fish and birds. Fort Knox has had considerable success with triploid (genetic configuration) grass carp, a fish that is biologically incapable of reproducing. Special permits are not needed for triploid grass carp, which are commercially available from certified suppliers. They are expensive, with each 8-inch grass carp costing about $8. Optimal stocking rate is 12 per acre and restocking should be done about every 5 years.

Stockings of grass carp are working with regard to weed control. Grass carp appear to be most effective in controlling filamentous algae and coontail. Although there are sometimes signs of over-control, which can be a problem with biological controls, they are relatively short lived. Over-control will remove fish cover and may adversely affect fish predator-prey relationships. Removal of waterfowl-favored species is also undesirable.

4.7.2 Nuisance Animal Control

Nuisance animal control is the responsibility of the Pest Management contractor; the Directorate of Emergency Services, Law Enforcement Division, Military Police; or the Directorate of Public Works, Environmental Management Division, Natural Resources Branch. Knox Hills is responsible for problems in Fort Knox housing. Although exceptions occur, the following breakdown of responsibilities and policies by species is generally accurate.

4.7.2.1 Insects, Rodents, and Other Cantonment Area Pests

The Pest Management contractor almost always handles insect and rodent problems. The most common insect problems are cockroaches (German, oriental, brown, and American), but other insects such as mosquitoes, spiders, ants, fleas, bees, wasps, ticks, silverfish, beetles, bed bugs, and subterranean termites create problems. The Pest Management contractor also generally handles other wild animal pest problems within the cantonment area such as foxes, coyotes, skunks, raccoons, and birds.

4.7.2.2 Beaver and Muskrat

Beavers and muskrats create problems at lakes and streams on Fort Knox. Muskrats dig holes in dams and beavers persist in damming spillways, threatening the stability of dams and blocking access. The Natural Resources Branch, in cooperation with the DES, deals with these problems by trapping or other means of removing these animals when habitats and structures such as roads and dams are damaged or have a potential to be damaged.

4.7.2.3 Groundhogs

The burrowing lifestyle of groundhogs causes problems at Fort Knox, primarily within the cantonment area. These problems are associated with storm drains, buildings, garden, and landscaping damage, as well as fleas getting into buildings. The Pest Management contractor uses trapping and EPA-approved gas cartridges to kill groundhogs.

4.7.2.4 Other Animals

Most "other animal" problems are handled by the Pest Management contractor or Military Police personnel as required. These problems include snakes, squirrels in attics and crawl spaces, and rabid animals. Each problem is evaluated individually for appropriate action. Bats found in buildings, office spaces, etc., are removed by the pest control contractor or Natural Resources Branch personnel and released alive. Bats are checked by the Natural Resources Branch when possible to identify if they are a threatened or endangered species.

Feral hogs have been reported on the installation by hunters, but have not been confirmed, however, hunters are encouraged to harvest them when, or if, the opportunity arises.

4.7.2.5 Noxious Fish Control

Two methods, drawdown and chemical treatment (Rotenone®), are used to remove undesirable fish species or stunted desirable species. Determination of this need is made by fish surveys using species composition and relative species abundance. The primary species of concern are the green sunfish and gizzard shad. Green sunfish are not a favored prey species, and its large mouth and feeding habits make it an effective predator and competitor with desirable species.

4.7.2.5.1 Drawdown

Pond level drawdown can either be complete or to seining depth. This can be done if an outflow pipe is present, which is true of almost all ponds and lakes on Fort Knox. Drawdown allows largemouth bass to prey upon excess prey species such as bluegill and other bream species. If pond renovation is needed, the drawdown can be complete, or nearly complete, to allow construction equipment onto the lake bed. If a considerable number of prey species need to be removed, drawdown to seining depth (less than 6 feet) allows seining to remove undesirable species and return desirable fish.

4.7.2.5.2 Rotenone® Treatment

The other method of noxious fish control is non-selective removal by using Rotenone®. Normally, Rotenone® is used when a complete fish population restructure is desired and is used at a concentration recommended to ensure an almost complete kill. Stocking follows to return the body of water to the desired fish population densities and proportions.

4.7.3 Integrated Pest Management (IPM)

In November 2016, Fort Knox completed a new Integrated Pest Management Plan (IPMP.) AR 200-1 provides Army policy guidance for this program. Applicators are certified and maintain their certification through the Academy of Health Sciences, Fort Sam Houston, TX. Chemicals used are approved by the EPA. AEC approval is required prior to using a new chemical.

Chemicals for pest management at Fort Knox are primarily applied by Pest Management contractor (pesticides), Grounds contractor, Natural Resources Branch (terrestrial and aquatic herbicides), and the golf course personnel. The Forestry Program Manager, Natural Resources Branch is the Pest Management Coordinator for the installation.

The IPMP recognizes potential impacts of pesticide application to endangered species and presents plans to minimize that threat. The plan is also cognizant of the potential for pesticide spills and is integrated with the Fort Knox Spill Prevention, Control, and Countermeasure Plan, and includes appropriate response mechanisms.

4.8 Integrated Training Area Management (ITAM)

ITAM was developed primarily by the Construction Engineering Research Laboratory (CERL) as an Army-wide program to provide quality training environments to support the Army's military mission. ITAM was funded because Army training lands were being degraded to the point where their capabilities to sustain military missions were in jeopardy. The ITAM program is one of the two core programs of the Sustainable Range Program and is responsible for maintaining the land to help the Army to meet its training requirements. This requires understanding and balancing Army Training requirements and land management practices.

The ITAM program relies on its five components and integrated management from HQDA, MACOM, and installations to accomplish its mission. The five components are Training Requirements Integration (TRI); Range and Training Land Assessment (RTLA); Land Rehabilitation and Maintenance (LRAM); Sustainable Range Awareness (SRA); and Geographic Information System (GIS). These components combine to provide the means to understand how the Army's training requirements impact land management practices, what the impact of training is on the land, how to mitigate and repair the impact, and communicate the ITAM message to Soldiers and the public. GIS is a foundational support element that provides locational information that assists land managers in making decisions.

Several documents provide policy guidance for the ITAM program:

The ITAM Program Strategy (1995): This document describes the roles, responsibilities, and relationships among the functional proponent and supporting organizations, provides an overview of the ITAM policy and guidance, and describes ITAM components. The ITAM strategy provided the foundation and guidance for the ITAM Regulation and Pamphlet.

ITAM Procedural Manual (1998): This document provides standard operating procedures (SOPs) for the ITAM program. The document accompanies AR 350-4 and defines HQDA, MACOM, and installation roles and responsibilities in greater detail than the regulation.

***AR 350-19 -The Army Sustainable Range Program (2005*)**: AR 350-19 (30 Aug 2005) consolidates AR 210-21 (1 May 1997), and AR 350-4 (8 May 1998). It assigns new responsibilities for integrating program functions to ensure the capability, accessibility, and availability of ranges and training lands. This regulation assigns responsibilities and provides policy and guidance for managing and operating U.S. Army ranges and training lands to support their long-term viability and utility to meet the National defense mission; planning, programming, funding, and executing the core programs comprising the Army's Sustainable Range Program (SRP), the Range and Training Land Program (RTLP), ITAM; integrating program functions to support sustainable ranges; assessing range sustainability; and managing the automated and manual systems that support sustainable ranges.

4.8.1 Geographic Information System (GIS)

AR 115-11 (Geospatial Information and Services, 28 August 2014) states that GIS applications assist the Army with completing its mission and objectives. GIS allows the Army to manipulate spatial data to create maps, manage facilities, and analyze data. Current regulations require that geographic data pertaining to the installation and the surrounding area must be obtained by the installation. Data that should be obtained by the installation includes, but is not limited to: wetlands, historic properties, endangered species, wash racks, prescribed burns, buildings, roads, utility lines, man holes, facilities, paved areas, fiber optic cables, switches, firing points, explosive safety quantity distance arcs, surface danger zones, noise contours, and air/water/soil/entomological samples. All GIS metadata will be documented in accordance with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata. GIS data will be organized and maintained through the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE). The datum for all GIS data on the installation will be in World Geodetic System of 1984 (WGS84) and North American Vertical Datum of 1988 (NAV88) to ensure consistent data alignment and accuracy.

The Geospatial Information Officer (GIO) in the DPW, Engineering and Services Division (ESD) Geospatial Data System office oversees the Garrison's installation Geospatial Information and Services requirements. The GIO ensures that the installation implements and remains in compliance with current Army GIS regulations and that all the data is network accessible and available for all installation functions. The ESD office has two GIS/CADD positions which support engineering and general services projects. The DPW, Environmental Management Division (EMD) is staffed by a GIS Specialist (contract position) and supports compliance with environmental management requirements. The DPW, EMD, Natural Resources Branch also has several GIS users that work with and update GIS layers. The Sustainable Range Program (SRP) funds a GIS Program Analyst (contract position) who provides support for the ITAM program.

The standard operating software at Fort Knox is ESRI's ArcGIS and related ESRI products. GIS data is consolidated into a central location with the goal of providing up-to-date spatial data that is available for post-wide use (Garrison Command, DPTMS, DPW, DOIM, etc.). All spatial data is organized and maintained in compliance with Spatial Data Standards Facilities, Infrastructure, and Environment (SDSFIE) and Federal Geographic Data Committee (FGDC) Metadata Standards.

4.8.2 Sustainable Range Awareness

Sustainable Range Awareness (SRA) is the component of the ITAM program that provides a proactive means to develop and distribute educational materials to users of range and training land assets. Materials relate procedures that reduce the potential for inflicting avoidable impacts on range and training land assets, including the local natural and cultural resources. ITAM SRA addresses specific environmental sensitivities at the installation level, to inform land users of restrictions and activities so as to prevent damage to natural and cultural resources.

AR 350-19 mandates the integration of SRA into existing command and/or installation operational awareness activities and events, and initiate new events that maximize outreach for the command.

The SRA component applies to Soldiers, other services using Army lands, installation staff, other land users, and the public. The SRA component also includes efforts to inform environmental professionals of Army and installation mission and training activities.

The most common formats for SRA products include:

- Soldier Field Cards
- Leader/Soldier Handbooks
- Posters/Photos
- News Articles
- Briefings
- Pamphlets/Brochures
- Web site/multi-media
- Maps and Overlays

4.8.3 Training Requirements Integration (TRI)

TRI is the component of the ITAM program that provides a decision support procedure that integrates training requirements with land management, training management, and natural and cultural resources management processes and data derived from RTLA and Army Conservation Program components. ATTACC is the standard method used in the TRI process. The integration of all requirements occurs through continuous consultation between the DPTMS, natural and cultural resources managers, and other environmental staff members, as appropriate. The INRMP is an implementing document and requires TRI input.

The TRI function is managed by the ITAM Coordinator, with direct support from the Range and Training managers, and the RTLA and LRAM coordinators. TRI is further supported by the natural resources management and/or environmental staff and the DPW. In addition, TRI involves coordination with external agencies and federal departments.

TRI achieves the "training-environmental" balance and interface that is key to ITAM and requires continuous interaction and coordination between the operations/training staff and the natural resources management/environmental staff. This ensures wise land-use planning and management decisions that meet regulatory compliance and training and testing activity requirements.

4.8.3.1 Mission Siting

It is important to site new missions in locations where natural resources can support them on a long-term, sustainable basis. This practice saves rehabilitation money and provides higher quality training to troops in the long term if adequate thought is given to both training requirements and the capability of the lands to support these requirements.

Mission siting is most effectively implemented on Fort Knox via the NEPA process. The very nature of NEPA is conducive to siting missions on lands best suited for supporting them in a sustained fashion.

4.8.3.2 Training Restrictions

Training restrictions are another form of ecosystem protection. Fort Knox has incorporated these into the FK Reg 385-22, *Range Regulation (Training/Impact Areas),* 1 December 2000.

Some environmental restrictions and programs enhance mission safety. One example includes restrictions in areas where sinkholes pose a safety hazard. In addition to the safety hazard, there are endangered species habitat threats and the threat of pollution to underground water quality. FK Reg 385-22 specifically identifies:

- Trees are not to be cut without coordination with NRB
- No digging without prior coordination
- Existing trails will be used to the maximum extent possible
- Vehicles will enter streams only during approved fording operations
- Newly seeded areas will not be used for training

Other areas marked as off-limits are the firebreaks and access lanes. These areas tend to have erosion problems if they receive too much use. Grahampton and McCracken Springs Cave have been signed and the ITAM program places signs and Seibert stakes to exclude disturbance of sensitive areas.

4.8.4 Land Rehabilitation and Maintenance (LRAM)

LRAM is a key enabler for sustaining realistic training conditions and supporting the personnel, weapons, vehicles, and the mission requirements for the units using the installation. It

provides a preventive and corrective land rehabilitation and maintenance procedure to reduce the long-term impacts of training and testing on an installation. It includes training area redesign and/or reconfiguration to meet training requirements.

LRAM uses technologies such as revegetation and erosion control techniques to maintain soils and vegetation required to support the military mission. These specifically designed efforts help installations maintain quality military training lands and minimize long-term costs associated with land rehabilitation or additional land purchases.

LRAM includes programming, planning, designing, and executing land rehabilitation, maintenance, and reconfiguration projects based on requirements and priorities identified in the TRI and RTLA components of ITAM.

4.8.4.1 Road Drainage Correction and Access Considerations

General road maintenance and construction in the training areas is normally a DPW function, with maintenance and repair requests sent through the DPW work order system to have the necessary work scheduled and completed. A few exceptions to road and trail work proceeding through work orders include ITAM initiated Range and Land Rehabilitation projects and forest management and harvesting activities executed by the NRB Forestry Office.

Construction and maintenance of stable all-weather access roads through the training areas is critical. In the past, many roads and trails were constructed with little regard to location, long-term stability, or erosion control techniques, with some created along and across drainage areas during wet weather as units conducted training exercises. Once a trail is created other vehicles tend to follow, which leads to a random network of roads and trails, often in the worst possible locations, resulting in serious land damage, reduction of quality training areas, and loss of training time due to equipment retrieval and repair. A goal of NRB is to assist Garrison Directorates and Partners to locate and establish quality access roads throughout heavily used training areas while minimizing land resource impacts and possible impacts to ESA species. NRB is consulted whenever road and trail work could involve tree removals.

4.8.4.2 Training Area Renovation

Training renovation costs approximately $2,000 per acre plus $10,000 per each hardened crossing that is constructed to protect a natural waterway. Renovation work is accomplished both with in-house crews and through contracts. Renovation projects usually start with the filling in of gullies. Once gullies are filled, the area is leveled and graded to its original contours. Brush and cedar trees are removed in heavily eroded areas to return the area to its original contour. Leveling and grading clear the area of brush and rubbish that may prevent proper applications of the renovation process. In the past, these materials have been burned within the area of work. Some debris is used for wildlife habitat and erosion sediment catchments in gullies. Other items such as rocks or similar items are usually buried. Any woody material or rubbish is buried with a minimum of 3 feet of cover material. Once the area is cleared, marking the area for terracing, shaping, and design is accomplished.

Shaping the eroded and denuded areas is generally the next step. This includes rerouting water drainages back into the natural drainages, which often involves terraces and diversion

ditches. Due to the extreme slopes of some areas, care is taken to shape the renovated area to natural contours and drainages. To help ensure proper drainage, gullies are often filled in with material generated on site. Dams, either earthen or rip-rap, are often used to collect sediment to fill ditches. Care must be taken to ensure that heavy equipment operations do not disturb native vegetation unless absolutely necessary. This is especially true in areas with poor soils due to the difficulty of revegetating these areas.

Prepared seed beds are required after completion of land shaping. The seedbed is prepared to a depth of 4 inches with a disk to incorporate fertilizer and provide a reasonably smooth, firm surface. A cultipacker seeder is used to introduce the seed into the area. Where this equipment cannot be operated, the seedbed is prepared by hand and seeded with a hand broadcaster. Wheat straw is uniformly spread over seeded areas.

Revegetation is the critical stage of training area renovation and general land rehabilitation. Revegetation must be accomplished to hold the soil in place, and ideally, revegetation should consist of native species in natural ecosystem associations. The revegetation process involves decisions regarding soil preparation and shaping, species to be planted, stage of plant to be planted (from seed to mature plant), fertilization, watering, soil retention options, scheduling, and similar items.

4.9 Natural and Cultural Resources Management

Cultural resources at Fort Knox include archaeological sites, historic sites, historic buildings and structures, objects and other material remains, and cemeteries. Given the hundreds of significant cultural resources distributed across nearly all natural and operational areas of Fort Knox, management of natural resources can have profound implications for the successful management of cultural resources. Early planning and coordination is the key to integrating successful cultural and natural resources management efforts (DoDI 4715.16). Natural resources projects that have the potential to negatively affect cultural resources are staffed through the EMD, Cultural Resources Office.

All cemeteries, regardless of their historic significance, are considered to be off-limits for training, construction, or other potentially destructive activities. As of January 2017, the Fort Knox inventory includes 118 cemeteries. Fourteen of these are in or adjacent to the cantonment area, and 101 are in training areas and on ranges. A 25-meter buffer must be maintained between cemeteries and tactical vehicle traffic.

No federally-recognized Native American tribes have treaties or land claims with, or on, Fort Knox. No sites of religious importance or other cultural significance to Native Americans have been identified on the installation (DoDI 4710.02). Native American tribes have been given opportunities to consult and comment on proposed projects and draft plans on various occasions, but Fort Knox has never received a response.

4.10 Research and Special Projects

Research and special projects are essential to developing management programs that are both effective and efficient. Natural resources programs and management needs are developing so

rapidly that research is often the only way to choose among management options to meet a particular objective. Thus, research and related projects often evaluate applied management. This fits into the adaptive management aspect of ecosystem management. In some cases, a specific problem requires a more basic type of study to identify options available to resolve problems. In either case, research and special projects on Fort Knox are oriented toward improving the installation's natural resources program.

Fort Knox has the following goals for research:

- To provide research and other studies to support the Fort Knox natural resources management program.
- To provide special projects to support the Fort Knox natural resources program.
- To provide a means to better measure overall trends in biological diversity.
- To provide management options to better implement adaptive management as an integral part of ecosystem management.

4.10.1 Research and Special Projects Mechanisms

4.10.1.1 In-house Capabilities

The Natural Resources Branch has limited in-house research capabilities due to personnel restrictions and a management-oriented mission. Their main contribution to research is collecting standardized data on the status of vegetation, populations, and user attributes. The in-house capability of the Natural Resources Branch to store, retrieve, and analyze data (Section 4.8.2) will assist other external research projects and studies.

4.10.1.2 Intergovernmental Personnel Act (IPA)

The Intergovernmental Personnel Act of 1972 is a means to accomplish research or obtain other personnel assistance on Fort Knox. IPA agreements are now commonly used throughout DoD for assistance with research, management, and even administration. If funds become available, this arrangement may be used to accomplish needed research or management assistance at Fort Knox. Major advantages are that personnel are directly supervised by the Natural Resources Branch and personnel authorizations are not required.

4.10.1.3 University Research Assistance

Universities are a significant source of research assistance. Fort Knox has used universities in recent years to help with specialized needs.

4.10.1.4 Other Agency Support

DA is a potential source of assistance with research. There are Research and Development (R&D) funds to implement research that will benefit multiple installations. Much of the ITAM program was developed via this mechanism. Any projects that are important to Fort Knox, as well as other installations, could be forwarded to TRADOC and DA for consideration for programmatic funding.

The USFWS and KSNPC have assisted Fort Knox's natural resources program in the past and can be called on to help again.

4.11 Conservation Awareness

The Fort Knox natural resources program is founded on the basic principle of using professional, sound practices to produce both user benefits and natural resources protection within the confines of the military mission. Conservation awareness aspects of the program are largely responsible for creating the necessary military support and public support needed to conduct professional natural resources management.

Items such as food plot planting, fish stocking, drainage correction, and aquatic weed control can be accomplished with little conservation awareness effort since Soldiers, hunters and anglers, and the general public tend to naturally support these easily understood efforts. However, options such as reduced grounds maintenance, restrictions on troop field operations, neotropical bird management, complex deer harvest regulations, importance of timber harvests to sustainable forest management, and tough law enforcement require effective conservation communication to muster positive support and, perhaps more importantly, avoid adverse reactions from various users. Other programs such as grass carp stocking and prescribed burning may be favored by installation decision makers, but they can be controversial to external interested parties. A conservation awareness program must be directed at both installation and external interests if it is to be effective.

The goals of conservation awareness are as follows:

- Provide an understanding of Fort Knox's natural resources management program to installation and surrounding communities.
- Provide decision makers with the information they need to make judgments that affect Fort Knox's natural resources management program.
- Provide general conservation education to the Fort Knox community.
- Enhance the professional skills of the Fort Knox Natural Resources Branch staff.
- Enhance awareness of the importance of and the requirements needed to protect biological diversity and manage Fort Knox for functional ecosystems.
- Provide updates for the quarterly Environmental Quality Control Committee. This forum is used to keep the Garrison and Fort Knox trainers abreast of the environmental program at Fort Knox as a whole.

4.11.1 Newspapers

The installation newspaper, *The Gold Standard*, is probably the most efficient medium to get information to large numbers of people in the Fort Knox community. This newspaper can be used to explain programs or develop attitudes that allow implementation of new programs. Articles can target a wide range of readers, and they can be specifically designed to particularly impress one or more categories of readers. Outside newspapers occasionally seek information on

Fort Knox's natural resources program. Interviews are coordinated with the Public Affairs Office.

Special efforts will be made to use newspapers to acquaint the Fort Knox-Radcliff community with ecosystem management concepts and their relationship to Fort Knox natural resources. This effort will focus on items such as endangered species management, forest management, neotropical birds, native ecosystem protection, reduced grounds maintenance, cave protection, and similar concepts.

4.11.2 Television and Radio

With television, points must be made extremely succinctly. Answers should be short and to the point to avoid editing out critical portions of complicated answers. Television interviews are generally short and very subject specific. If questions are provided in advance, there is usually time to carefully consider the answers.

Radio interviews, on the other hand, may be very informal. Questions often arise as the reporter's interest is touched. Questions should be addressed if the answer is known. Questions about topics such as noise, dust, and fires will eventually come up in outside media interviews. These questions should be answered frankly to support the Fort Knox position in a positive manner. Preparation in advance for such questions is important. Television and radio will be used to particularly emphasize ecosystem management as discussed in the above newspaper section.

4.11.3 Prepared Talks

Prepared talks are given at the request of the group being addressed. In many cases, the topic can be chosen to explain a specific management program that needs public support, or at least understanding. General Fort Knox natural resources management program talks can lead to an overall awareness that Fort Knox is taking care of the land and its wildlife. This attitude among community leaders is good to foster. Time spent preparing professional slide talks for such occasions can have positive long-term benefits.

Requests for prepared talks will be responded to according to personnel and time availability. Whenever possible, talks will be geared toward explaining contemporary natural resources issues and management.

4.11.4 Youth Groups

Fort Knox Natural Resources Branch personnel have worked with all ages of school children, generally in a classroom setting. Fort Knox personnel also have mentored high school students with a special interest in conservation. This one-on-one relationship is rewarding to both parties; some examples include helping design an outdoor classroom trail for Van Voorhis Elementary School and conducting hunter education classes.

Fort Knox EMD personnel conduct yearly celebrations of Arbor Day and Earth Day at the elementary schools on Fort Knox.

Scouts are another youth group that request help with projects, merit badges, and conservation talks. Again, Fort Knox personnel have a tradition of helping these youngsters learn about conservation.

Fort Knox Natural Resources Branch personnel will continue to work with youth groups whenever possible. This is a good investment in the future.

4.11.5 Professional Communication

The Wildlife Society (TWS), Society of American Foresters (SAF), National Military Fish and Wildlife Association (NMFWA), Society for Ecological Restoration, National Registry of Environmental Professionals, and the Society for Conservation Biology are among the professional societies and organizations applicable to Fort Knox's professional natural resources managers. Membership in these societies is encouraged. Meetings of these societies provide an excellent way to communicate with fellow professionals and provide a means to maintain professional standards.

Other opportunities to communicate with professionals and maintain professional standards include annual meetings and training workshops. The SAF Annual Convention, TWS's Annual Conference and state Chapter meeting, and the NMFWA annual training workshop provide the best opportunities each year to learn and exchange ideas with other professionals. These meetings include DoD and U.S. Army breakout sessions. The Southeastern Association of Fish and Wildlife Agencies is an excellent regional meeting. The North American Wildlife and Natural Resources Conference address national issues and priorities. Specialized meetings include law enforcement seminars and similar educational events.

Natural Resources Branch personnel will be encouraged to join professional societies and their state chapters. Personnel will be sent to as many meetings as feasible to meet with other professionals and exchange ideas, lessons learned, and success stories on matters of common interest. It will be a Natural Resources Branch goal to send at least one of its natural resources personnel to the annual meeting/training workshop of the NMFWA, TWS's Annual Conference and state Chapter meeting, and to the annual meeting of the Society of American Foresters (with its military session). Natural Resources Branch personnel particularly need to receive training in ecosystem management and wetlands restoration. Maintaining and enhancing professional skills will be of primary importance. Cross training through attendance in meetings outside of ones area of expertise is also encouraged.

4.11.6 Special Events

Special events with local, state, or national significance offer opportunities to educate the public on programs of high interest. Arbor Day, a major event for Fort Knox, is the best example of this type of awareness. The installation is proud of its continued designation as a "Tree City USA." by the National Arbor Day Foundation and intends to maintain this status. This status depends upon an Arbor Day celebration with a proclamation by the Commanding General,

maintaining a professional forestry staff, and a commitment to spend at least $2.00 per capita on urban tree management. The Fort Knox community is confident these conditions will be met.

There are other possibilities for such special events. These include Earth Day celebrations, fishing derbies, and National Hunting and Fishing Day. Fort Knox Natural Resources Branch will consider these possibilities for inclusion into the overall awareness program.

Each year, Fort Knox celebrates Army Earth Day in April. Environmental Management Division, with the assistance of ITAM and the Recycle Center, sets up informational displays, hands out brochures, plants trees at schools, and gives tours of the Recycle Center to educate the Fort Knox community on the environment. This is an Army-wide program to promote sustaining the environment on installations for future training generations.

4.12 Outdoor Recreation

Fort Knox has a very active outdoor recreation program that uses renewable natural resources. The goals of the outdoor recreation program will be as follows:

- To provide opportunities to both the Fort Knox community and the general public for high-quality outdoor recreation.
- To manage outdoor recreation consistent with the needs of the Fort Knox military mission.
- To manage outdoor recreation, while maintaining ecosystem integrity and function.

4.12.1 Military Mission Considerations

The military mission has priority over outdoor recreation involving training area access. If outdoor recreational activities are to continue to thrive on Fort Knox, the military mission priority must not be compromised.

From time to time, proposals are made to change the military mission, which cause conflicts with recreational opportunities. The best way to deal with these conflicts is to offer alternatives that fulfill mission needs with fewer conflicts. The Army has been training Soldiers to win on battlefields around the world for more than a century, as well as providing quality recreational opportunities for Soldiers, their families, employees, and the general public. This can, and indeed must, continue.

4.12.2 Public Access

Across the installation, there are many opportunities for the general public to participate in installation activities. All personnel entering the installation without a valid military ID, Common Access Card (CAC), or an Automated Installation Entry (AIE) Pass are required to stop at the Visitor Control Center at the Chaffee Gate and show proper identification, be vetted for access, and registered into AIE prior to entry.

The Fort Knox hunting and fishing program is open to the public. There are no restrictions on the number of permits sold to the public for fishing or small game hunting. Safety and

overcrowding are concerns with deer and turkey hunting, thus, quotas are established for these sports, and applications often exceed quotas.

4.12.3 Hunting and Fishing Programs

Hunting and fishing are the primary natural resources related outdoor recreation programs at Fort Knox. Both programs are high quality, and the deer hunt enjoys a regional and national reputation for quality. Fort Knox Hunting and Fishing Regulation, FK 200-3 is the primary means of establishing controls on hunting and fishing, as well as some other fish and wildlife related activities. The NRB develops guidelines for the conduct of hunting and fishing on the installation. These guidelines are referenced in the Fort Knox regulation and are used for enforcement of hunting and fishing violations.

4.12.4 Other Natural Resources Oriented Outdoor Recreation

4.12.4.1 Trails

The Tioga Falls Hiking Trail is a self-guided trail. It was developed to display an area with a unique combination of natural beauty and 19th century history. It is a 2-mile dirt trail which meanders up the side of a hollow for the first mile and descends into the hollow along a creek for the final mile of the trail. The first mile of the trail is steep in some areas. There are numerous varieties of trees and plants growing along the trail. Additionally, 19th century stone retaining walls and a spring house exist along the trail. The trail crosses over railroad tracks which are still in use, and hikers must be cautious of trains. Tioga Falls are located within the hollow along the trail.

The L&N Turnpike is another 2-mile long self-guided, historic walking trail. The trail is currently an asphalt road which winds through a hollow located on the northern portion of the installation. In the 19th century this road was a limestone based road with three limestone constructed bridges. Construction on the road began near West Point, Kentucky in 1837 and continued south to the Kentucky/Tennessee line. The L&N Turnpike was a "macadamized" roadway, so named after John McAdam, a Scottish engineer who developed the revolutionary construction method. Beneath the asphalt surface of Old Wilson Road, much of the original stone surface of the old L&N Turnpike still exists. The stone bridges are the only ones of their kind still in existence along the original L&N Turnpike in Kentucky. Except for minor repairs by prisoners of war (POWs) during World War II, the bridges are unchanged. It is currently listed on the National Register of Historic Places.

Both of these hiking trails enter Fort Knox and military training and hunting events sometimes require that these trails be closed. This activity is coordinated by the EMD.

4.12.4.2 Off-Road Vehicles (ORVs)

ORVs have great potential for damage to natural resources. The Army's policy on ORVs is very restrictive (AR 200-1). No recreational use of an ORV is permitted on Fort Knox. Exceptions to this include use by Garrison personnel in the conduct of the mission and hunters

with a physical disability that have obtained a Hunting Methods Exemption Permit from the Kentucky Department of Fish and Wildlife Resources.

4.12.4.3 Other Recreational Activities

Fort Knox is open to hiking, bird watching, berry picking, nature photography, and general nature enjoyment activities. These activities are managed by the Hunt Control Office. Areas released for recreational use and not occupied by hunters may be used and all personnel are required to check in/out through the iSportsman system.

4.13 Enforcement

Many aspects of natural and cultural resources management require effective enforcement if they are to be successful. Fort Knox has robust hunting, fishing, and cultural resources programs and management aspects such as harvest controls, cave protection, cemetery and artifact protection, water pollution prevention, hunting and fishing recreation, and non-game protection are dependent upon properly trained Conservation Law Enforcement Officers for protection. The Directorate of Emergency Services, Law Enforcement Division, Military Police is responsible for conservation law enforcement on the installation (DoDI 5525.17). The goals of enforcement are to:

- Ensure installation and military and public users remain in compliance with appropriate environmental, natural, and cultural resource laws and regulations.
- Use enforcement personnel to enhance the overall natural and cultural resources program.
- Provide protection of plant and animal species and their habitats to promote increased species numbers and distribution.
- Provide protection of cemeteries and archaeological sites.

4.14 Other Pertinent Programs and Plans

Other plans and programs on the installation that may be associated with, or affect, natural resources management include the Master Plan, Range Complex Master Plan (RCMP), and the ITAM Plan. The Master Plan is the planning document for developing facilities on Fort Knox, and by definition, this INRMP is a part of that Master Plan. No programs or items within this INRMP are inconsistent with other aspects of these plans. The NRB reviews and comments on the RCMP and ITAM plans to ensure compliance with the ESA, Clean Water Act, DoD Instructions, and NEPA.

All aspects of current endangered species management are fully consistent with this INRMP. Endangered species management requirements may change, and these changes will likely take precedence over other programs due to the compliance aspects of endangered species management. This INRMP also includes the timber harvesting plan, so there are no inconsistencies between forest management and other natural resources management. The Integrated Pest Management Plan and this INRMP are fully integrated. No inconsistencies exist between the two.

Cultural resources protection requires procedures for programs that are likely to impact these resources. This INRMP requires survey, management, and mitigation to protect cultural resources for those aspects of INRMP implementation that could meet the definition of "undertakings."

4.15 Climate Change

The DoD actively manages for climate change impacts and their effect on mission activities so it can adapt current and future operations in ways that maintain an effective and efficient military (DoDD 4715.21). The Department is responding to climate change in two ways: adaptation, or efforts to plan for the changes that are occurring or expected to occur; and mitigation, or efforts that reduce greenhouse gas emissions.

Initial analysis indicates that four primary climate change phenomena are likely to affect the Department's activities:

- Rising global temperatures
- Changing precipitation patterns
- Increasing frequency or intensity of extreme weather events
- Rising sea levels and associated storm surge

As climate science advances, the Department will regularly reevaluate climate change risks and opportunities in order to develop policies and plans to manage its effects on the Department's operating environment, missions, and facilities. Research organizations within the Department, including the Strategic Environmental Research and Development Program (SERDP), are planning and completing studies to characterize climate change impacts in specific regions of the world and develop and pilot vulnerability assessment and adaptation methodologies and strategies.

5.0 IMPLEMENTATION

5.1 Forest Management

Forest resource management is mandated on DoD lands by DoDI 4715.03. This instruction states, "DoD forest lands shall be managed for sustained yield of quality forest products, watershed protection, wildlife habitat, and other uses that can be made compatible with mission activities." This instruction further states, "forest products shall not be given away, abandoned, carelessly destroyed, used to offset costs of contracts, or traded for products, supplies, or services." These specified concepts and instructions are incorporated in forest planning and decision-making.

Additional forest resource management and forestry funds guidance are provided in AR 200-1, *Environmental Protection and Enhancement*; AR 405-80, *Management of Title and Granting Use of Real Property*; and AR 405-90, *Disposal of Real Estate*. Other applicable Army and Federal regulations, instructions, directives, guidance, and local laws also apply to forest management on the installation (Table 5-1).

Table 5-1. Laws, regulations, instructions, directives, and guidance applicable to forest management on Fort Knox.

Federal
Sale of certain interest in land; logs (10 U.S.C 2665)
The Clean Water Act, *as amended* (33 U.S.C 1251 et seq.)
The Sikes Act, as amended (16 U.S.C. 670 et seq. / 32 CFR 190)
The Endangered Species Act, *as amended* (16 U.S.C. Sec 3371 et seq. / 50 CFR 17; 50 CFR 402)
The National Environmental Policy Act (43 U.S.C. 4321 et seq. / 40 CFR 1500)
USDA Emerald Ash Borer Policy (7 CFR 301.53-1)
DoD
Defense Finance Accounting Service – Indianapolis Regulation 37-1, *Finance and Accounting Policy Implementation*, Chapter 14, "Sales and Revenues", June 2004
DoD Financial Management Regulation 7000.14-R, Volume 11A, Chapter 16, August 2002
DoD Instruction 4715.03, *Natural Resources Conservation Program*
DoD Instruction 6055.06, *DoD Fire and Emergency Services Program*
DoD Instruction 6055.17, *Installation Emergency Management Program*
Conserving Biodiversity on Military Lands: *A Guide for Natural Resource Managers*
U.S. Army
Army Regulation 200-1 - *Environmental Quality: Environmental Protection and Enhancement*
Army Regulation 115-13 - *Installation Geographic Information and Services*
Army Regulation 215 -1 - *Non-appropriated Fund Instrumentalities*
Army Regulation 405-80 - *Management of Title and Granting Use of Real Property*
Army Regulation 405-90 - *Disposal of Real Estate*
Army Regulation 420-1 - *Army Facilities Management*

Army Policy Guidance - Procedures for Installation-Conducted Timber Sales (June 2004)
Army Policy Guidance - Reimbursable Agricultural/Grazing and Forestry Programs (August 1999) Army
Wildland Fire Policy Guidance (September 2002)
U.S. Army (cont'd)
Memorandum from the Principal Deputy Assistant Secretary of the Army (Installations and
Environment),
Army Forest Conservation Policy (October 2000)
Fort Knox
Policy Memo 13 - Environmental Policy
Fort Knox Indiana Bat and Gray Bat Management Plans
Fort Knox Urban Forestry Management Plan
Fort Knox Integrated Training Area Management (ITAM) Five Year Plan
Fort Knox Environmental Handbook
Commonwealth of Kentucky
Kentucky Forest Conservation Act
Kentucky Division of Forestry Best Management Practices (Technical Manual)
Kentucky Master Logger Program

5.1.1 Fort Knox Forest Landscape

75% of the Fort Knox landscape is forested, with the majority of the forestland dominated by a diverse mix of hardwood species. Of the 81,000 forested acres on Fort Knox, there are approximately 45,000 acres potentially available for commercial timber management. The forests in the range and impact areas, while not available for active management activities due to highly restricted access, UXO, and metal contamination issues, do provide beneficial opportunities to retain older age-class timber as potential endangered Indiana bat roosting habitat.

Fort Knox is situated in the Oak-Hickory Forest Region of Kentucky. This historically significant and ecologically valuable complex of oak-hickory forest types has been identified as the target forest complex to manage for on Fort Knox, where appropriate site conditions exist and the recommended forest management activities can be implemented. This complex has seen a considerable reduction in overall acreage both in Kentucky and across the rest of the Eastern USA over the past many decades for a host of suspected reasons. Some of the more impactful ones include the gradual mesophication of historically oak-hickory dominated forests due in part to a long history of wildland fire suppression for public safety and resource protection, and short-sighted timber harvest practices such as high grading, which removes the more valuable tree species including oaks and hickories, and leaves mostly damaged, low value, and poor quality species that outcompete and outgrow any struggling oak regeneration. Increased consumption of acorns, nuts, and young regeneration by growing herds of herbivorous mammals (e.g., white-tailed deer) due to the significant reduction of natural predators, and increasing competition from aggressive invasive species such as Ailanthus, Paulownia, and various grass and shrub species

are additional factors complicating attempts to retain and eventually return the oak-hickory forest complex to its former position on the landscape..

5.1.2 Forestry Program and Project Goals

The following are the program-level goals of the Fort Knox Forestry Program as previously established in AR 200-1.

- Promote and manage a healthy forested ecosystem capable of supporting the military training mission while meeting resource conservation requirements, and ensure that those forest management activities do not conflict with the military mission.
- Investigate and utilize advances in silvicultural research and technology to restore, maintain, and improve forested ecosystem functions and values.
- Ensure that forest management actions comply with all applicable Federal, state, and local laws, regulations, and guidance, including endangered species management requirements.
- Promote the production and sustained yield of commercially valuable forest products.
- Monitor and protect forest resources from damage caused by wildfires, and monitor for and develop responses as needed to insect and disease outbreaks.

The following are project-level goals of the Fort Knox Natural Resources Forestry Program.

- Develop and implement specific silvicultural prescriptions to restore, protect, and improve forest health and value, with particular emphasis on oak-hickory management.
- Regularly coordinate with relevant personnel from Training Division, DPTMS and Environmental Management Division, DPW to ensure forest management activities do not conflict with training mission planning and use of the forested landscape.
- Create and maintain GIS coverages and geodatabases to support, manage, and track the planning and implementation of forest management activities.
- Pursue regularly scheduled forest stand inventories of forest product volumes, species composition, and related data to monitor and evaluate forest health, diversity, and value, not to exceed 10 years in currency.
- Use revenues generated from commercial harvesting of forest products to protect, improve, and restore as needed desired forest ecosystems.
- Investigate and procure funding for new forestry equipment and technology to replace aging and inefficient systems as needed, as well as add new capabilities to NRB operations.
- Ensure forest management practices are in compliance with the Endangered Species Act.
- Ensure forest management practices protect water quality by following Kentucky

Division of Forestry Best Management Practices (BMPs).

5.1.3 Silviculture

Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society, such as timber production, wildlife habitat, water resources, ecosystem restoration, and recreation on a sustainable basis. Specific to DoD ownership is the need to support the military training mission, to provide flexibility to enhance military mission capabilities without degrading biological diversity and ecosystem health of the forested training lands. This is accomplished by applying different types of silvicultural treatments such as thinning, harvesting, prescribed burning, and other timber stand improvement (TSI) treatments. Harvest or regeneration treatments are intended to remove valuable mature timber that has begun to stagnate in growth to allow new and younger regeneration to flourish and grow. Intermediate treatments are intended to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest.

The composition and structure of hardwood forests, such as the ones that dominate Fort Knox, are shaped into similar groups of trees by analyzing numerous factors including but not limited to species composition, age, aspect, slope position, soils, drainage, past land use practices, past forest management practices, and training use. These groups are called forest stands and are the basic unit of the forest to which silvicultural treatments are applied.

5.1.3.1 Forest Stand Density

Density, or stocking of forest stands, is expressed as the number of trees, basal area, volume, or some other measurable criteria usually on a per-acre basis. Stocking levels can be generally described as:

- Fully stocked - all the growing space is effectively occupied but there is still ample room for growth and development of the dominant or crop trees.
- Overstocked - the growing space is so completely utilized that growth has slowed down and many trees, including dominants, are being suppressed.
- Understocked - the growing space is not effectively occupied by the dominant or crop trees.

Basal area per acre is the preferred measure for describing stocking levels of merchantable forest products in Fort Knox forest stands. Due to the relatively wide range of stem diameters both between and within hardwood tree species of similar ages on the same site, basal area measurement provides a less biased and more stable description of stocking density than the number of trees or volume of merchantable timber per acre for tress generally greater than 4 inches diameter breast height (dbh). Seedling regeneration and young sapling stocking densities are more typically referenced as trees per acre. Table 5-2 below relates tree diameters to basal area and trees/acre.

Table 5-2. Number of trees per acre by DBH and basal area on Fort Knox.

	Basal Area/acre (sq ft/ac)													
DBH	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	**140**
(inches)	**Trees/acre**													
1	1834	3667	5501	7334	9168	11001	12835	14668	16502	18335	20169	22002	23836	25669
2	458	917	1375	1834	2292	2750	3209	3667	4125	4584	5042	5501	5959	6417
3	204	407	611	815	1019	1222	1426	1630	1834	2037	2241	2445	2648	2852
4	115	229	344	458	573	688	802	917	1031	1146	1261	1375	1490	1604
5	73	147	220	293	367	440	513	587	660	733	807	880	953	1027
6	51	102	153	204	255	306	357	407	458	509	560	611	662	713
7	37	75	112	150	187	225	262	299	337	374	412	449	486	524
8	29	57	86	115	143	172	201	229	258	286	315	344	372	401
9	23	45	68	91	113	136	158	181	204	226	249	272	294	317
10	18	37	55	73	92	110	128	147	165	183	202	220	238	257
11	15	30	45	61	76	91	106	121	136	152	167	182	197	212
12	13	25	38	51	64	76	89	102	115	127	140	153	166	178
13	11	22	33	43	54	65	76	87	98	108	119	130	141	152
14	9	19	28	37	47	56	65	75	84	94	103	112	122	131
15	8	16	24	33	41	49	57	65	73	81	90	98	106	114
16	7	14	21	29	36	43	50	57	64	72	79	86	93	100
17	6	13	19	25	32	38	44	51	57	63	70	76	82	89
18	6	11	17	23	28	34	40	45	51	57	62	68	74	79
19	5	10	15	20	25	30	36	41	46	51	56	61	66	71
20	5	9	14	18	23	28	32	37	41	46	50	55	60	64
21	4	8	12	17	21	25	29	33	37	42	46	50	54	58
22	4	8	11	15	19	23	27	30	34	38	42	45	49	53
23	3	7	10	14	17	21	24	28	31	35	38	42	45	49
24	3	6	10	13	16	19	22	25	29	32	35	38	41	45
25	3	6	9	12	15	18	21	23	26	29	32	35	38	41
26	3	5	8	11	14	16	19	22	24	27	30	33	35	38
27	3	5	8	10	13	15	18	20	23	25	28	30	33	35
28	2	5	7	9	12	14	16	19	21	23	26	28	30	33
29	2	4	7	9	11	13	15	17	20	22	24	26	28	31
30	2	4	6	8	10	12	14	16	18	20	22	24	26	29

For example, referencing a measured basal area of 100 square feet per acre (BA100) in a stand generally indicates a well, to fully stocked stand condition irrespective of the average or range of diameters of trees. On the other hand, referencing a stand with 50 trees per acre without also noting diameters could indicate anything from a fully stocked stand of 20 inch dbh trees (BA110) to a well understocked stand of 8 inch dbh trees (BA20), site quality being the same.

5.1.4 Silvicultural Systems of Forest Stands

A silvicultural system is a planned series of treatments for tending, harvesting, and

regenerating a forest stand. They are typically categorized by the number of age classes that characterize the resulting stand structure. The age class structures are generalized into two broad categories:

- Even-aged – trees that are about the same age or generally fall within a few distinct age classes (also called two-aged). Even-aged system treatments favor shade-intolerant and moderately shade-tolerant species and generally mimic large natural disturbances to forest stands such as wildfire, severe storm events, or widespread insect and disease outbreaks.
- Uneven-aged – trees of many ages distributed throughout. Uneven-aged system treatments favor shade-tolerant species and mimic small, infrequent, or irregular natural disturbances to individual and small groups of trees such as lightning strikes and normal decay and mortality from age.

5.1.4.1 Even-Aged Silviculture Harvest Treatments

Harvest methods to create or regenerate even-aged stand structures most commonly include clearcuts, seed-tree, shelterwood, and occasionally overstory removal methods. The intent of these harvest treatments is to mimic a natural disturbance regime that allows relatively high amounts of sunlight to reach the forest floor and trigger the regeneration of desirable and valuable sunlight-dependent tree species such as Oaks, Hickories, Yellow Poplar, Walnuts, and Black Cherry.

Clearcut: Clearcutting essentially removes all trees over a few inches in diameter and over several feet in height from a stand usually in one harvest activity. On Fort Knox, clearcutting is primarily used when all trees need to be cleared for construction or specific training range needs. With some limitations, clearcutting can be a valuable silvicultural tool in hardwood management, particularly in stands with an overstory dominated by undesirable species of pine or redcedar. Research has also found beneficial applications of clearcutting in mixed hardwood dominated stands using limited size clearings (patch or group clearcuts typically around 2 acres per patch) as well as strip clearcuts limited primarily by width (typically 75 to 150 feet in width, separated by equal width leave strips). A slight variation referred to as clearcutting with reserves can be applied to retain a few suitable roost tree candidates per acre to meet ES needs.

For hardwood management, clearcut areas are normally regenerated naturally by seedlings and saplings previously established in the understory, stored seed in the soil and duff layer, and natural sprouting or coppicing from hardwood stumps and roots. Should some areas fail to regenerate successfully, site preparation treatments and tree planting (see 5.1.1.4) can be used to fill in.

Seed-tree: This method typically removes almost all merchantable trees in a stand except approximately five to ten dominant trees per acre, typically 18 inch dbh or larger. While this harvest method is more often applied to pine stands, it can be used to regenerate light seeded shade intolerant hardwoods such as Yellow Poplar as well. The leave trees are usually of good form and vigor, are abundant seed producers, and are left to provide seed to regenerate the stand. Once the new stand is established, the seed trees can be removed, although there is usually not

enough merchantable volume to justify another timber sale.

Shelterwood: Shelterwood harvesting has seen a considerable rise in interest and implementation in recent years, especially for oak-hickory management. Shelterwood cutting differs from seed tree and clearcutting by gradually removing the overstory of merchantable sawtimber over a couple of harvest cuts usually separated by several to many years. For oak-hickory management, the decision driver on initiating the final, or regeneration, harvest of the remaining overstory is the size and density of the oak-hickory regeneration. For the first harvest entry, timber is typically marked to leave approximately 60 to 80 square feet of basal area as the residual overstory. This allows adequate sunlight to reach the ground and provides good germination conditions for seed released from the residual trees. As with the seed-tree method, the residual trees should be healthy, vigorous, have good form quality, and be good seed producers. The final harvest of the residual timber is scheduled once the new generation of trees reach five to ten or more years old and of sufficient height and vigor to outcompete the less desirable competition. This final cut opens up the established understory and creates suitable growing conditions for the new stand. The residual overstory may be removed completely or have as much as 20 feet of basal area left (shelterwood with reserves or deferment cut). Shelterwood harvest plans may include a preparatory or establishment cut and one or more overstory removal cuttings, along with any desired intermediate treatments over the intervening years.

Overstory Removal: While typically the second or final treatment in shelterwood management, overstory removal can be recommended for stands that exhibit characteristics of overstory mortality, damage, or poor quality but with existing advanced regeneration already present. Though these stands may not have previously received an initial or establishment shelterwood cut, the overstory is marked and removed as in the final shelterwood cut to release the existing understory trees.

5.1.4.2 Uneven-aged Silviculture Harvest Treatments

Selection (Single tree or Group): This treatment method is primarily used in hardwood stands comprised of shade tolerant species such as Sugar Maple and Beech, or in or along sensitive areas such as perennial streams or viewsheds where protection of resources requires leaving a more intact canopy to meet particular management objectives. Single trees or small patches of a few trees are removed throughout the stand producing very small openings in the canopy, which provides favorable conditions for the regeneration of shade tolerant species. Since this harvest method does not favor oak-hickory regeneration, its use will generally be limited.

5.1.4.3 Intermediate Treatments/Timber Stand Improvements (TSI)

Intermediate treatments are used to increase and improve the quality, growth, and species composition of a stand prior to reaching the age when the stand should be regenerated. A wide range of treatments using a variety of application equipment and techniques can be employed to implement what are commonly called timber stand improvement (TSI) treatments. These treatments might be applied as part of a shelterwood harvest plan, or applied separately to address a particular concern or need.

Pre-Commercial Thinning: Pre-commercial thinning is often used to reduce tree density in young stands and is carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees, thus increasing average diameter, retaining a higher live crown ratio, creating opportunities for future commercial thinning activities, improving stand operability and accessibility, and enhancing wildlife habitat. Competing vegetation and small trees are typically removed either mechanically using equipment such as brushsaws, chainsaws, or severe-duty shredders, or chemically by applying approved herbicides at labeled rates via a variety of application methods including hack and squirt, foliar (e.g., spot, broadcast, or mist), stump, or basal bark spray methods. The killed, felled, or shredded vegetation debris remains distributed throughout the stand.

Pre-commercial thinning can also be implemented as part of a shelterwood harvest plan, either as a pre-harvest treatment targeting shade tolerant species to improve understory light conditions and encourage early regeneration of desirable species, or a post-harvest treatment targeting damaged stems and portions of the harvest area that were not marked as heavily to reduce competition and improve light penetration under the residual mature timber.

Crop Tree Release: This is a particular type of pre-commercial thinning implemented to improve the health, vigor, and growth of intentionally selected trees (crop trees) by removing the vegetation surrounding the selected trees to increase the availability of light, water, and nutrients. This would be accomplished by removing adjacent trees to allow full sunlight on at least three of four sides of the selected crop tree's crown. Since this operation is intended to improve timber quality, the selection criteria for crop trees includes larger trees of preferred species with healthy crowns and sound stem origins. They should be high-quality trees with no apparent defects or compromised health status, of high potential commercial value, species well suited to the site, and with expected longevity greater than the typical rotation age.

Commercial Thinning: Commercial thinning is typically executed in younger dense overstocked timber stands once a majority of trees have reached a minimum merchantable size but are still well below desired maturity. Although normally associated with pine management, thinning has been successfully applied to hardwood stands, primarily for removal of firewood and fuelwood. Thinning will typically remove from 1/3 to around 1/2 of the tree stocking in a stand. The trees removed are more frequently the less vigorous and undesirable lower value species. This results in more growing room for the remaining high quality trees and allows them to respond with increased growth and vigor to create the final, mature stand structure.

Salvage Harvests: Unfortunately Fort Knox is no stranger to stand and forest level catastrophic events with detrimental impacts to forest resources. Extreme weather events such as ice storms, wind events, wildfires, and insect and disease outbreaks can leave once healthy stands of timber in rapidly deteriorating states. The intent of a salvage harvest is to recover the merchantable value of the damaged timber and return the affected stand to a healthier and more useable state – damaged and downed timber can also interfere with the training mission. In cases of extreme and widespread damage, a salvage harvest may be more of a regeneration harvest, while less concentrated impacts may require harvest activities more similar to commercial thinning or a cleaning of damaged and low value poor quality trees.

Prescribed Burning: Prescribed understory burning has been increasingly recognized as

providing multiple benefits to hardwood stands, especially oak-hickory stands, than previously realized, and will be utilized more frequently on Fort Knox than in the past. See Section for more detail.

Non-Native Invasive Species Treatments: Numerous non-native invasive species such as Ailanthus, Paulownia, and Japanese stiltgrass have been causing increasing problems on the Fort Knox forest landscape, and if left unchecked, will have considerable detrimental effects to both forest management and the training mission in the future. Chemical treatment of the many different invasive species found on the installation is the only reliable method to regain control by relying on a variety of approved herbicides using various application methods. Invasive treatments may be applied in conjunction with other silvicultural activities, or if the impact is severe enough as a separate treatment.

While technically not classified as non-native invasives, there are some native trees and plants that can have near-invasive impacts. Spicebush, Paw-Paw, Sassafras, and Wood Oats (*Chasmanthium* sp.) are some examples of native species that can be found at such high densities on some forested sites that they greatly restrict successful management and regeneration of desirable trees. These high-density high-impact occurrences will be subject to the same treatment applications as invasives.

5.1.4.4 Site Preparation and Afforestation or Reforestation

Regeneration of hardwood species is most commonly done via natural regeneration, relying on seed dropped from the overstory, existing seedlings and saplings, and coppice sprouting from stumps and roots. However, at times planting of improved seedlings may be the only way to re-establish a stand of trees on sites that have been devoid of trees for extended periods, such as open fields or old maneuver areas. Site preparation techniques, including but not limited to residual debris burning, subsoil ripping, disking, or chemical treatment of undesirable vegetative competition may be prescribed to improve the site or soil characteristics prior to tree planting and enhance the survivability of the planted trees. Seedling species recommendations and stocking levels should be made based on the conditions of the particular site to be planted.

5.1.5 Forest Types and Forest Groups

The FKFI currently lists 20 forest types that have been grouped into 5 primary Forest Groups (FG) for descriptive and general management purposes (Table 5-3). Should additional forest types be identified in future FKFI updates, they will be incorporated into these groups as appropriate, or allow for the creation of a new FG if necessary. The FKFI currently covers approximately 40,300 forested acres, with the inventory of another 4,700 acres in progress.

Table 5-3. Description of the primary Forest Groups on Fort Knox.

	Dominant Forest Types	Acres	Percent of Inventory
Forest Group 1	Mixed Upland Hardwoods & Yellow Poplar	19,100	47%
Forest Group 2	Oak & Oak-Hickory	6,400	16%

Forest Group 3	Mixed Lowland Hardwoods & Lowland Brush	4,500	11%
Forest Group 4	Sassafras-Persimmon & Upland Brush	1,700	4%
Forest Group 5	Redcedar & Pine-Hardwood	8,600	22%

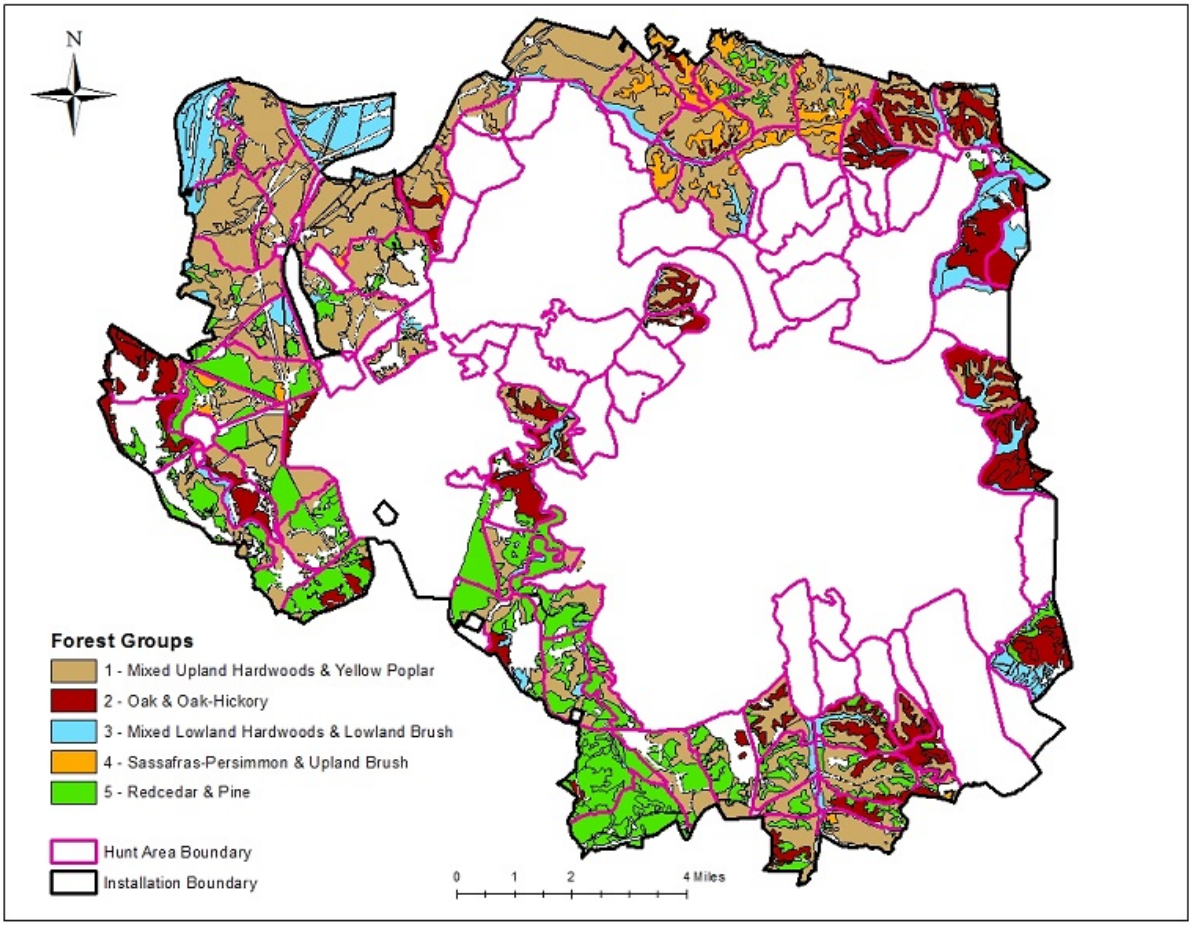

Figure 5-1.

5.1.5.1 Forest Group 1: Mixed Upland Hardwoods and Yellow Poplar Forest Types

The Mixed Upland Hardwood and Yellow Poplar forest types have been combined to form Forest Group 1 (FG1). This is the largest FG on Fort Knox, covering approximately 19,100 acres spread across most of the installation. Only 8 out of over 60 inventoried Hunt Areas do not have any acreage classified under this group. Many upland hardwood tree species are found in the stands comprising this FG, with Yellow Poplar, Sugar Maple, and a mixed variety of oaks and hickories the most common. While oak-hickory as a species grouping could be considered dominant in a number of locations, particularly on south-facing slopes, they do not dominate sufficiently across enough area to be separately classified as oak-hickory dominated forest types. The understory component of this FG is often heavily dominated by less desirable shade tolerant

species, with extremely dense understories of Spicebush regularly found on the higher quality sites. The lack of available sunlight combined with intense competition from shade tolerant species typically prevents the successful advance regeneration of the more desirable overstory species. This FG has great potential to expand and improve mixed oak-hickory regeneration and eventual conversion to oak-hickory forest types, provided that manipulation of stand stocking and species density is pursued via a variety of forest management practices.

FG1 has been the primary focus for most of the forest management activities and projects applied to hardwood stands on the installation since 2008. Most of the commercial hardwood timber sales held from 2008 through 2016 have occurred within FG1 (19 sale locations covering 1,800 acres) due to the high volume of large diameter commercial sawtimber found on FG1 sites. TSI projects initiated since 2010 (approximately 1200 acres pre-harvest TSI and 1200 acres post-harvest TSI) have taken place primarily within this FG as well, intending to manipulate the understory component and encourage oak-hickory regeneration where suitable.

FG1 should be managed using primarily even-aged silvicultural techniques to favor the oak-hickory component. The preferred target rotation age should generally fall within 80 to 120 years for most stands, while a slightly shorter range of 60 to 100 years may be considered for Yellow Poplar dominated stands due to its faster growth rate. The particular silvicultural treatments applied will be determined at the stand level on the basis of what applications should create the environmental conditions that are optimum for germination and establishment of the desirable regeneration. Variations of shelterwood management will be the most common regeneration method utilized, however other options may be considered for limited and specific uses, such as seed tree harvests and groups of small irregular patch or strip clearcuts particularly for Yellow Poplar dominated stands. Regardless of the intensity of the harvest action, scattered, residual trees from 5 to over 24 inches DBH should be left to provide roosting opportunities for Indiana and northern long-eared bats. FG1 offers some of the best opportunities to restore and expand oak-hickory forest types on Fort Knox, especially on broad rolling ridges and southeast to west facing slopes.

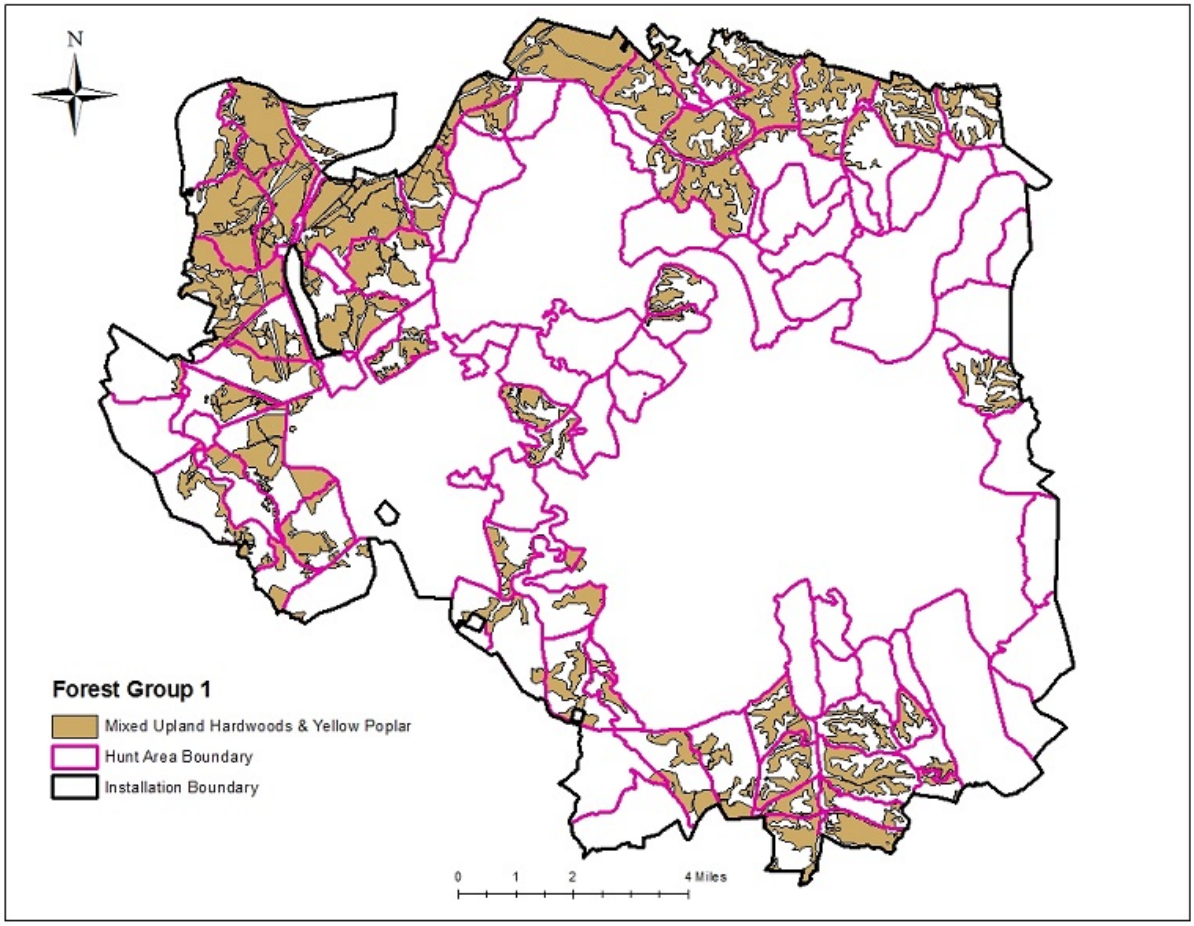

Figure 5-2.

5.1.5.2 Forest Group 2: Oak and Oak-Hickory Forest Types

Several Oak and oak-hickory forest types comprise Forest Group 2 presently covering 6,400 acres (Figure 5-1), including both upland and lowland types such as White Oak-Red Oak-Hickory, Chestnut Oak-Black Oak-Scarlet Oak, and Yellow Poplar-White Oak- Red Oak. FG2 stands can be found throughout the installation, but are concentrated more on the eastern side and in the northeastern corner above Wilcox Range. A wide variety of oaks and hickories are found in FG2, with White Oak by far the most common, followed by tight barked hickories, and Black Oak. Yellow Poplar and Sugar Maple can be found as well in the overstory, but not as nearly as much as in FG1.

There have been a minimal number of silvicultural treatments applied to FG2 in the past 25 years, due to several factors. Much of FG2 occupies steep slopes that limit operability or are more difficult to access because of a lack of improved access roads or frequent training use of nearby ranges. While FG2 is comprised of many oak and hickory species in the overstory, in many areas the limited past disturbance and resulting restricted penetration of light to the forest floor is causing a gradual change in species composition from moderately shade-tolerant mixed oak-hickory to a mosaic of shade-tolerant species such as Sugar Maple and Beech with some encroachment from invasive species. Silvicultural treatments to address the declining condition

of the mid- and understory should be a primary focus for many of these stands prior to initiating final regeneration harvests.

FG2 should be managed primarily using even-aged silvicultural methods - primarily shelterwood harvesting - to maintain and improve the long-term oak-hickory composition. Generally, the target rotation age for FG2 should be 80 to 120 years or slightly longer, to provide large-diameter class trees. When the final shelterwood removal cut is scheduled, scattered, residual trees from 5 to over 24 inches DBH should be left to provide roosting opportunities for Indiana and northern long-eared bats. Ideally over time, FG2 stands will expand to cover more acres as stands from other Forest Groups are gradually converted from mixed hardwood species composition to oak-hickory dominated forest types.

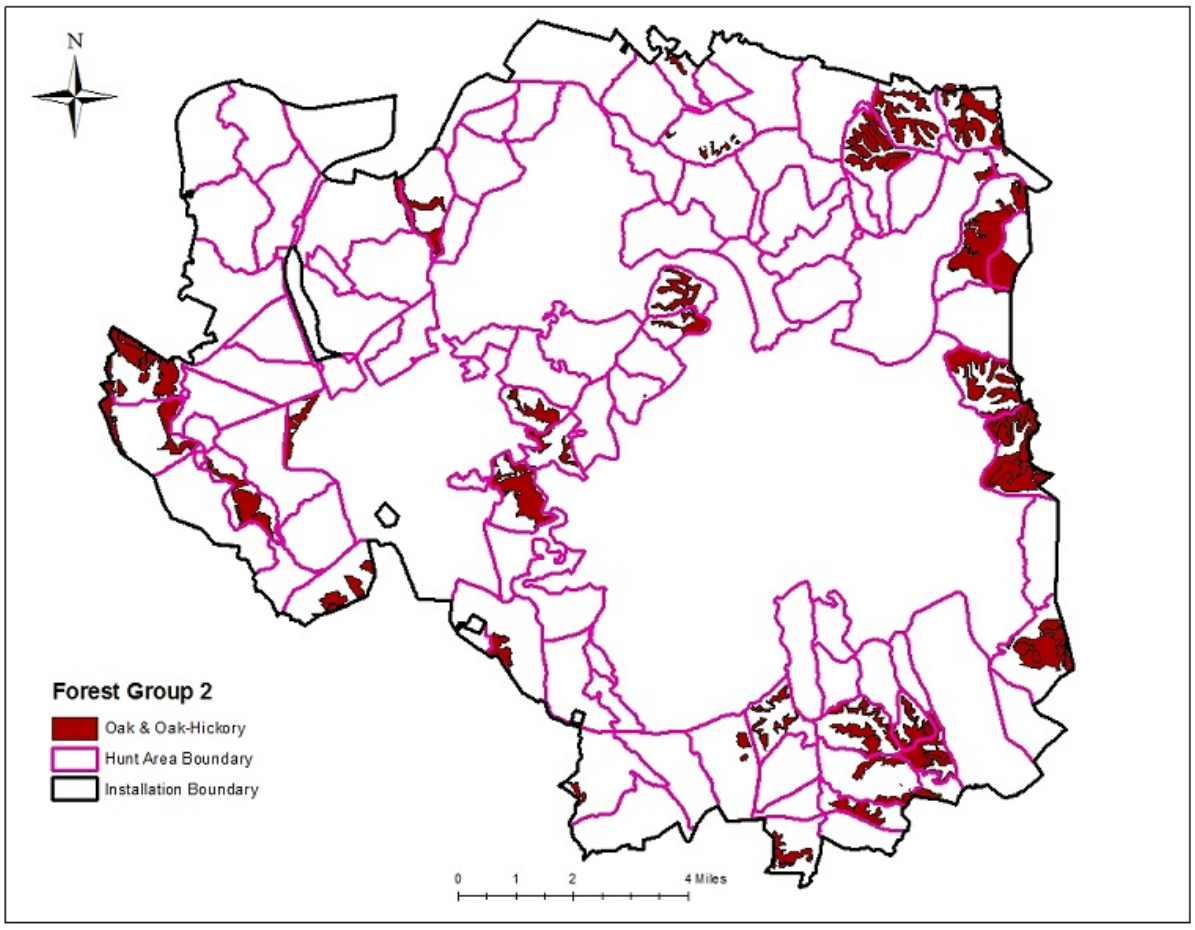

Figure 5-3.

5.1.5.3 Forest Group 3: Mixed Lowland Hardwoods and Lowland Brush Forest Types

Forest Group 3 is comprised primarily of the mixed lowland hardwood and lowland brush bottomland forest types and covers 4,500 acres. This FG dominates most of HA 1 and 6 and a significant portion of the IBMA in HA 96 and 97. Some larger drainages throughout the installation also contain enough contiguous acres to note them separately as part of FG3.

Along with Yellow Poplar, this FG is populated by numerous bottomland species, with significant populations of Sweetgum, Red Maple, and Sycamore. Bottomland oaks are also present in limited numbers, but not enough to be a significant component or to separate out into the oak-hickory FG2. Much of FG3 will likely see a minimum of silvicultural activity due to the seasonally wet nature of the soils and resulting limited accessibility for harvesting activities, along with the numerous perennial drainages this FG surrounds. While less intensive single tree removals are recommended along drainages to protect erosion and water resources, some larger contiguous stands in HA 1 and 6 would benefit from active even-aged treatments eventually leading to regeneration harvests.

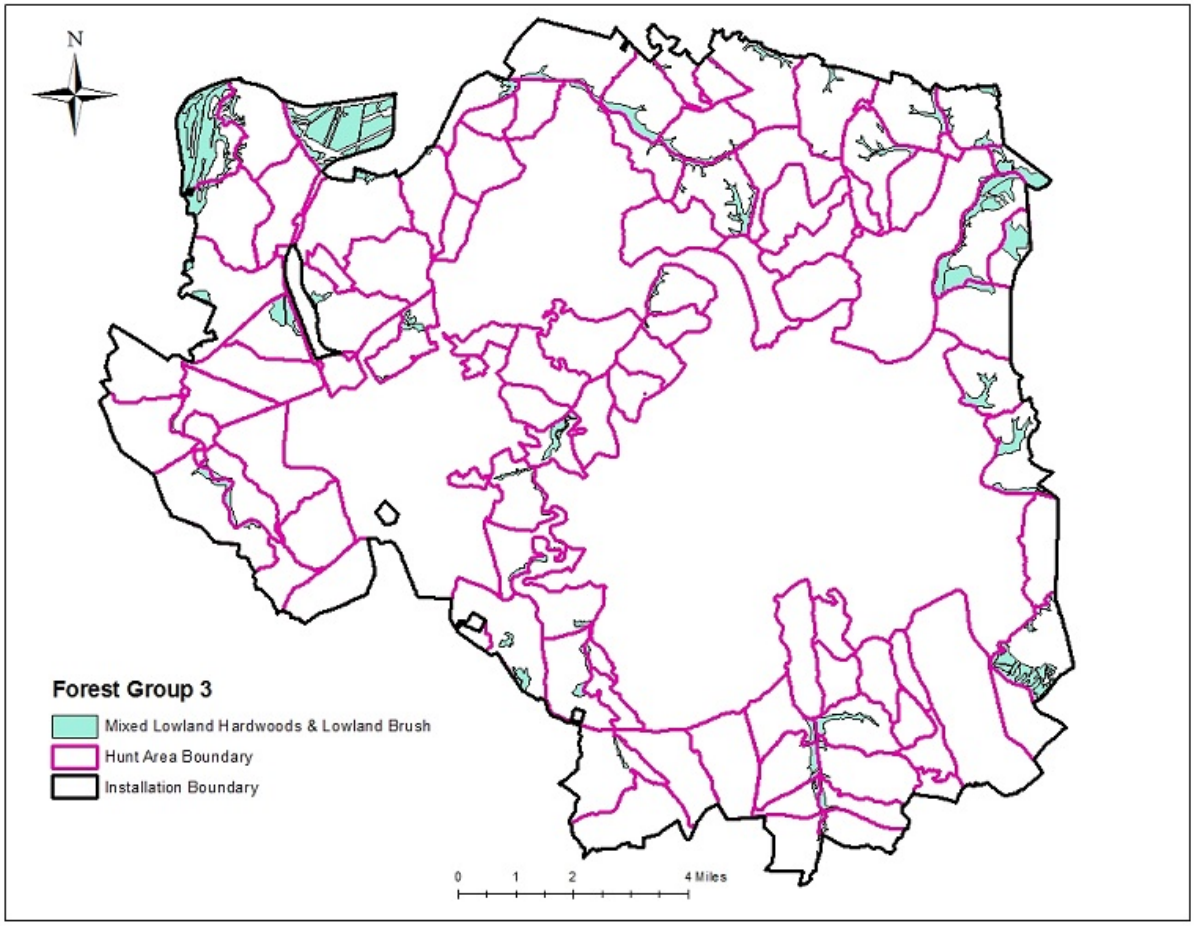

Figure 5-4.

5.1.5.4 Forest Group 4: Sassafras/Persimmon and Brush Forest Types

Forest Group 4 covers 1,700 acres located primarily in several northern Hunt Areas and is comprised primarily of the Sassafras-Persimmon and Upland Brush forest types. Some of the lowest stocked and poorest quality stands on the installation are found within this FG, and provide some of the greater management challenges to return them to more productive conditions.

Priorities for management activities in this FG should focus on manipulating and improving the understory component of these stands using both chemical and mechanical means as best applied, with timber harvesting activities limited for a time to better stocked portions of FG4 stands. Any harvesting activity should focus more on cleaning out low value and poor quality timber to improve the remaining quality of the overstory as a seed source for future regenerations harvests. As the dense mid- and understories of Sassafras, Spicebush, and other undesirable species found are addressed, then the various even-aged regeneration harvest options, including seed tree and variations of clearcutting, should be considered.

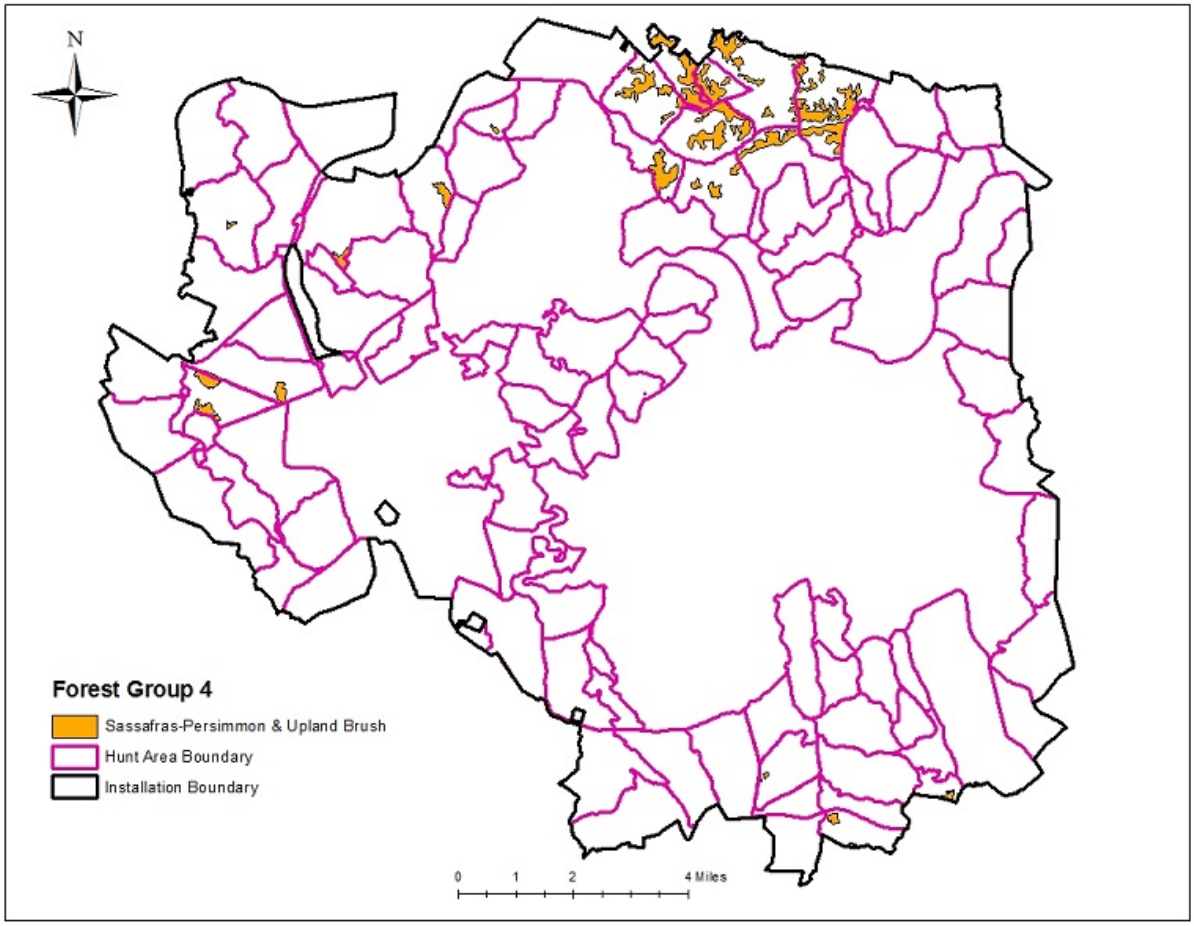

Figure 5-5.

5.1.5.5 Forest Group 5: Pine, Redcedar, & Mixed Hardwood-Pine-Redcedar Forest Types

The various pine, redcedar, and mixed pine-redcedar-hardwood forest types have been combined to form Forest Group 5, covering 8,600 acres. Evergreen species, for the most part, are not considered desirable components of managed stands on Fort Knox. Not only do dense thickets and stands of pine and redcedar create largely monoculture "dead zones" of limited biological value, they are not the most conducive to training use either. As such, the long-term plans for stands in this FG are to convert them as best possible to hardwood dominated stands by removing the merchantable pine and Redcedar in commercial harvests and initiating silvicultural treatments such as prescribed burning to remove the undesirable regeneration. Despite the largely monoculture overstory, there is usually suppressed hardwood regeneration and seed already present in the understory on these sites just needing the overstory removed to release it. Mature hardwood along edges and scattered hardwood among and in small groups within the stands provide regeneration seed sources as well.

Since 2008, 2,100 acres of these stands have been commercially harvested, resulting in the sale of over 51,000 tons of pine and Redcedar. The majority of these harvested acres suffered moderate to severe damage from the 2009 ice storm that devastated Kentucky, and salvage sales were initiated over several years to recover the merchantable timber value and return the stands to more accessible and manageable condition. The salvage cuts conducted resulted in large clearcuts on some sites, considerably larger than the 2 acre patch clearcut sizes experimented with in hardwood stands earlier. Scattered hardwood species present within the denser salvaged stands, including various oaks, hickories, and Yellow Poplar were left standing. Also, much of the total acreage cut was of a mixed pine-Redcedar-hardwood stand composition, with the removal of the pine and Redcedar more closely resembling the initial harvest cut of a hardwood shelterwood project. The young regeneration on these sites, and particularly within the larger clearcut areas, will continue to be monitored and considered for additional silvicultural treatments as needed to complete the conversion to young hardwood dominated stands. Prescribed burning has been completed on over 600 acres of these areas through 2016. Once these harvested sites come back up in the inventory rotation, they will be re-evaluated and the stands re-classified and distributed appropriately to other forest types and groups.

Pine and redcedar harvests for the purpose of stand type conversion to hardwood dominated will continue to be implemented in the remaining stands in this FG over the coming years, only at a lesser annual acreage than was completed for much of the ice storm salvage. Due to the typically dry soil conditions found on many of the sites in FG5 and the presence of mixed oak and hickory species within and around the stands, this FG presents another good opportunity to increase the oak-hickory component of Fort Knox forests by removing the Redcedar and pine.

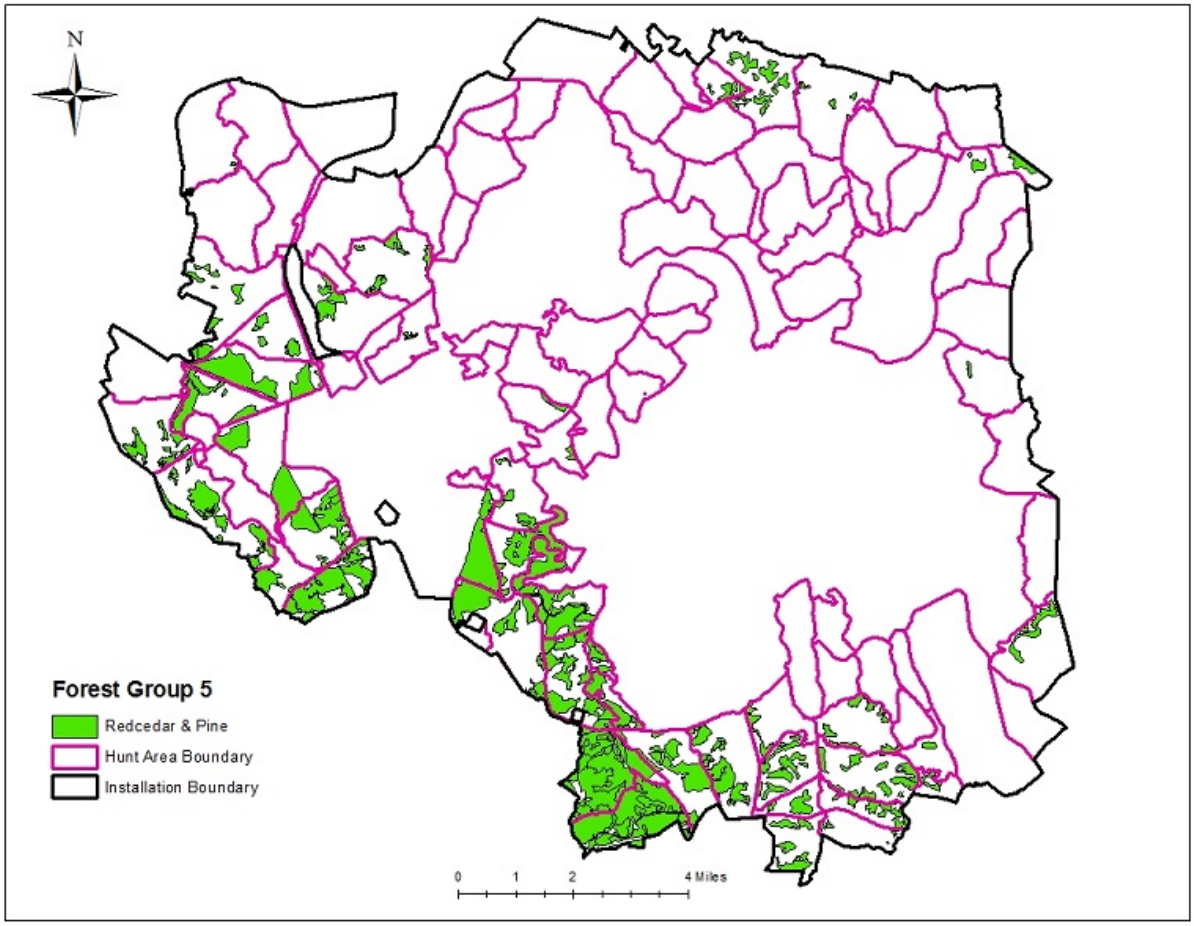
N
Forest Group 5
Redcedar & Pine
Hunt Area Boundary
Installation Boundary
0
1
2
4 Miles

Figure 5-6.

5.1.6 Timber Harvesting

Timber harvests initiated for silvicultural purposes resumed in 2008 on Fort Knox after a long hiatus. The table below presents the results of silvicultural based sales held from 2008 to 2016. Timber sales involving range or other construction clearing projects are not included.

Table 5-4. Timber harvests on Fort Knox by sale year, acres, volumes, species, and value.

Sale Year	Hardwood Sawtimber Acres	Hardwood Sawtimber Volume (bf)	Hardwood Sawtimber Volume/Acre (bf/ac)	Pine & Redcedar Acres	Pine & Redcedar Volume (tons)	Pine & Redcedar Volume/Acre (tons/ac)	Total Sales Value
2008	60	269,200	4,487	---	---	---	$109,270
2009	67	636,100	9,494	152	3,018	20	$175,288
2010	237	626,750	2,645	441	9,055	21	$220,608
2011	253	604,790	2,390	544	13,923	26	$287,169
2012	215	760,377	3,537	409	10,792	26	$354,001
2013	320	869,336	2,717	173	6,559	24	$338,230
2014	164	545,700	3,327	168	4,604	27	$257,192
2015	223	714,200	3,203	122	1,322	11	$314,098
2016	257	697,805	2,715	100	2,056	21	$344,651
Total/Avg	**1,796**	**5,724,258**	**2,887***	**2,109**	**51,329**	**24**	**$2,400,507**

* - average Hardwood Volume/Acre does not include 2008 and 2009 as they were a series of two acre group clearcuts

Sections 4.0 through 4.1.1 describe the history and development of the current maximum sustainable annual harvest limitation of 1,200,000 bf of hardwood sawtimber from silviculturally prescribed timber harvest actions. Fort Knox will continue with this maximum limitation based on annual board footage harvested for the next 5 years even though recent timber inventory data indicates potential growth rates that could sustain harvest rates at more than double this limitation (3,800,000 bf). This decision is based on several additional factors, including:

- Operational and logistical complications to completing significant additional harvest planning and implementation activities within historical time limitations and current personnel staffing levels.
- Limitations due to timing, funding, and/or staffing levels to completing related forest management activities prior to or after harvest completion, such as pre- and post-harvest chemical treatments for invasive and undesirable species control, prescribed burning, and access road and trail improvements.
- Potential conflicts with military training use in obtaining access to considerably greater harvest acreage for extended periods.
- A small level of uncertainty in the accuracy of current growth estimates that will be addressed over time by the greater intensity, frequency, and accuracy of the improved FKFI process.

By addressing and reducing these concerns over time, Fort Knox may be able to increase the maximum annual harvest limitation to permit greater flexibility in managing the forest resources of the installation while maintaining sustainability requirements. Possible increases in the maximum allowable harvest limitation will be addressed in future INRMP updates.

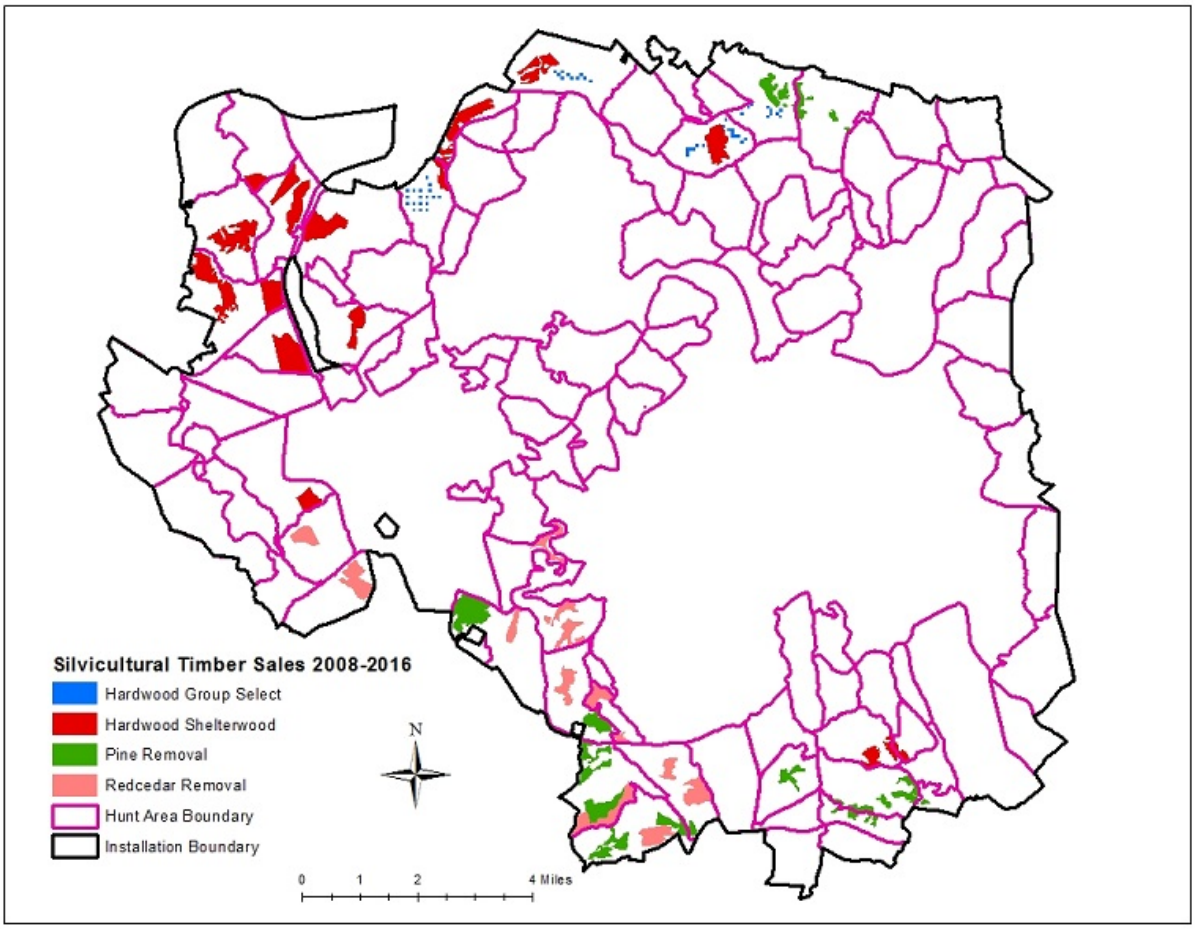

Figure 5-7.

5.1.6.1 Timber Harvest Timing

Due to endangered species concerns, timber harvesting activities are conducted outside the bat maternity roosting and swarming seasons running from 1 April through 14 November. This has limited tree cutting to occur between the 15 November and 31 March each year on the installation. As a result of consultations with the USFWS with positive responses to and opinions of the benefits of the installation harvest projects for improving roost habitat, an extended harvest window has been developed to initiate harvest operations as early as 1 August on up to 150 acres of hardwood stands located within established swarming areas, and up to an additional 150 acres in non-swarming areas. A similar extended window for harvesting and converting pine and redcedar stands to hardwood dominated stands has also been set for up to 75 acres in each swarming type for the same timeframe. See Section 5.3 for more detail. This approach will allow greater flexibility in planning and executing timber harvest actions, particularly on forested ground that has access and operability complications within the more

restrictive harvest window. The acreage limitations apply only to the extended harvest windows from 1 August to 14 November.

There are no set total acreage limitations for annual timber harvest actions. Instead, the total annual harvest limitation is based on the current maximum allowable sustainable harvest volume of 1,200,000 bf per year as established in Sections 4.0 through 4.1.1 and 5.1.6. This is because bf/ac harvest volumes vary greatly between targeted stands due to silvicultural prescriptions, species composition, stand stocking, timber size, and other parameters. Therefore, setting an annual maximum harvest limit based on total acres harvested per year is not a reliable method leading to consistent, sustainable, and predictable volumes of annual timber removals.

5.1.6.2 Timber Harvest Sale Planning and Implementation

All timber harvesting plans are coordinated with DPTMS and DPW, with required NEPA and ESA consultation documentation completed prior to commencing harvest operations. Confirmation that the required Phase I Cultural Resources Surveys have been completed is obtained from the Cultural Resources Office, and any registered Archeological Sites within or nearby the harvest areas and access roads are flagged as off-limits and protected.

Timber harvesting activities shall be conducted in accordance with all applicable US Army regulations, federal and state laws, and forestry BMPs. Trees or areas to be cut are clearly marked with either paint or flagging as necessary. If required, trees to be protected (e.g., den trees, snags) are separately and distinctly marked in a clearly different manner from harvest marking. Stumps are expected to be cut as low as feasible to avoid potential issues with military training and to improve the quality of stump sprouts. Actual marked hardwood volumes, estimated pine and redcedar volumes (from inventory with adjustments if needed), maps, and any other pertinent information are delivered to the US Army Corps of Engineers (USACE) Louisville District Forester in a Report of Availability (ROA) with attachments. Descriptions of sale specifics including special considerations developed during the NEPA and ESA documentation are added to proposed sale descriptions and requirements as necessary.

5.1.7 Forest Inventory

The Fort Knox Forest Inventory (FKFI) will be completed on 45,000 acres once the 2015 inventory project has been completed and analyzed. The calculated allowable annual net growth will be refined once the additional forest inventory data is available. See Section 4.1.1 for more detail on the FKFI. Starting in 2017, Fort Knox will pursue the re-inventory of approximately 4,500 acres annually to update the FKFI database on a 10 year cycle

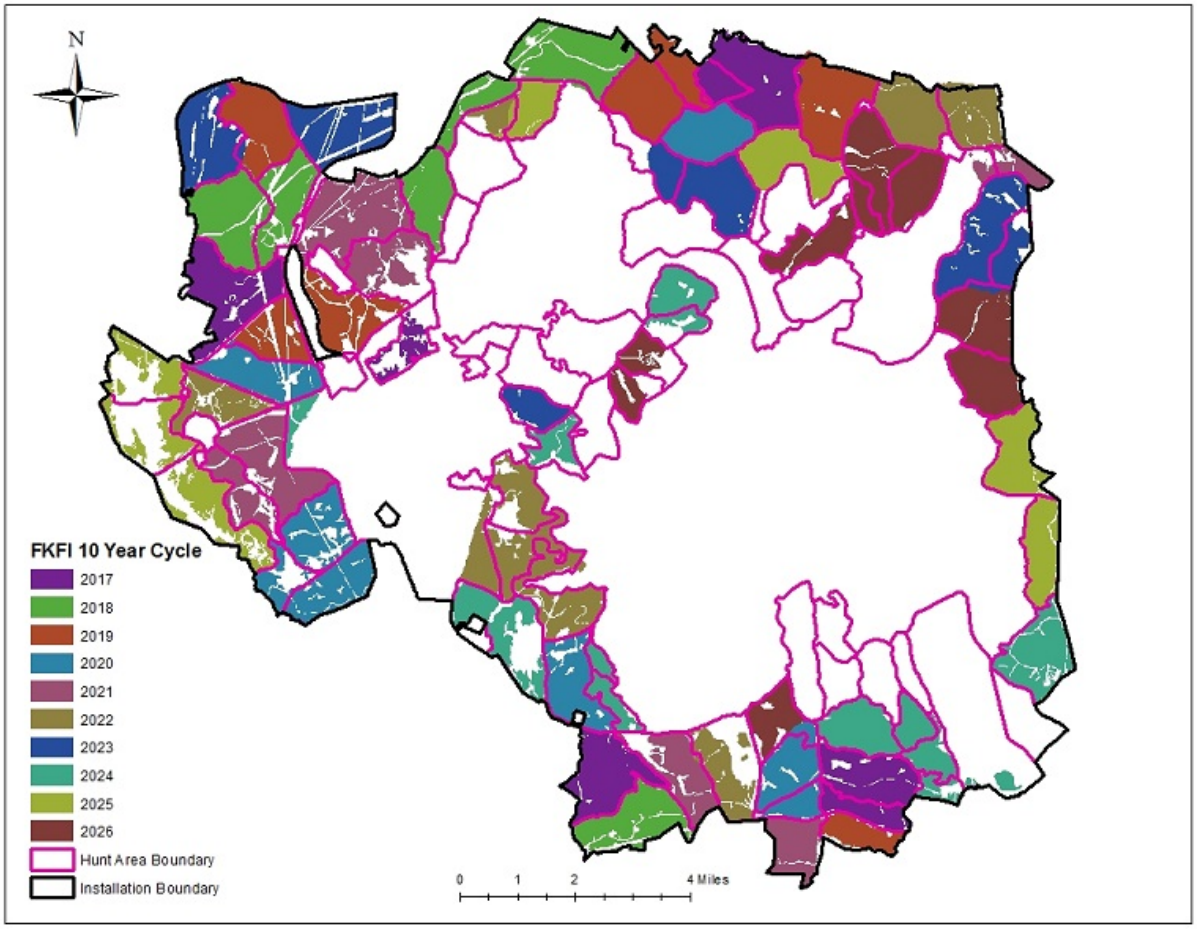

Figure 5-8.

5.1.8 Significant Natural Area Considerations

Sections 4.5 and 5.4 outline procedures to protect significant natural areas on Fort Knox. Some of these have special requirements of the forest management program.

5.1.9 Prescribed Burning

The Natural Resources Branch conducts prescribed burns to improve wildlife habitat, encourage oak/hickory regeneration, aid in the recovery of the native flora that occurs on the limestone hillside glade system, reduce fuel loads, and control/reduce the encroachment of undesirable species on training lands. The NRB also burns to maintain line of sight on range facilities, in cooperation with DPTMS Range Branch. Burns are generally conducted from January to March, however, weather may dictate the burns be conducted into early-April. Fall and late-growing season burns may become increasingly important to meet management goals, particularly with regard to reduction of woody encroachment into grasslands, reducing invasive species, and in the management of forests and woodlands. These burns are generally conducted during the period of August through October.

The NRB strives to conduct up to 2,500 acres of prescribed burns annually and will continue to do so for the period of this document. This total includes all habitat types and is highly variable due to burning conditions and availability of land being used for military training.

Prior to any burning, a prescription will be written and approved by the Wildland Fire Program Manager, and then explained to all involved with the burn. Upon completion of all prescribed burns a report will be filed to evaluate if the desired results were obtained.

5.1.10 Wildfire Prevention

The Natural Resources Branch is responsible for about 10.2 miles of firebreaks on the eastern boundary of the impact area. The firebreaks serve as a valuable resource protection measure and will be maintained as bare ground by disking. If needed, the process will be repeated in late spring. If a serious drought increases fire danger, these critical firebreaks will be bog-disked as needed to keep them bare. The firebreaks serve to keep fire on the installation, but also to keep off-post fires from coming onto the installation and possibly interfering with the military mission. Terrain in the area where the disking occurs is relatively flat, and buffers will be left around streams.

Access roads (generally gravel) will be maintained. These are primarily non-perimeter firebreaks where there are infrequent fires and other features (such as roads) exist to contain wildfires. The other 26.2 miles of firebreaks will be maintained by mowing. Mowing generally will occur once a year, although some areas may require a second mowing

5.1.11 Cantonment Area Management

The goal of cantonment area management is to maintain an aesthetically pleasing cantonment area landscape that preserves natural ecosystem functions as much as possible.

The Natural Resources Branch has prepared an Urban Forestry Management Plan which outlines ways to enhance greenspace within the cantonment area in need of improvement. This plan includes specific locations and plans for developing increased tree planting for carbon sequestration and improvement of wildlife habitat. Some examples include:

- Reducing the width of range road shoulder mowing in general
- Returning many disused building sites, especially isolated buildings, to natural habitat
- Planting trees on a one-for-one basis as trees are removed in the cantonment area
- Planting trees in areas that have been returned for natural habitat to increase Fort Knox's carbon sink

However, the privatization of family housing has impacted the management of the urban forest. Management of 2,386 family housing units on 1,535 acres of cantonment is the responsibility of Knox Hills. Knox Hills has developed a Natural Resources Management Plan, which includes provisions for tree management. Knox Hills coordinates management of the urban forest in their footprint to maintain compliance with this document.

5.2 Wildlife Management

5.2.1 Food Plots

The focus of this program will continue to shift to more plantings of perennial species such as clovers and other legumes that require less maintenance and are more beneficial to wildlife.

Fort Knox will continue with the eradication of non-native grasses, particularly tall fescue, and the replanting of these areas in nwsg. Previously renovated areas will be maintained through prescribed burns, mowing, and application of appropriate herbicide as needed. Disturbing new ground will require consideration of cultural resources.

5.2.2 Terrestrial Brush Piles

Brush piles will continue to be created as time permits, primarily during the winter months. Focus will be on creating brush piles in conjunction with clearing of small invading non-desirable trees in areas managed in early successional stages or native grasses. 5.2.3 Fallow Disking

Fallow disking will continue to be used to promote the growth of native grasses and forbs and to maintain early successional habitats along edges, prescribed burn control lines and in old field habitat areas.

5.2.3 Fish Habitat Structures

The placing of pond structures for fish habitat will be continued on a low-priority basis. If any new ponds or lakes are constructed, they will be designed to leave natural vegetation for structure, and additional needed structures will be placed on the bottom prior to pond filling.

5.2.4 Game Management

Game harvest often requires that population status information is available. Harvest management also requires continued strong support from Fort Knox hunters and anglers if it is to be effective. Conservation education must remain a high priority if such customer support is to be maintained.

5.2.5 Game Harvest Strategies

5.2.5.1 Gun Deer Harvest

Fort Knox Natural Resources Branch will continue to closely monitor the deer population and adapt harvest management.

5.2.5.2 Turkey Harvest

The spring turkey hunt and the fall archery and gun turkey season will continue. Harvest will be monitored to ensure that there is an abundant supply of turkeys in all areas. Data are collected

from successful hunters regarding the number of turkeys heard in specific hunting areas to assist in determining the availability of adult male birds in the hunting areas.

5.2.5.3 Channel Catfish Harvest

Fort Knox will continue to stock catchable size catfish annually, depending on funding as well as monitor populations in cooperation with KDFWR.

5.2.6 Game Monitoring

Game monitoring on Fort Knox will emphasize two species, white-tailed deer and wild turkey. Deer and wild turkeys are monitored to ensure that harvest levels are proper for both use and protection of the overall population.

5.2.6.1 White-Tailed Deer

Harvest data are needed to determine the effects of closing the impact area. The area of particular concern is the edge of the impact area. Disease and parasite problems are expected to be significant within the impact areas, and these could easily be carried outside impact areas. Deer will probably move into the impact area refuge from adjacent areas to avoid hunting pressure. This compounds the problem of harvesting a sufficient number of animals in these areas

With the implementation of QDM, virtually eliminating harvest of the statistically important yearling buck class of deer, yearling doe weights and other parameters will be monitored to ascertain relative health of the deer population. Additionally, annual collection of 6-10 adult does during the period of January through March will be conducted to determine fawn conception date and fetuses per doe ratios. The percentage of fawns in the overall harvest of a year will also be closely monitored. This data set is a somewhat unknown variable as percentages in the harvest are based partially on hunter selection and may not accurately reflect the ratio within the population. This reinforces the importance of the fetus counts in winter collections of adult does.

5.2.6.2 Turkey

Fort Knox will use late-summer poult counts along predetermined driving routes to monitor wild turkeys. Considering the high annual mortalities common to wild turkeys, annual reproduction is the most significant factor in flock size.

Standard routes were established in 1997 for August poult-to-hen ratio counts on the following roads: Main Range, Mount Eden, Carpenter Test, Pinwheel, 7th Armored Division, and Porter River. Natural Resources Branch personnel drive these roads as often as possible during August to count hens and poults. Surveys are normally done in conjunction with other activities. Hen-to-poult ratios are used to determine relative changes in turkey numbers.

5.2.6.3 Game Fish

Periodic surveys will be conducted to monitor fish populations in heavily used fishing ponds and lakes. Survey techniques will include seining, gill netting, and electroshocking. The amount of electroshocking will depend on the availability of state equipment and personnel. The intent is to sample the following managed lakes every 2 to 3 years: Upper Douglas, Lower Douglas, Crystal, Dickerson, Camp Carlson, Wilcox, and Sanders Spring. Stocking and other management decisions will be made based on these surveys. Gill nets will only be used for special purposes due to better results from electroshocking for most species.

Channel catfish stocking will continue to be based on the number stocked and fishing pressure until a refined stocking technique becomes available.

5.2.7 Non-Game Species

Both inventory and census are important to the Fort Knox fish and wildlife management program, but emphasis in the next 5 years will be more on monitoring since most basic inventories for vertebrates are complete.

5.3 Endangered Species

The ecosystem management approach utilized for the implementation of this INRMP provides for the best available management and landscape setting within the resources available. Application of sound forest management practices, where appropriate, provide for the most ecologically sound forest setting. Through this approach, opportunities for merchantable timber harvest, realistic training land, and support of a diverse ecosystem are achieved. This application also provides the means to support a robust forest-dwelling bat population. Conduct of the military mission and many of the management practices outlined in this plan may have direct and indirect effects to federally-listed species on the installation. These management actions are, however, required for the long-term support of the habitats required for these species.

Any management action taken has the potential to result in positive and/or negative direct and indirect effects to listed species and proposed actions are taken with these possible outcomes in mind. Actions that have the highest potential to directly affect these species are largely avoided. The primary negative direct effect results from forest conversion during periods when those habitats are occupied, particularly during the period when young are non-volant; these actions are avoided. Actions that have the potential to result in indirect effects are minimized. Most actions that have the potential to indirectly effect forest-dwelling bats, such as timber harvest, prescribed burning, TSI, and removal of undesirable stems, are primarily conducted during the timeframe when these species are not present on the landscape (15 November-31 March). Reaching the goals of ecosystem management require that some of these actions occur during the timeframe when bats may be on the landscape, but are required to meet management objectives.

Monitoring and habitat management actions undertaken since approximately 1999 have resulted in finding that the military mission and natural resources management is compatible with these species through the identification of the largest maternity colony of Indiana bats

documented to date. In close cooperation and coordination with the USFWS, detailed monitoring, development of management strategies such as artificial roost structures, cooperation in development of acoustical detection protocols, invasive species control, and timber stand improvement actions have largely been responsible for these successes. The comprehensive implementation of this plan, with management actions based on the best available science, over the scope of 170 square miles of this installation, will provide additional positive effects for listed species.

The following management actions, small mission-related projects, and conservation measures will be undertaken at Fort Knox which may affect federally-listed, forest-dwelling bats (Table 5-6). Fort Knox will, however, avoid and minimize potential direct and indirect effects to the maximum extent practicable by conducting these activities during the time of year which is most unlikely to negatively affect listed species, and will strive to improve habitat for imperiled species, while supporting the military training mission.

1. Burn up to 2,500 acres annually, with approximately 75% occurring during the period of 15 November through 31 March. The remainder will occur during 1 August through 14 November, with a small potential for up to 500 acres annually during 1-30 April, if burning conditions permit.

2. Consider potential smoke effects on caves known to be used by bats in any prescribed burning action and avoid those prescription conditions that may introduce smoke into those caves.

3. No forest removal or prescribed burning during 1 May through 31 July to avoid direct effects to bats during the maternity season.

4. Harvest an annual maximum of 1,200,000 board feet of hardwood sawtimber, 5,000 tons of cedar/pine, and 5,000 tons of hardwood pulp. These volumes are well under 80% of the updated estimated annual growth of the commercial forest of the installation, and does not consider the remaining acres of non-commercial forest comprising approximately 40,000 acres. These annual limits support the maintenance of an older age class forest post-wide, which is important for forest-dwelling bats. Additionally, any timber harvests conducted within the IBMA will specifically be accomplished to enhance habitat conditions for forest-dwelling bats and in close coordination with the USFWS.

5. During the swarming period between 1 August and 14 November, up to 150 acres of hardwood timber harvesting and up to 75 acres of pine and redcedar harvesting may be initiated in each of the delineated swarming and non-swarming areas (300 acres and 150 acres, cumulatively) as necessary to alleviate restrictive access and limited ground operability concerns. Harvest acreage above those limits will be restricted to 15 November through 31 March.

6. All applicable forestry BMPs will be implemented and enforced on all timber harvest locations.

7. In commercial timber harvest areas, all standing dead snags that do not pose a hazard to personnel or property will be avoided and left standing to the extent practicable. In addition, one live tree greater than 18 inches DBH per 10 acres will be deadened post-harvest to enhance potential roost tree availability and mitigate the occasional loss of standing snags during harvest operations.

8. Conduct up to 2,000 acres of TSI annually using chemical application methods, during appropriate weather conditions, to encourage the regeneration of desirable tree species, remove invasive species, provide ample potential roosting sites for tree-dwelling bats, and improve bat foraging habitats. During the period of 1 April – 31 July, up to 1,000 of those acres will be broadcast/mist applications for undesirable/invasive grass species, and injection, basal, or directed foliar for woody stems.

9. Conduct mechanical removal of undesirable stems utilizing a Fecon forestry mower, tree shear, and/or chainsaw to improve forest stands and enhance and manage early successional habitat, primarily during the period of 1 August - 31 March. Annual maximum of 250 acres to be conducted during the period of 1 August through 14 November. Undesirable stems are typically non-merchantable pines, cedars, and to a lesser extent sassafras, black locust, maple, persimmon, ash, boxelder, etc. and are typically 3-14 inches DBH in size. They are typically young, fast growing species and exhibit very little potential as bat roosting habitat.

10. Forest access road maintenance/upgrades requiring incidental tree removal will be conducted primarily during the period 1 August through 30 April. Potential roost trees will be avoided when possible, but if required to be removed outside of the 1 August through 30 April timeframe, trees will be reviewed by NRB personnel to determine if occupied by bats prior to removal to avoid potential negative effects. These actions will be limited to an annual maximum of 5 non-contiguous miles, considering 5 feet on each side of the access road could be removed resulting in a maximum of 6 acres of removal.

11. Small mission and/or INRMP-related forest removal up to an annual maximum of 25 acres, with an individual project-specific maximum of 5 acres will be conducted during the period of 15 November through 31 March. These actions will be documented appropriately through NEPA and opportunities to maintain these in native, early successional habitats will be initiated as appropriate.

12. Cantonment area tree removals will be reviewed by qualified NRB personnel, by tree, to verify need and no presence of bats prior to removal regardless of season.

13. Vegetated buffers a minimum of 70 feet will be maintained around rivers, streams, sinkholes, and caves. Forest removal within ¼ miles of Grahampton and McCracken caves that has a potential to effect cave suitability will be avoided.

14. Continued monitoring of bat populations on the installation.

15. Placement of artificial roost structures as appropriate and in coordination with the USFWS.

16. Annual acoustical bat monitoring routes.

17. The mouth of Grahampton cave will remain fenced to preclude unauthorized access that could disturb bats. Periodic, potentially seasonal, monitoring of Grahampton and McCracken caves will be conducted as determined appropriate in coordination with USFWS.

18. Participation in the Environmental Officers (EO) Course. This is a requirement for all units on the installation. An individual from each unit is designated in writing to be the EO. This person is trained by the Environmental Management Division annually regarding environmental requirements on post including information on the natural resources program with special emphasis on listed bat species and our requirements regarding these species. This program is especially important to getting the information out regarding avoidance of actions that might negatively affect listed species.

Table 5-6. Management actions, small mission-related projects, and conservation measures that will be undertaken at Fort Knox, by season, which may affect federally-listed, forest-dwelling bats.

Project	All Year	1 - 30 April	1 May - 31 July	1 Aug - 14 Nov	15 Nov - 31 March	Average Annual Acres
Prescribed Burning		Up to 500 acres.		Up to 625 acres.	Up to 1,875 acres.	2,500 acres.
Timber Harvesting		No tree cutting, completion of cut log handling and hauling, and BMP operations, as needed.		Up to 150 acres of hardwood and 75 acres pine/redcedar each in swarming and non-swarming areas (300/150 acres cumulative).	Up to 600 acres depending on bdft/acre marked per harvest site and use of Aug - Nov harvest option.*	Up to 600 acres.*
Forest road maintenance and upgrades (requiring incidental tree removal)	Trees avoided as best possible, inspected prior to removal if unavoidable.					Up to 5 miles of non-contiguous road edges (equivalent to a total of 6 acres).
Chemical TSI control of invasive and nuisance tree, shrub, and grass species		Up to 1,000 acres broadcast/ mist application for grasses, and injection, basal, or directed foliar for woody stems.		Up to 1,000 acres of any application method for all target species.		2,000 acres.
Mechanical TSI control of invasive and nuisance tree and shrub species (≥3"dbh)				Up to 250 acres.		250 acres.
Small mission and/or INRMP related forest removals					Not to exceed 5 acres per project up to 25 acres cumulative.	25 acres.
Hazardous tree removals in cantonment area	All trees inspected prior to removal.					Individual trees only, not contiguous acres.

*Annual harvest limitations based on sawtimber volume sold, not acres harvested. See Sections 4.0 through 4.1.1 for discussion of maximum sustainable annual harvest limitations, and Section 5.1.6 for discussion of timber harvesting and timing.

5.4 Significant Natural Areas

Fort Knox hopes to have significant natural areas identified on training maps using an overlay when funding becomes available. The Leader's Handbook (Section 4.8.3) will include a copy of this map when completed.

5.4.1 Wetlands Management

The goal for wetlands management on the installation is to restore, or attempt to restore, those wetlands that were historically converted to agriculture. In addition, efforts will be made to avoid impacting wetlands as much as possible since mitigation is generally an expensive option. Natural Resources Branch personnel will take steps to preserve existing wetlands and will continue to evaluate opportunities to restore degraded wetland resources as they are identified.

5.4.2 Cedar Glades Monitoring and Management

Currently, the glade and barren complex is being surveyed by the Kentucky State Nature Preserves Commission for rare plants. Surveys will be conducted during two growing seasons at various times to capture the flowering phenology of the plants. Each site selected will be visited to determine the overall condition of the community(s). Overall condition will be assessed based on native vegetation structure and composition, soil conditions/disturbances, and abundance of invasive exotics.

Fort Knox will continue the ongoing management activities to include: prescribed burning, herbicide treatments, and invasive species removal, but may modify these management actions based on the results and recommendations of the KSNPC survey. Plans are currently being made to survey pollinators on the installation, to include the cedar glades.

5.4.3 Otter Creek Ravines Management

Forest practices in the Otter Creek Ravines Area will emphasize restoring the forest ecosystem. Special considerations will be given to minimizing erosion during forest management activities. Erosion will be controlled in uplands to the east of this area to maintain water quality (Sections 5.1 and 5.1.3).

5.4.4 Grahamton Cave

Management will primarily entail maintaining the fence (Section 3.5.6) and designating off-limits areas. Dye tracing may be used to identify the watershed, and rehabilitation projects will be directed to problem areas within this watershed. Fort Knox will not stock trout in the stream draining this cave. The northern cavefish is not adapted to predation, and trout could adversely affect this species.

5.4.5 Karst Ponds West of Otter Creek

Natural Resources Branch and ITAM personnel have developed a plan to protect the watershed of McCracken Spring, as well as vegetation associated with these karst ponds, using

70 feet as a guideline. The plan includes some restrictions on military operations in the vicinity of these ponds. Natural Resources Branch staff will work toward implementation of a plan that will increase the value of these ponds for wildlife and provide increased protection from potential negative effects of training activities. The relocation of the Armor School to Fort Benning in 2011 has afforded Fort Knox the opportunity to reclaim heavily degraded training lands around these resources. As of 2016, reclamation actions have occurred on all of the heavily degraded areas except approximately 200 acres. These lands are the focus of funds procurement efforts for reclamation going forward.

5.4.6 Godman Army Airfield

Management will entail restoring and maintaining native grasses and forbs. Mowing and burning will be used to achieve this goal. Mowing is prohibited in this area during the period of 1 April through 15 August to protect nesting migratory birds. Herbicides may be used as appropriate to maintain this area in native warm season grasses and forbs.

5.4.7 Ohio/Salt River Tributary Ravines

The ravine topography precludes heavy mounted training activities. Damaged areas immediately to the south and east will continue to be high priority for rehabilitation. Any timber harvest in this area will be done with exceptional care with regard to preventing erosion into this watershed.

5.4.8 Floodplains and Lower Slopes along Salt River, Rolling Fork, and Lower Mill Creek

Threats to these floodplain and lower slope areas include the lack of BMPs during construction activities and development of military training ranges. Agriculture and forestry activities are eliminated from these areas by impact area designation.

5.5 Pest Management

5.5.1 Terrestrial Weed Control

Herbicides will continue to be used to control woody and herbaceous species mentioned previously in section 4.7. These herbicides are integral to the management goals of this plan. New products and methodologies of application will be researched going forward to improve the application of this useful tool. Particular focus will be placed on keeping current with the most efficient and effective means of managing invasive species and undesirable forest species to improve management effectiveness the Fort Knox ecosystem.

5.5.2 Aquatic Weed Control

5.5.2.1 Fertilization

Fort Knox may fertilize to control aquatic weeds primarily Upper and Lower Douglas Lakes. Fertilizer (liquid 10-34-0) will be applied beginning in April, with about two applications per

month for the first three treatments. Then it will be applied about once a month for the rest of the summer. Timing will be influenced by results.

5.5.2.2 Biological Control

The proven potential of triploid grass carp is such that these fish can be an integral part of an aquatic vegetation management program in the managed lakes. All of the managed lakes currently have a population of grass carp, and these will be maintained as needed based on vegetation abundance.

5.5.2.3 Aquatic Herbicides

In cases of extreme infestations the Natural Resources Branch may use herbicides such as aquazine, Cutrine®, and Rodeo® to control filamentous algae and emergent weeds such as cat tail, coontail, musk grass, pond weed, and water primrose.

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PERSONS CONTACTED

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LIST OF ACRONYMS AND ABBREVIATIONS

AEC	Army Environmental Command
AR	Army Regulation
ARPA	Archeological Resources Protection Act
BCE	Base Commercial Equipment
BMPs	Best Management Practices
BRAC	Base Realignment and Closure
CERL	Construction Engineer Research Laboratory
CFI	Continuous Forest Inventory
CX	Categorical Exclusion
DA	Department of the Army
DBH	diameter at breast height
DCFA	Directorate of Community and Family Activities
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoDM	Department of Defense Manual
DPTMS	Directorate of Plans, Training, Mobilization, and Security
DPW	Directorate of Public Works
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMD	Environmental Management Division
EPA	Environmental Protection Agency
EPR	Environmental Program Requirements
ESMP	Endangered Species Management Plan
FEMA	Federal Emergency Management Agency
FKFI	Fort Knox Forest Inventory
FLETC	Federal Law Enforcement Training Center
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
GPS	Global Positioning System
GRASS	Geographic Resources Analysis Support System
HUD	Housing and Urban Development
IBMA	Indiana Bat Management Area
IBP	Institute for Bird Populations
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IMCOM	Installation Management Command
IPA	Intergovernmental Personnel Act of 1972
IPMP	Integrated Pest Management Plan
IPM	Integrated Pest Management
ITAM	Integrated Training Area Management
IWFMP	Integrated Wildland Fire Management Plan
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDEP	Kentucky Department for Environmental Protection
KDF	Kentucky Division of Forestry

KFO	Kentucky Field Office
KPDES	Kentucky Pollutant Discharge Elimination System
KSNPC	Kentucky State Nature Preserves Commission
LCTA	Land Condition Trend Analysis
LRAM	Land Rehabilitation and Maintenance
LTADD	Lincoln Trail Area Development District
MACOMs	Major Commands
MAPS	Monitoring Avian Productivity and Survivorship
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
MOUT	Military Operations on Urbanized Terrain
MP	Military Police
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NRB	Natural Resources Branch
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
ODCSOPS	Office of the Deputy Chief of Staff for Operations and Plans
OJT	on-the-job training
OMA	Operations and Maintenance Army
ORV	off-road vehicles
PAM	Pamphlet
PIP	Partners in Flight
RCMP	Range Complex Master Plan
REC	Record of Environmental Consideration
ROD	Record of Decision
ROTC	Reserve Officer Training Corps
RTLP	Range and Training Land Program
SCA	Student Conservation Association
SERDP	Strategic Environmental Research and Development Program
SMZs	Streamside Management Zones
SRA	Sustainable Range Awareness
SWPPP	Stormwater Pollution Prevention Plan
TNC	The Nature Conservancy
TRADOC	Training and Doctrine Command
TRI	Training Requirements Integration
TSI	Timber Stand Improvement
TSS	Total Suspended Solids
UFMP	Urban Forestry Management Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
WES	Waterways Experiment Station

APPENDIX A

RECORD OF ENVIRONMENTAL CONSIDERATION
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN UPDATE
FORT KNOX, KENTUCKY

Date: June 2018

PROJECT TITLE: Integrated Natural Resources Management Plan Update

DESCRIPTION: The Integrated Natural Resources Management Plan (INRMP) guides the implementation of the natural resources program for the U.S. Army Garrison Fort Knox, Kentucky. The program helps to ensure the conservation of Fort Knox's natural resources while maintaining/emphasizing compliance with related environmental laws and regulations. This INRMP contains a 5-year work plan designed to meet the goals and objectives outlined in the plan. This plan also helps to maintain quality training lands to accomplish Fort Knox's critical military mission. This plan applies to organizations internal and external to Fort Knox that are involved with, or interested in, managing or using Fort Knox's natural resources. This includes active duty units, National Guard and Reserve Components, directorates, private groups, and individuals. This INRMP is intended to be an integral part of the Fort Knox Installation Master Plan.

This action is covered under 32 CFR Part 651, Environmental Analysis of Army Actions: Final Rule, (March 29, 2002), Appendix B – Categorical Exclusions, Section II: Paragraph (b) Administration/operation activities: (3) Preparation of regulations, procedures, manuals, and other guidance documents that implement, without substantive change, the applicable HQDA or other federal agency regulations, procedures, manuals, and other guidance documents that have been environmentally evaluated (subject to previous NEPA review).

ANTICIPATED START DATE OF THE PROPOSED ACTION: June 2018

1. This action is not a major federal action significantly affecting the quality of the human environment. This action has not been segmented.

2. There are no exceptional circumstances that exist at the building sites.

3. There are no environmentally controversial changes to existing environmental conditions for the proposed demolition areas.

4. There are no extraordinary conditions associated with this project.

5. This project does not involve the use of unproven technology.

6. There is no reasonable likelihood of significant effects on public health, safety, or the environment.

7. There is no reasonable likelihood of significant environmental effects (direct, indirect, and cumulative).

8. There is no imposition of uncertain or unique environmental risks.

9. The scope or size of this project is no greater than normal for this category of action.

10. The proposed action would not normally result in releases of petroleum, oils and lubricants (POL) except from a properly functioning engine or vehicle. Accidental release of POL products would be reported and cleaned up in accordance with EPA and Kentucky laws and regulations.

11. The use of pesticides or herbicides is prohibited without the approval of the Natural Resources Branch, Environmental Management Division, Directorate of Public Works.

12. There is no reasonable likelihood of violating any federal, state or local laws or requirements imposed for the protection of the environment.

13. There is no potential of an already poor environment being further degraded.

14. This action does not establish a precedent for future or subsequent actions that is likely to have a future significant effect.

15. Potential Effect on Sensitive Resources:

a. Threatened and Endangered Species: Two federally-listed endangered species occur on the installation: the gray bat (*Myotis grisescens*) and Indiana bat (*M. sodalis*); and one threatened species, the northern long-eared bat (*M. septentrionalis*). Any tree removal on the installation must be coordinated through the Natural Resources Branch prior to being removed.

b. Cultural Resources:

(1) The INRMP describes numerous policies and procedures that will help protect and preserve cultural resources. The plan emphasizes the importance of early planning and coordination for natural resources activities that have the potential to result in adverse effects to cultural resources. In accordance with the NHPA and AR 200-1, undertakings such as timber harvests, endangered species habitat enhance projects, and erosion control projects are review for potential adverse effects on historic properties.

(2) Effective coordination of natural and cultural resources management requirements provides significant benefits to the management of historic properties. Natural resources management practices that stabilize soils and control erosion benefit archaeological sites and historic cemeteries. Urban forestry management preserves the historic setting of the Fort Knox Cantonment Historic District. Conservation Law Enforcement Officers and other enforcement

activities support cultural resources management by monitoring for illegal activities such as looting of archaeological sites and removal of artifacts.

(3) In summary, the policies and procedures described in the INRMP will benefit management of Fort Knox's cultural resources. The plan supports compliance with the NHPA and the cultural resources components of AR 200-1. The emphasis on early planning and coordination of natural and cultural resources management concerns is a key to effective environmental management.

CONCLUSIONS: The proposed action as currently described would have no long-term cumulative effects on the environment. If the scope of the project changes, this REC would be reviewed to determine if the document fully complies with the intent of the National Environmental Policy Act.

THIS DOCUMENT *DOES NOT* RELIEVE THE PROPONENT OF COMPLIANCE WITH APPLICABLE FEDERAL AND STATE LAWS AND REGULATIONS.

PROPONENT:

Michael Brandenburg Date 6 Mar 18

MICHAEL G. BRANDENBURG
Chief, Natural Resources Branch, EMD
Directorate of Public Works

CONCURRENCE BY OFFICE OF STAFF JUDGE ADVOCATE:

Betty Walker Date 2 March 2018

BETTY WALKER
Administrative Attorney
Office of the Staff Judge Advocate

APPROVED BY INSTALLATION ENVIRONMENTAL COORDINATOR:

_____**Date** _____
DANIEL S. MUSEL
Chief, Environmental Management Division
Directorate of Public Works

CONCURRENCE BY DIRECTOR OF PUBLIC WORKS:

_____**Date**_____
PATRICK A. WALSH
Director of Public Works

APPENDIX B

NATURAL RESOURCES MANAGEMENT INITIATIVES/PROJECTS

ORGANIZATION

The existing Natural Resources Branch organization at Fort Knox will implement this INRMP with assistance from other Fort Knox organizations and contract support as outlined within this INRMP.

PERSONNEL

Implementation of this INRMP requires the following positions:

Integrated Training Area Management:

ITAM Coordinator
LRAM Coordinator
GIS Analyst

EMD, Natural Resources Branch:

Natural Resources Branch Chief

Forestry:

Forestry Program Manager
Forestry Technician

Fish and Wildlife:

Wildlife Biologist
Wildlife Biologist
Tractor Operator
Hunt Control Assistant
Recreation Aide
Contract Forest Lead Technician
Contract Forest Technicians (2)

Personnel Training

The Natural Resources Branch will, within resources and scheduling constraints, send at least one person to each of the following annual workshops or professional conferences as funding permits:

- North American Natural Resources Conference/NMFWA
- Southeastern Association of Fish and Wildlife Agencies
- The Wildlife Society Conference
- Kentucky Chapter of The Wildlife Society Meeting
- Kentucky Prescribed Fire Council Meeting
- GIS training
- Partners in Flight

- Society of American Foresters Annual Convention
- IMCOM SE Forestry and Wildlife Workshops
- Wildland fire management training

Other conferences and workshops will be evaluated for their usefulness, and decisions will be made based on the appropriateness to ongoing projects and funding availability. Projects that are especially useful include GIS basic and advanced training, turkey symposia, white-tailed deer symposia, Watchable Wildlife workshops, wetlands restoration training, KY Master Logger Workshops, Hardwood Silviculture Workshops, Wildland and Prescribed Fire Training, endangered species training, and erosion control/bioengineering workshops. It is especially useful to have as several persons attend the NMFWA conference. Efforts will be made to have more than minimal attendance at that meeting.

Personnel will be trained in related environmental fields. NEPA training will be required of all supervisory personnel, as well as others who review or prepare NEPA documents. If law enforcement personnel are hired, they will be required to attend spill response and cultural resources enforcement training.

Outside Assistance

Implementation of this INRMP will require active assistance from Fort Knox's partners, both signatory and otherwise. Chapter 1 indicates agencies, organizations, and others in this category. Specific needs from organizations external to Fort Knox are indicated throughout this document. Fort Knox will require considerable expertise from universities, agencies, and contractors to accomplish some tasks within this plan. Fort Knox will reimburse parties for much of this assistance.

PROJECT/PROGRAM PRIORITIES

The Sikes Act and AR 200-1 require preparation and implementation of this INRMP. Therefore, it is a high funding priority according to OMB Circular A-106 rules. The fact that this INRMP is a Federal Facilities Compliance Agreement with action required in the attached NEPA document also qualifies it for high priority funding. There are also programs within this INRMP that are required for compliance with other laws, especially laws involving such things as endangered species and wetlands.

However, it is unlikely that all programs within this INRMP will be funded immediately. Therefore, the following sections define the relative importance of projects and programs specifically included within this INRMP.

Lower priority projects may be implemented ahead of higher ones. Some high priority projects are critical, but they may not be compliance driven, which makes funding more difficult. The lists provided below are based upon need and effect on Fort Knox natural resources, not funding likelihood.

Projects for Fiscal Years 2018 through 2022

*Projects not accomplished in a projected year are to be evaluated for movement to the next year.

Projects for Fiscal Year 2018

High Priority Projects

- Continue Forest Inventory
- Maintain firebreaks
- Digitize forest management data into the GIS
- Stock fish in managed lakes and Otter Creek
- Implement federally-listed bat species management actions (monitoring, telemetry, habitat, and management)
- Protect areas of special significance
- Implement Integrated Pest Management
- Site projects and military missions on lands best suited to support them
- Implement silvicultural methods based on management objectives and findings from the forest inventory
- Timber harvest, stand improvement, and site preparation for regeneration on required areas
- Develop and implement surveys and management actions for special ecological areas
- Collect harvest/trip data and maintain hunting pressure within desired limits
- Implement invasive species management
- Plant NWSG and forbs in reclaimed areas
- Use prescribed burning to enhance wildlife habitat and obtain ecological goals
- Renovate training areas as scheduled
- Protect cultural resources while implementing this INRMP
- Review NEPA documents
- Use NEPA mitigation to maximum efficiency
- Educate troops on natural resources through the Environmental Compliance Officer Course (ECO)
- Conduct deer camera survey
- Plant food plots

Important Projects

- Implement urban forest management
- Use SWPPPs
- Control undesirable fish species
- Plant trees
- Implement reduced grounds maintenance
- Perform late summer turkey hen to poult ratio counts
- Monitor cedar glades
- Organize and participate in Arbor Day and Earth Day activities
- Provide other outdoor recreation opportunities

Low Priority Projects

- Assist the Forest Service with gypsy moth trapping
- Place mineral blocks
- Place terrestrial brush piles

- Conduct fallow disking
- Prepare and give talks
- Improve boundary marking
- Conduct fish surveys as needed

Projects for Fiscal Year 2019

High Priority Projects

- Implement silvicultural methods based on management objectives and findings from the forest inventory
- Continue forest inventory
- Digitize forest management data in to the GIS
- Maintain firebreaks
- Timber harvest, stand improvement and site preparation for regeneration on all required areas
- Develop and implement surveys and management actions for special ecological areas
- Incorporate new inventory information into the Forestry Management Sections of this document
- Implement invasive species management
- Plant NWSG
- Manage wildlife plots
- Implement federally-listed bat species habitat management and population surveys
- Use prescribed burning to enhance wildlife habitat and obtain ecological goals
- Stock fish
- Review NEPA documents
- Implement Integrated Pest Management
- Renovate training areas as scheduled

Important Projects

- Implement urban forest management
- Electroshock fish surveys
- Evaluate usefulness of IPAs
- Perform late summer turkey hen to poult ratio counts
- Collect and monitor game and fish harvest data
- Consider issues and potential management of emerald ash borer on Fort Knox.

Low Priority Projects

- Assist the Forest Service with gypsy moth trapping
- Place mineral blocks
- Place terrestrial brush piles
- Conduct fallow disking
- Prepare and give talks
- Sponsor Arbor Day activities
- Improve boundary marking
- Conduct seine and gill net surveys as needed

Projects for Fiscal Year 2020

High Priority Projects

- Continue forest inventory
- Implement silvicultural methods based on management objectives and findings from the forest inventory
- Maintain firebreaks
- Timber harvest, stand improvement, and site preparation for regeneration on all required areas
- Develop and implement surveys and management actions for special ecological areas
- Digitize forest management data in to the GIS
- Update environmental restrictions within training regulations
- Use prescribed burning to enhance wildlife habitat and obtain ecological goals
- Implement IBMA plan
- Implement Integrated Pest Management

Important Projects

- Implement urban forest management
- Upgrade training video
- Upgrade Leader Handbook
- Evaluate usefulness of IPAs
- Evaluate hunting and fishing map
- Renovate training areas as scheduled

Low Priority Projects

- Assist the Forest Service with gypsy moth trapping
- Place mineral blocks
- Place terrestrial brush piles
- Conduct fallow disking
- Prepare and give talks
- Sponsor Arbor Day activities
- Improve boundary marking

Projects for Fiscal Year 2021

High Priority Projects

- Implement sustain-yield silvicultural prescriptions
- Maintain firebreaks
- Timber stand improvement and site preparation for regeneration on all required areas
- Develop and implement surveys and management actions for special ecological areas
- Implement the Forest Management Plan
- Develop GIS databases based on the forest inventory for forest management planning
- Use prescribed burning to enhance wildlife habitat and obtain ecological goals
- Implement IBMA
- Implement Integrated Pest Management

Important Projects

- Develop and annually collect forest inventory to maintain annual growth basis and current forest conditions
- Implement urban forest management
- Electroshock ponds

Low Priority Projects

- Assist the Forest Service with gypsy moth trapping
- Place mineral blocks
- Place terrestrial brush piles
- Conduct fallow disking
- Prepare and give talks
- Sponsor Arbor Day activities
- Improve boundary marking
- Conduct seine and gill net surveys as needed

Projects for Fiscal Year 2022

- Implement sustain-yield silvicultural prescriptions
- Maintain firebreaks
- Timber stand improvement and site preparation for regeneration on all required areas
- Develop and implement surveys and management actions for special ecological areas
- Implement the Forest Management Plan
- Develop and annually collect forest inventory to maintain annual growth basis and current forest conditions
- Implement urban forest management
- Reevaluate gray and Indiana bat management activities
- Implement IBMA habitat management
- Use prescribed burning to enhance wildlife habitat and obtain ecological goals
- Implement Integrated Pest Management
- Measure effectiveness and Evaluate INRMP for next revision

FUNDING OPTIONS

Forestry Funds

The proceeds from timber sales are directed to the Fort Knox Forestry Program under the Army Conservation Reimbursable Program. The Fort Knox Forestry Program provides annual timber harvest revenue estimates through Reports of Availability (ROAs) in May and submits Annual Work Plans (AWPs) in June of each year. The timber harvest revenue estimates are utilized by the Office of the Assistant Chief of Staff for Installation Management (ACSIM) to allocate available forestry funds to all Army installation and USACE forestry programs through the Automatic Reimbursable Account (ARA). After expenses, 40% of the net income generated through timber sales become state entitlements and are allocated to the State of Kentucky to be used for schools and roads in Bullitt, Hardin, and Meade Counties. The resulting 60% of net forestry dollars are made available to the installation forestry programs through the Forest Reserve Account (FRA). The FRA funds are available to all DoD forestry programs and are

competitively awarded on a project-level basis. Each FRA project must address one of the following: improvement of forest lands; meet unanticipated contingencies in the administration of forest lands and in the production of forest products, when other sources of funds are not available in a timely manner; and implement approved natural resource plans and agreements.

The table below details annual ARA, income from installation timber sales, and funded FRA projects from 2008 through 2016.

FY	Initial ARA	ARA Plus-up	Total ARA Received	Installation Projected Income	ARA % of Projected Income	USACE Reported Income	FRA Received	FRA Project
2008	$121,500		$121,500	$226,242	53.7%	$226,566		
2009	$127,500		$127,500	$202,000	63.1%	$175,288		
2010	$125,000		$125,000	$256,000	48.8%	$150,060	$100,000	Rehabilitation
2011	$141,738		$141,738	$307,000	46.2%	$309,246		
2012	$222,213	$50,000	$272,213	$275,000	99.0%	$420,268	$150,000	Fire Dozer
2013	$110,500	$18,000	$128,500	$250,000	51.4%	$262,579	$165,000	Transport
2014	$137,000	$90,600	$227,600	$275,000	82.8%	$334,804	$40,000	Inventory
2015	$204,485	$70,000	$274,485	$275,000	99.8%	$305,000		
2016	$237,500		$237,500	$330,000	72.0%	$340,613	$200,000	Firebreaks
Totals	**$1,427,436**	**$228,600**	**$1,656,036**	**$2,396,242**	**69.1%**	**$2,524,425**	**$655,000**	

Fish and Wildlife Funds

These funds are collected from the sales of installation permits to hunt or fish. They are authorized by the Sikes Act and regulated via AR 200-1. These funds may be used only for fish and wildlife management on the installation where they are collected. They cannot be used for the recreational aspects of fish and wildlife management. They are exempt from the BCE cap ($50,000 currently), and they have no year-end (i.e., unobligated funds carry over on 1 October).

Fort Knox collects about $140,000 annually from the sale of installation hunting and fishing permits. These funds are primarily used to support salaries and purchase supplies, fish stock and equipment. The collection, expenditure and reporting of program funding is managed through the Reimbursable Programs Tracking System (RPTS).

Environmental Funding

Environmental dollars are a special category of O&M dollars. The program heavily favors high-priority funding projects that are needed to obtain/maintain compliance with federal or state laws, especially if non-compliance is backed by notices of violation or other enforcement agency action. “Must fund” classifications include mitigation required and identified within RODs and FONSIs, as well as items required within Federal Facilities Compliance Agreements. This INRMP is a Federal Facilities Requirement Agreement.

ITAM Funds

The Fort Knox ITAM Coordinator requests an average of $2.5M/year to sustain and execute the four core components of the ITAM program. This amount also includes the GIS support to the program. Program execution is then based on actual funding received. Some components of the ITAM program must then go unfunded to ensure that LRAM projects can be executed as needed.

INRMP IMPLEMENTATION FUNDS

Overall, costs to implement this INRMP are highly variable. The primary sources of funding implementation are through appropriated environmental conservation funds. Annual appropriations can be variable based on the Defense appropriations. The ARA forestry and fish and wildlife funds are installation generated funds that are based on installation projected proceeds and tend to be less variable. ITAM funding is primarily project driven and determined by DoD priority based funding competition. Specific costs for each program and project are difficult to predict, especially considering that future events determine the extent of many programs. The estimates below are correct based on current knowledge. Annual costs are estimated by types of funding availability.

Forestry: $250,000 for forest management programs (Automatic Reimbursable Account Funds that fluctuates year to year, dependent on forest management activities)

Fish and Wildlife: $140,000 for fish and wildlife programs (Automatic Reimbursable Account variable each year)

Environmental Conservation Funds: $1,173,000 for FY16

Forest Reserve Account: Project submittal annual and variable. Thus, total annual funding levels (in FY 16 dollars) are $2,558,780.

COMMAND SUPPORT

Command support is essential to implementation of this INRMP. Many priority projects for natural resources management within the next 5 years require command support. The Garrison Commander is liable for non-compliance with environmental laws such as those affected by this INRMP. Thus, he has a vested interest in assuring that this plan is implemented.

This plan has the support of the Fort Knox Garrison Commander and other personnel in command positions that are essential to implementation of this INRMP. The command is dedicated to implementation of this plan as required by AR 200-1 and federal laws. Just as importantly, the command is dedicated to maintaining and improving the military mission at Fort Knox. Implementation of this plan is a means to that end.

APPENDIX C

COOPERATIVE PLAN AGREEMENT

BETWEEN THE

KENTUCKY DEPARTMENT OF FISH & WILDLIFE RESOURCES, FRANKFORT, KY,

U.S. FISH & WILDLIFE SERVICE, FRANKFORT, KY,

AND

U.S. ARMY GARRISON FORT KNOX, KY

1. PURPOSE. To provide a cooperative plan for the coordination, development, and maintenance of a fish and wildlife management program on the Fort Knox Military Reservation.

2. AUTHORITY. In accordance with the authority contained in TITLE 10, U.S. Code, Section 2671, Title 16, U.S. Code, Section 670, and in Public Law 86-797, the Department of Defense, the Department of Interior, and the Commonwealth of Kentucky, through their duly designated representatives whose signatures appear below, have approved the following cooperative plan for the protection, development, and management of fish and wildlife resources on the Fort Knox Military Reservation. Fort Knox is under predominantly exclusive federal jurisdiction.

3. AGREEMENT FOR TECHNICAL ADVICE AND ASSISTANCE. WHEREAS, there exists a need for the conservation, protection, and development of fish and wildlife resources on the Fort Knox Military Reservation, in keeping with the installation's objectives; and

WHEREAS, the scientific resources for planning and providing technical guidance for implementation of such plans are not otherwise readily available to the Army; and

WHEREAS, the Department of Fish and Wildlife Resources, Commonwealth of Kentucky and the U.S. Fish and Wildlife Service-Kentucky Field Office, Department of Interior, Frankfort, Kentucky are the recognized authorities in these fields and it has been determined to be in the best interest of the three parties concerned to enter into this cooperative endeavor;

NOW, therefore, for and in consideration of the promises and mutual covenants herein contained, the parties hereto do agree with each other as follows:

a. The U.S. Army Garrison Fort Knox will:

(1) Cooperate with the Kentucky Department of Fish and Wildlife Resources and the U.S. Fish and Wildlife Service-Kentucky Field Office on matters relating to endangered species, migratory birds, and fish and wildlife management and research.

(2) Permit full access to the installation by designated employees of the Kentucky Department of Fish and Wildlife Resources and the U.S. Fish and Wildlife Service, within established safety and security requirements, to effect measures relating to management and conservation of fish and wildlife resources.

(3) Consider recommendations for fish and wildlife management made by the Kentucky Department of Fish and Wildlife Resources and the U.S. Fish and Wildlife Service and adopt them, subject to and consistent with the military mission, safety concerns, and within manpower and funding limitations.

(4) Permit hunting and fishing on the installation by the general public within manageable quotas, subject to safety, training, and security requirements and accepted fish and wildlife management practices.

(5) Require and enforce provisions for sportsmen to have the appropriate state and/or federal hunting and fishing licenses and permits prior to hunting or fishing on the reservation and that all hunting and fishing on the installation be in accordance with established fish and wildlife laws of the state and federal government.

(6) Arrange annual meeting between all parties.

b. The Kentucky Department of Fish and Wildlife Resources will:

(1) Assist in the preparation of annual and long-range plans for the development of fish and wildlife resources in coordination with representatives from the U.S. Fish and Wildlife Service.

(2) Determine the need and means of accomplishing restoration or restocking of desired wildlife species.

(3) Provide technical assistance in conducting wildlife surveys and wildlife management activities.

(4) Within manpower limits provide personnel to assist in the operation of deer check stations and collection of pertinent data during the annual deer hunt to the extent necessary for obtaining an adequate sample of deer condition parameters.

(5) In conjunction with the Director of Emergency Services, agents from the U.S. Fish and Wildlife Service and Kentucky Law Enforcement Conservation Officers may assist in the enforcement of requirements that all hunting and fishing on the installation be in accordance with established fish and wildlife laws of the state and federal government.

c. The U.S. Fish and Wildlife Service will:

(1) Provide assistance, within funding and personnel limitations, on a cost-reimbursable or non-reimbursable basis as follows:

(a) Cost-Reimbursable activities - All technical wildlife and fisheries assistance and law enforcement training provided by the Fish and Wildlife Service will be on a cost-reimbursable basis. Reimbursement, by Fort Knox, will be made by means of a Military Interdepartmental Purchase Request (MIPR).

(b) Nonreimbursable activities - Law enforcement assistance (excluding training); activities required of the Fish and Wildlife Service by the Endangered Species Act, in particular Section 7 consultations or reviews associated with the National Environmental Policy Act and other federal laws; limited participation in annual military fish and wildlife planning meetings; and the coordination of assistance from the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, for the purpose of reducing animal damage control problems.

4. ENDANGERED SPECIES. A threatened and endangered species inventory was conducted on Fort Knox during 2004-2005; a list of threatened and endangered species occurring on Fort Knox is attached at Appendix 1. A mussel survey was conducted on portions of the Salt and Rolling Fork Rivers on Fort Knox in 2010-2011 and no extant species of threatened or endangered mussels were found. Fort Knox has an Integrated Natural Resources Management Plan that outlines management activities and protections for the threatened northern long-eared bat and endangered Indiana and gray bat, and will make every effort to fully protect and manage for current, and future, threatened and endangered species and their habitats on Fort Knox. Fort Knox will cooperate with the U.S. Fish and Wildlife Service and the Kentucky Department of Fish and Wildlife Resources in the surveying and management of these species.

5. HARVESTING OF FISH AND WILDLIFE RESOURCES. Fort Knox comprises approximately 109,000 acres and is used intensively throughout the year for military training. Approximately 101,000 acres of the installation are classified as training, range, or impact areas and are available for maneuver and live-fire training. There are 34,880 acres designated as restricted areas and are off-limits for recreational use. The harvesting of fish and wildlife resources on Fort Knox must, therefore, be limited and controlled in strict accordance with the requirements for adequate safety precautions, range entry procedures and restrictions, accepted fish and wildlife management practices, and Fort Knox Regulation 200-3 (*Fort Knox Hunting and Fishing Regulations and Procedures*). Participation by the general public in the harvest of fish and wildlife on the military reservation must, therefore, be limited and subjected to the safety and military security requirements as provided for in Fort Knox Regulation 200-3.

6. PERMITS. In addition to the appropriate state licenses and permits, special Fort Knox hunting and fishing permits will be issued. Persons eligible for issuance of hunting and fishing permits may be issued such permits in accordance with the provisions in Fort Knox Regulation 200-3, Fort Knox Hunting and Fishing Guidelines, and within manageable quotas.

7. FEES. The fish and wildlife management program on Fort Knox is supported primarily by fees collected from the sales of hunting and fishing permits. The fees charged for each type of permit will be approved by the Garrison Commander, or his designated representative. Fees collected under this authority are kept separate from other funds and are utilized only on Fort Knox in support of the fish and wildlife management program and for no other purpose. Accounting for collections and disbursements of such funds will be in accordance with Army Regulation 37-108 under the accounting classification published in AR 37-102.

8. INTRODUCTION OF NEW SPECIES. In compliance with AR 200-1, paragraph 4-3, this installation has introduced triploid grass carp as a biological control of excessive aquatic

vegetation. In accordance with Executive Order 13112, Fort Knox will not carry out any actions that it believes are likely to cause or promote the introduction or spread of invasive species.

9. WILDLIFE RESOURCES. Approximately 67,000 acres of the installation are available for wildlife management. The available land will be managed and utilized for fish and wildlife management and outdoor recreation within the constraints of safety and the training mission.

10. ALL TERRAIN VEHICLES (ATVs). The use of ATVs on Fort Knox is not authorized, except by:

(a) Hunters that possess a Vehicle Methods Exemption Card and whose physical disabilities preclude them from hunting by conventional means or,

(b) An employee, agent, or designated representative of the federal government or one of its contractors in the course of their employment, agency, or representation.

11. ANNUAL MEETING. An annual meeting will be held by Fort Knox officials, representatives of the Kentucky Department of Fish and Wildlife Resources, and the U.S. Fish and Wildlife Service to discuss updating fish and wildlife management plans for the upcoming year and to review accomplishments of the past year.

12. ADOPTION. This cooperative plan will be in full force and effect as of the date shown below when approved by the individuals designated as representatives of the parties hereto.

This agreement is subject to later amendment or revision as may be agreed upon by all parties represented. A request for such amendment or revision may be originated by any one of the parties concerned.

U.S. Fish and Wildlife Service,
Department of Interior:

Virgil Lee Andrews, Jr.
Field Supervisor
Kentucky Field Office

Date: 6/4/18

Department of Fish and Wildlife Resources,
Commonwealth of Kentucky:

Frank Jemley, III
Interim Commissioner

Date: 5/23/18

U.S. Army Garrison,
Fort Knox, KY:

Patrick N. Kaune
Colonel
Garrison Commander

Date: 25 JUNE 2018

APPENDIX 1.

Known threatened, endangered, and species of concern at Fort Knox as of June 2018.

Scientific Name	Common Name	Federal Status	State Status
Myotis grisescens	gray bat	endangered	threatened
Myotis sodalis	Indiana bat	endangered	endangered
Myotis septentrionalis	northern long-eared bat	threatened	endangered
Nycticeius humeralis	evening bat		special concern
Haliaeetus leucocephalus	bald eagle		threatened
Accipiter striatus	sharp-shinned hawk		special concern
Ammadramus henslowii	Henslow's sparrow		special concern
Dendroica cerulea	cerulean warbler		
Amblyopsis spelaea	northern cavefish		special concern
Orconectes inermis	cave crayfish		special concern
Hyla versicolor	gray treefrog		special concern
Heteranthera limosa	blue mud-plantain		special concern
Sedum telephioides	Allegheny stonecrop		threatened
Silphium laciniatum	compass plant		threatened
Spiranthes magnicamporum	Great Plains ladies'-tresses		threatened
Viola septemloba var. *egglestonii*	Eggleston's violet		special concern
Juglans cinerea	white walnut		special concern

APPENDIX D

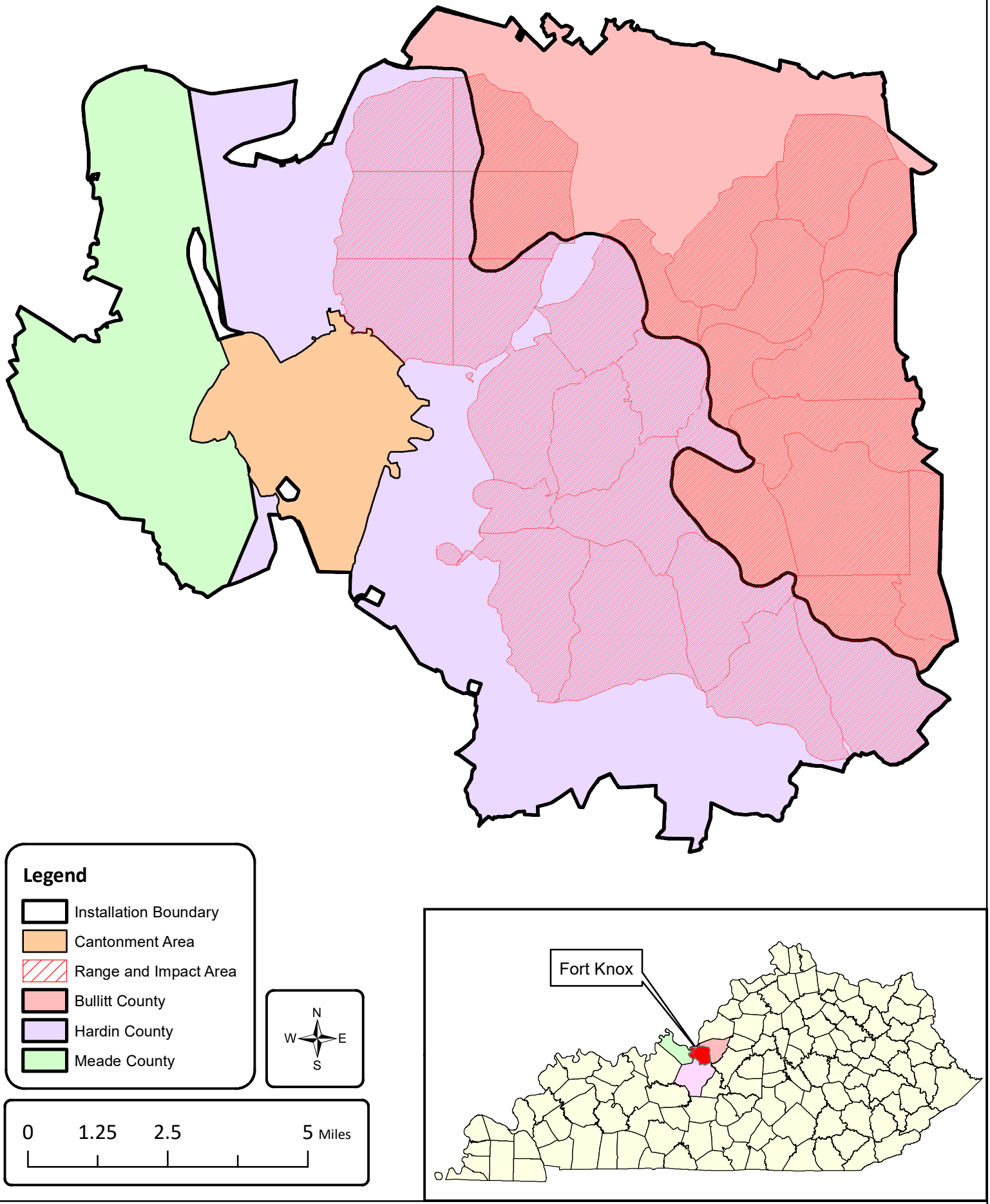

Figure 1. Location of Fort Knox, Kentucky.

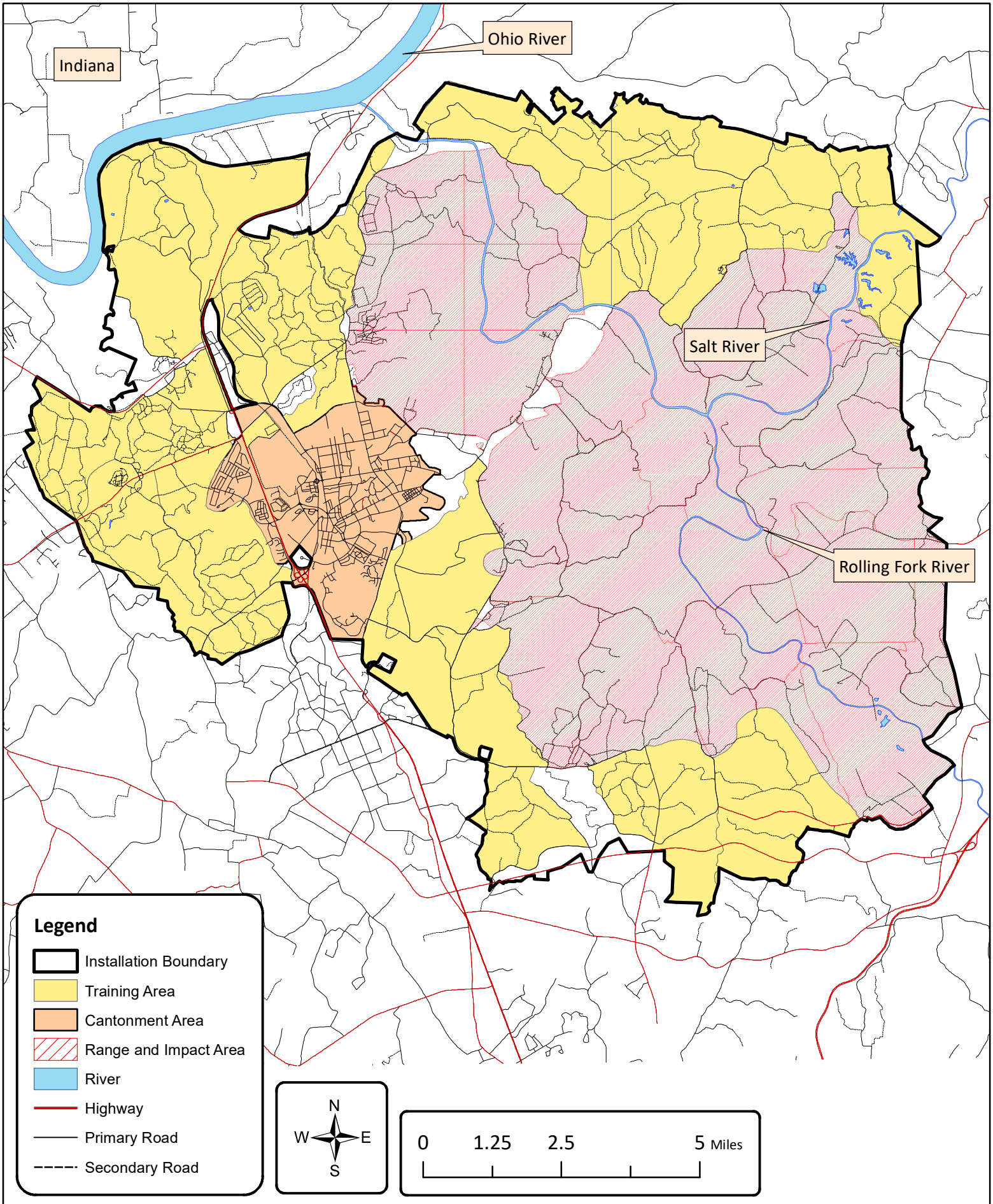

Figure 2. General Installation Features.

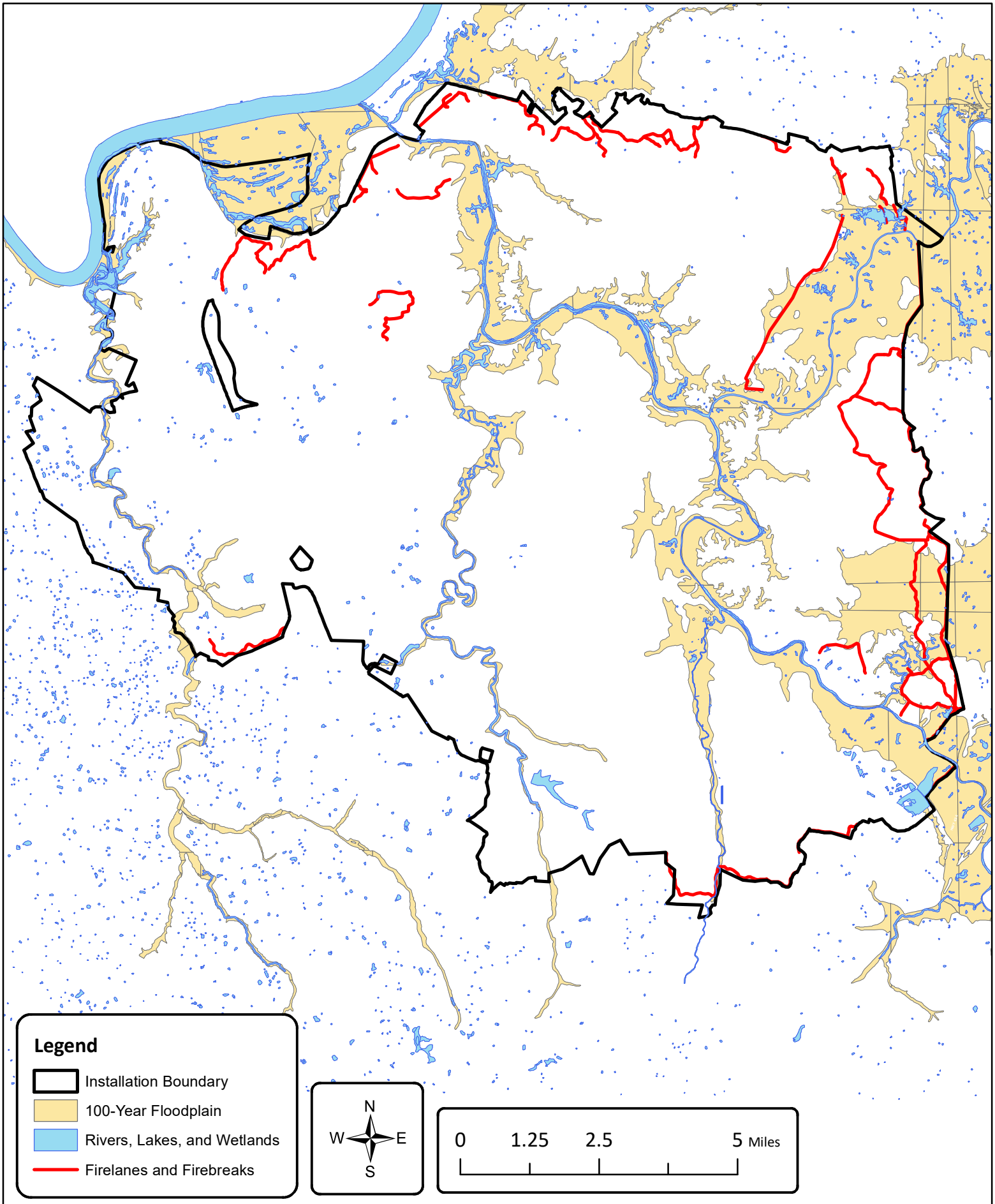

Figure 3. 100-Year Floodplain, Water Resources, Firelanes, and Firebreaks.

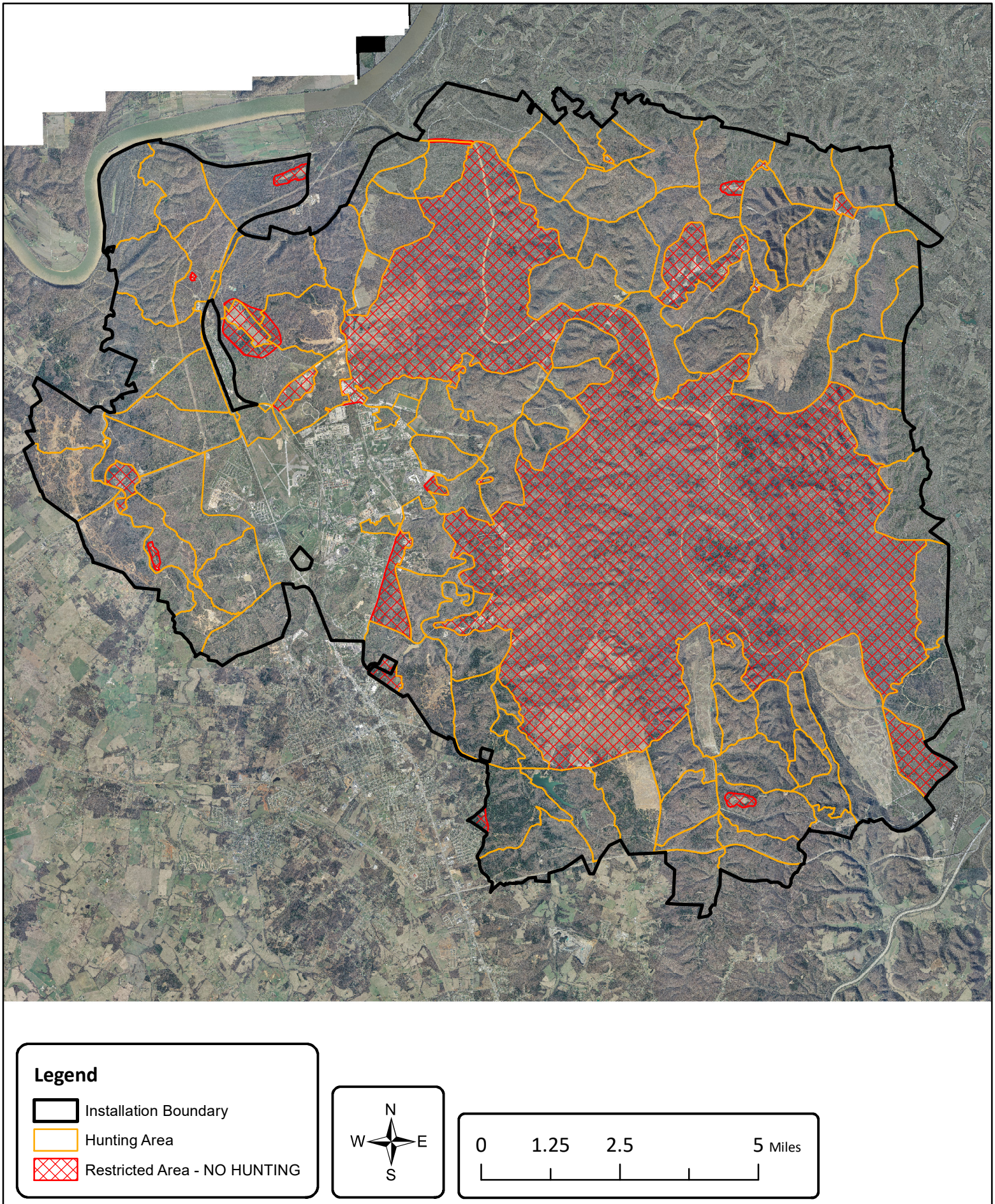

Figure 4. Fort Knox Hunting Areas.

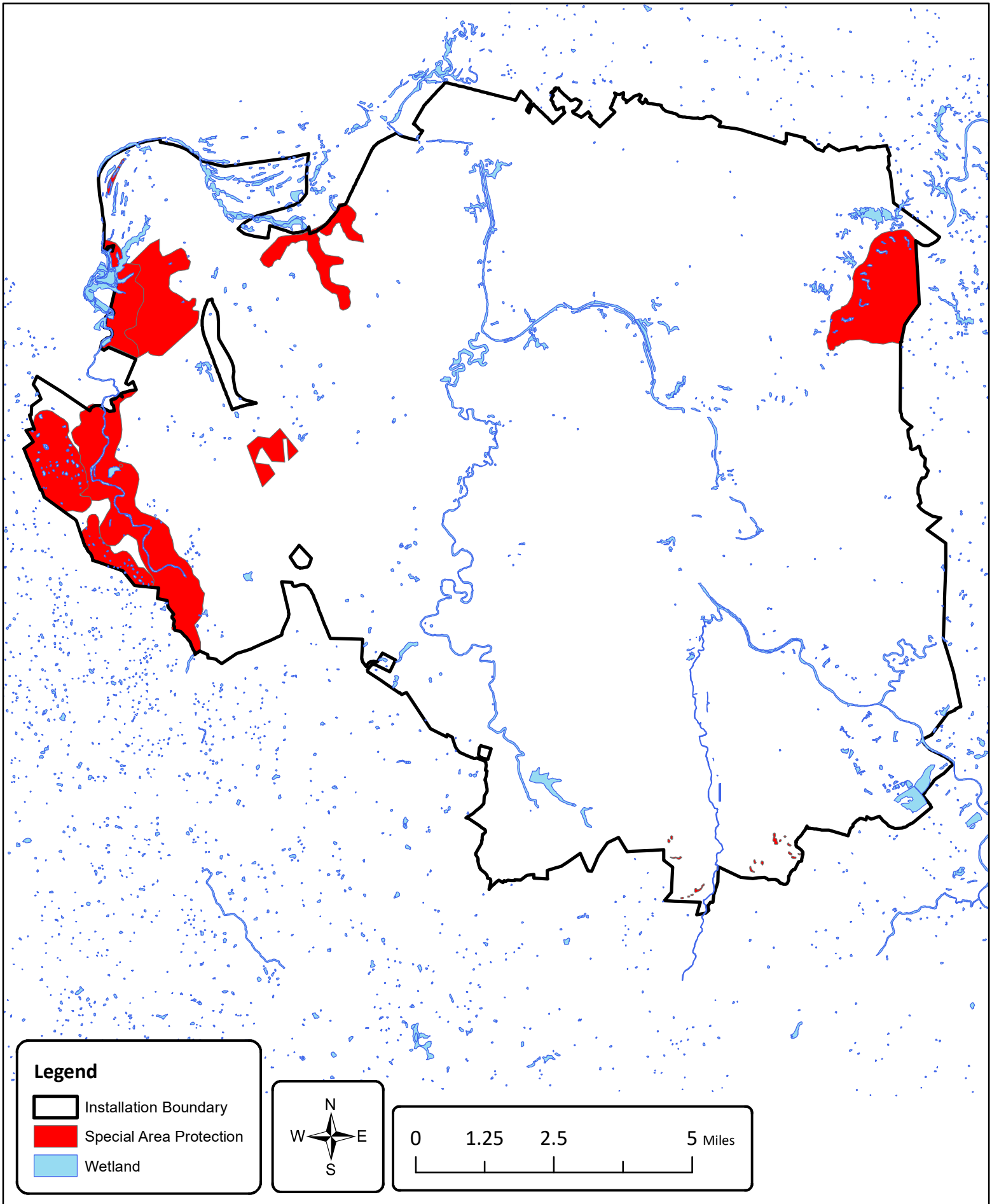

Figure 5. Special Area Protection.

APPENDIX E

FINAL

INTEGRATED PEST MANAGEMENT PLAN

FOR

FORT KNOX, KENTUCKY

November 2016

INTEGRATED PEST MANAGEMENT PLAN FOR FORT KNOX

Prepared by: CPT Tosha Nichols, Environmental Science Engineering Officer, Environmental Management Division, Fort Knox

Reviewed by:	Signature	Date
Mr. Michael Brandenburg Chief, Natural Resources Branch Fort Knox, Kentucky	BRANDENBURG.MICHAEL.G.1230569386 Digitally signed by BRANDENBURG.MICHAEL.G.1230569386 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=BRANDENBURG.MICHAEL.G.1230569386 Date: 2016.10.18 16:21:04 -04'00'	18 October 16
Gildelbrandt Martinez, 1LT Chief, Environmental Health Services Ireland Army Community Hospital	MARTINEZ.GILDELBRANDT.III.1183106933 Digitally signed by MARTINEZ.GILDELBRANDT.III.1183106933 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MARTINEZ.GILDELBRANDT.III.1183106933 Date: 2016.10.19 12:48:25 -04'00'	19 October 16
Mr. Patrick A. Walsh Director, Public Works Fort Knox, Kentucky		NOV 10 2016

Technical Approval by:

Dr. William Miller Army Environmental Center Joint Base San Antonio, TX	MILLER.WILLIAM.BOYD.1127207808 Digitally signed by MILLER.WILLIAM.BOYD.1127207808 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MILLER.WILLIAM.BOYD.1127207808 Date: 2016.10.20 07:32:08 -05'00'	20 October 16

Approved by:

Stephen K. Aiton, COL Garrison Commander Fort Knox, KY		15 NOV 16

INTEGRATED PEST MANAGEMENT PLAN
FOR
FORT KNOX, KENTUCKY

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APPENDICES

EXECUTIVE SUMMARY

SITE. Fort Knox's primary military mission is to develop leaders and train soldiers for the armed forces. Officers and enlisted personnel are trained and equipped to ensure assigned combat readiness posture. The Center controls, coordinates, and prepares administrative and logistical support plans for mobilization forces and missions. Fort Knox provides training, administrative and logistics facilities, and support as required for United States Army Reserve units, Army National Guard units, and Reserve Officers' Training Corps (ROTC) activities within the assigned geographical area.

SCOPE. The contents of this Integrated Pest Management Plan (IPMP) apply to all activities and individuals working, residing, or otherwise doing business on Fort Knox.

OVERVIEW. Federal Agencies are mandated by Public Law (Section 136 r-l of title 7, United States Code) to use Integrated Pest Management (IPM). This IPMP for Fort Knox describes past and anticipated pests and outlines the resources necessary for surveillance and control of these pests including any administrative, safety, or environmental requirements. The program uses certified Government and contract pest management technicians to control pests.

RESPONSIBILITIES. The Fort Knox Pest Management Coordinator (PMC) oversees the program. Pest prevention, through good sanitation practices, is the responsibility of all individuals that occupy or maintain buildings or open spaces on the installation. Pest management personnel will follow the Integrated Pest Management Outlines located in Appendix A of this document. Before any pesticides are applied, non-chemical control efforts will be used to the maximum extent possible. At no time will pest management operations be done in a manner that may cause harm to personnel or the environment.

IMPACT. Without an IPM program for Fort Knox, pests can interfere with the military mission, lower morale, damage real property, increase maintenance costs, and potentially expose installation personnel to disease.

PEST MANAGEMENT COMPONENTS. Major aspects of the pest management program are addressed in the plan and deal specifically with administration, pest surveillance, storage and handling locations of pesticides, and pest control are addressed in the plan.

MAINTENANCE. This plan is a working document that is updated annually. Please send comments or suggested changes to:

Pest Management Coordinator (Acting):	**Mr. Michael Brandenburg**
Mailing Address:	**Environmental Management Division, Building 9297 4916 Wilson Rd, Fort Knox, KY 40121**
Office Phone Number:	**502-624-7368**
FAX Number:	**502-624-1868**
Email Address:	**Michael.G.Brandenburg2.civ@mail.mil**

1 BACKGROUND

1.1 PURPOSE

Integrated Pest Management (IPM) is a sustainable approach to managing pests by combining biological, cultural, physical, mechanical, and chemical tools in a way that minimizes economic, health, and environmental risks. This plan is a framework through which an IPM program is defined and accomplished on the installation. It describes program elements including health and environmental safety; pest identification; pest management methodologies; and pesticide storage, transportation, use and disposal. This Integrated Pest Management Plan (IPMP) is a guide to reduce reliance on pesticides, to enhance environmental protection, and to maximize the use of integrated pest management techniques. It reflects current Department of Defense (DoD)/Army policies, procedures and standards and incorporates the requirements of the Environmental Protection Agency (EPA), and the State of Kentucky.

1.2 AUTHORITY

This IPMP is written under the authority of:

a. Section 136 et seq. of title 7, United State Code, *Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) as amended.*

b. DOD Instruction 4150-7, *DOD Pest Management Program*, 29 May 2008.

c. AR 200-1, Environmental Protection and Enhancement, 13 December 2007

1.3 PLAN MAINTENANCE

The Fort Knox Pest Management Coordinator (PMC) maintains this IPMP. While pen and ink changes are made to this plan throughout the fiscal year, this plan is reviewed and updated annually to reflect all changes made in the pest management program during each fiscal year. The Annual Plan Update Form (PUF; Appendix B) is recommended for use by the Army Environmental Command (AEC) to help streamline the plan update process, but is not mandated. Annual updates of this plan are sent to the AEC Pest Management Consultant (AEC-PMC) not later than 30 October of each year by the PMC. Annual updates to the plan should be submitted using the AEC website.

2 RESPONSIBILITIES

2.1 GARRISON COMMANDER, US ARMY GARRISON – FORT KNOX

a. Designate an Installation Pest Management Coordinator (PMC) for all pest management activities.

b. Approve and support the pest management plan.

c. Ensure that all pest management operations are conducted safely and have minimal impact on the environment.

d. Ensure that installation personnel performing pest management functions receive adequate training and achieve pest management or Quality Assurance Evaluator (QAE) certification as required.

e. Provide adequate resources for the proper implementation of this plan.

2.2 DIRECTORATE OF PUBLIC WORKS (DPW)

a. Obtain and maintain adequate supplies of pesticides and pesticide application equipment.

b. Coordinate training and pest management certification for Fort Knox personnel performing pest management and ensure contractors performing pest management are properly trained and certified.

c. Maintain and forward records of pest management operations per guidance of the PMC.

d. Coordinate all pest management contracts through the PMC to ensure regulatory compliance.

2.3 DIRECTORATE OF PUBLIC WORKS, ENVIRONMENTAL MANAGEMENT DIVISION, FORT KNOX

a. Provide administrative liaison between the Pest Management Program and Fort Knox activities.

b. Assist the Pest Management Program in abiding by environmental requirements.

2.4 INSTALLATION *PEST MANAGEMENT COORDINATOR (PMC)*

a. Determine the pest management requirements for Fort Knox.

b. Annually update the IPMP.

c. Coordinate pest management activities between Fort Knox and AEC.

d. Gather pest management relevant information (e.g. pesticide use on the installation), report requested information to AEC on an annual basis (e.g. Pesticide Use Proposal; PUP), and provide answers to questions concerning pest management from AEC.

e. Submit all pest management contracts to AEC for review and approval.

f. Maintain current pest management coordinator training.

g. Ensure that installation and contractor personnel performing pest control are certified, as required.

h. Coordinate with local, State, and Federal agencies, as necessary, to conduct the installation's pest management program.

i. Maintain adequate records of pesticide application, contracts, and a list of all trained and certified personnel on the installation.

2.5 CONTRACTED AND NON-CONTRACTED PEST MANAGEMENT PERSONNEL

a. Use integrated pest management techniques to the maximum extent possible; as outlined in Appendix A of this document.

b. Control pests according to the provisions of this plan.

c. Operate pesticide applicators in a manner that minimizes risk of contamination to the environment and exposure to personnel.

d. Provide written records of pest surveillance and control efforts to the PMC.

e. Maintain State/DoD certification and provide written records of technician certification status annually or as changes in status occur to the PMC.

f. Coordinate with law enforcement and/or veterinary officials in handling suspicious wild or domestic animals on post.

2.6 CONTRACT OFFICER'S REPRESENTATIVE (COR) FOR PEST MANAGEMENT CONTRACTS

a. Coordinate with and supply documentation of pesticide usage to the PMC.

b. Oversee contract pest management operations to ensure specifications are met.

c. Ensure that pest management contract specifications refer to, or are based upon, specific IPM procedures detailed in Appendix A.

d. Modify pest management contract specifications if they do not to incorporate the latest, most effective and least toxic IPM methodologies, in coordination with the QAE and PMC.

e. Coordinate with the PMC to ensure that contractor applied pesticides have been approved and that they are detailed on the annual PUP. The PUP is located in the PMC's office (BLDG 9297).

2.7 QUALITY ASSURANCE EVALUATORS FOR PEST MANAGEMENT CONTRACTS (QAE)

a. Obtain training and certification in accordance with DoD Instruction 4150.7 and AR 200-1 for the appropriate pest categories.

b. Evaluate contract pest management operations to ensure contract specifications are met.

c. Evaluate the functions or tasks of the contract pest managers while in progress to ensure that effective integrated pest management services are being provided.

d. Monitor type, concentration, and application method of pesticides used by contractor.

e. Notify COR and PMC of changes needed or deviations observed regarding pest management operations.

f. Monitor pest management contract operations for compliance with health, safety, and environmental standards.

g. Document results of the evaluation criteria for contract pest management operations.

2.8 FORT KNOX TENANTS

a. Coordinate with the PMC regarding any planned pest management services or contracts.

b. Abide by the principles of the Fort Knox IPMP, ensuring that personnel conducting pest management are certified to transport, handle, and apply pesticides in a safe manner.

2.9 BUILDING OCCUPANTS

a. Apply good sanitary practices to prevent pest infestations.

b. Use practical nonchemical pest management techniques prior to requesting assistance from DPW.

c. Cooperate with DPW personnel and contractors in scheduling pest management operations, including preparing the areas to be treated.

2.10 INSTALLATION SAFETY OFFICE

a. Provide safety and occupational health guidance to pest management personnel.

b. Coordinate HAZCOM, DOT, and other training as appropriate for pest management personnel.

c. Evaluate the pest management operations adherence to safety and occupational health standards.

d. Provide respirator fit testing to DoD certified pesticide applicators.

2.11 ENVIRONMENTAL HEALTH SERVICES

a. Conduct surveillance for pests which could adversely affect the health and welfare of installation occupants and report results to appropriate parties.

b. Coordinate with local health officials to determine the prevalence of disease.

c. Evaluate the health aspects of the pest management program.

d. Document results of all evaluations and health inspections; provide a copy to PMC and appropriate service managers.

3 INTEGRATED PEST MANAGEMENT PLAN (IPM)

3.1 LEGAL MANDATE

Federal Agencies are mandated by Public Law to use Integrated Pest Management (IPM). IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks. The AEC is committed to IPM at its facilities and installations as the best approach to control pests and reduce pesticide reliance and resistance.

3.2 IPM OPERATIONS

Although IPM emphasizes the use of non-chemical strategies, chemical control may be an option when used in conjunction with other methods. The IPM Outlines (Appendix A) describe methods for detecting, monitoring, and controlling specific pests. The annual Pesticide Use Proposal (PUP) lists all the pesticides Fort Knox intends to use during the upcoming calendar year. It is a working document and can be reviewed at any time by contacting the PMC. The PUP will include pesticide names, active ingredients and percentages, EPA registration numbers, label signal words, target pests, and intended sites. Department of Defense (DoD) policy mandates that professional pest management personnel approve all pesticides applied to DoD installations. New pesticides lists will be submitted through the PMC and/or AEC or appointee for approval before application.

4 PEST MANAGEMENT PRIORITIES

4.1 PUBLIC HEALTH PESTS

Mosquitoes. While mosquitoes are potentially medically important pests, their impact on Fort Knox has been minimal to date. Over twenty different mosquito species are found on Fort

Knox. Several mosquito species found have the potential to transmit several diseases including Eastern Equine Encephalitis, St. Louis Encephalitis, and West Nile Virus. Fort Knox is known to have *Aedes albopictus* mosquitoes, which could possibly transmit the Zika Virus. Appendix G of this document outlines mosquito surveillance, testing, and control.

Ticks. Ticks and tick-borne diseases are well documented on Fort Knox. The important tick species include the Black-legged tick (*Ixodes scapularis*) which can carry Lyme disease and Human Ehrlichiosis, and the American dog tick (*Dermacentor variabilis*) which can transmit Rocky Mountain spotted fever. The most prevalent tick species is the Lone Star tick (*Amblyomma americanum*), which can carry Human Monocytic Ehrlichiosis and Rocky Mountain spotted fever. Preventive and protective measures are stressed though public education by the Fort Knox medical personnel, primarily through Environmental Health Services. During the summer months, surveillance efforts are made to monitor tick populations. Only when significant populations occur should treatments be made. The use of non-chemical control measures such as consistent mowing and habitat reduction can significantly reduce tick populations.

Bees and Wasps. Bees and wasps are found throughout Fort Knox. The stings are painful and can illicit serious allergic responses in some individuals. These insects are most prevalent during late summer and fall at Fort Knox. Treatment for bees and wasps is accomplished through contractors and/or self-help efforts.

Filth Flies. Filth flies have created problems during the warm months in the past. Most are directly related to sanitation deficiencies.

Spiders. Spiders can be found in undisturbed places, outdoor storage areas, below-grade utility access, and in and around other buildings and structures. The Brown recluse spider (*Loxosceles recluse*) is native to the area, however, it and other venomous spiders having medical importance are rare, so other potential sources of alleged “spider bite” wounds such as ring worm or community-acquired methicillin-resistant *Staphylococcus aureus* (MRSA) should be considered. Medical attention should be sought following any suspected spider bite. Spiders are controlled by sanitation, physical exclusion, and reducing their food source (other insects).

Fleas. Fleas are also medically important because they serve as vectors of disease and act as intermediate hosts of certain tapeworms that may be parasitic to humans. Fleas can be annoying to humans due to their blood sucking habits, which may produce dermatitis (inflammation of the skin) in hypersensitive individuals.

Commensal rodents. Mice and rat populations are of concern due to their potential for harboring disease and causing damage to both facility structures and their contents. There are a number of diseases that can be transmitted to humans through rodent activity. These include, but are not limited to: Plague, Leptospirosis, Salmonellosis, Lymphocytic Choriomeningitis, Rickettsial Pox, Rat Bite Fever, Tapeworms, Tetanus, and Hantavirus. Most of these diseases are transmitted to humans via rodent bites or through contact with surfaces, soils, water, or food contaminated with infected rodent feces and/or urine.

4.2 STRUCTURAL PESTS

Termites. Subterranean termites may cause damage to wooden buildings and other structures on the installation. Surveys of wooden structures and treatment, when termites are found, have kept damage to a minimum. All new construction will meet Corps of Engineer design standards for termite pre-treatment. Carpenter ants and carpenter bees also invade wooden structures, particularly where wet conditions exist.

Commensal rodents. Mice commonly damage buildings or structures as a result of their attempts to gain entry, reach stored foods, or create a nest or den. Their efforts often result in widened openings where pipes or wires pass through exterior walls. Within buildings, rats and mice will enlarge existing openings or create new ones in walls, doors, cabinetry, and furniture. Mice frequently nest around stationary electrical appliances, damaging wires and affecting appliance performance. Odors from feces and urine are generally offensive to most people, as is any destruction of personal property. Rodent control is periodically required in and around the various buildings located on site.

4.3 STORED PRODUCT PESTS

Food items stored in food service locations, the Post Exchange and Commissary, and other areas may become infested by stored products pests. Occasional complaints are received from family housing residents, but insect infestations usually originate in the home. “First in, first out” rotation procedures for infestible commodities which have been instituted have substantially reduced the probability that goods become infested while in storage at Fort Knox. However, some goods may be pre-infested at the production source. These include: saw-toothed grain beetles, red flour beetles, carpet beetles and other dermestids. Warehouse invaders such as raccoons, rats, mice, and pest birds can also have economic and health impacts.

4.4 ORNAMENTAL PLANT AND TURF PESTS

Trees and shrubs on Fort Knox can be infested by various insect pests, resulting in damage or destruction of the plants. Tent caterpillar populations cyclically increase to levels that have caused tree defoliation in the past. Hemlock Woolly Adelgids are present in Kentucky and may present a problem on Fort Knox. Pests which damage lawns and recreational grass areas (ball field) do cause damage and require continuing surveillance and control.

4.5 UNDESIREABLE VEGETATION

Weeds along fence lines, on road shoulders, on paved surfaces, along decorative perimeter walls, and on turf associated with the lawns of the Fort Knox and the family housing areas require control using appropriate herbicides. Some control of unwanted plants is done mechanically (e.g., mowing, string trimmers). Several noxious weeds and exotic invasive plants are found on Fort Knox requiring control measures when problems are identified and resources available. A list of noxious weeds in Kentucky may be found at the United States Department of Agriculture: Natural Resources Conservation Service website (Reference 10.8.b)

4.6 VERTEBRATE PESTS

Stray dogs and cats are occasionally reported at Fort Knox. Stray animal control is accomplished by Knox Hills LLC or the Provost Marshal. Appendix E is the Directorate of Emergency Services Annex 52: Standing Operating Procedure (SOP) #54 Small Animal Control. This SOP outlines the procedures and responsibilities for the Desk/Patrols regarding pest control on Fort Knox. Appendix F is the Memorandum of Agreement (MOA) (Stray Animals) between Knox Hills LLC and Hardin County, Kentucky. Knox Hill LLC is responsible for the transportation of any stray, or abandoned dogs or cats to a designated Hardin County Animal Shelter. The MOA outlines the responsibilities of both parties.

As mentioned above, raccoons can cause damage to stored food products and occasionally invade offices and barracks. When vertebrate pests infest a structure exclusionary efforts should be made to prevent future infestations. When animals enter a structure, live traps are used to capture and remove the animal for relocation to a natural area on the installation.

Nuisance birds do exist at Fort Knox. Pigeons, starlings, and house sparrows roost under building eves and around areas where food is an attractant. Barn swallows nesting in building entry ways are a continuing problem. Exclusionary tactics are made to keep bird pests from infesting structures.

4.7 HOUSEHOLD AND NUISANCE PESTS

Crawling insects (e.g., ants, cockroaches, crickets, ground beetles, earwigs, centipedes, millipedes, and silverfish) and spiders may require control in billets, family housing, food service facilities, warehouses, and offices. The pests in this category constitute minor pest problems on the installation. Proper sanitation and housekeeping will do much to discourage these pests.

4.8 QUARANTINE PESTS

Emerald Ash Borer (*Agrilus planipennis*) is a potential quarantine pest. Currently it is quarantined for the majority of New England states and has been identified in several counties in Northern Kentucky. This pest is the cause of widespread ash (*Fraxinus* spp.) tree decline and mortality. Hemlock Woolly Adelgid (*Adelges tsugae)* is also a potential quarantine pest for Fort Knox. Currently Active populations have been observed in the southeastern portion of Kentucky. This pest is a small, aphidlike insect that threatens the health and sustainability of eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*Tsuga caroliniana*) in the Eastern United States.

4.9 OTHER PEST MANAGEMENT REQUIREMENTS

Provost Marshall or DPW Personnel are responsible for large animal carcass removal. Removal of small animal carcasses in the Knox Hills housing areas is the responsibility of Knox Hills Maintenance. The carcass will be either taken to the Kentucky Board of Health if being tested for pathogens or properly disposed of.

5 HEALTH AND SAFETY

5.1 MEDICAL SURVEILLANCE OF PEST MANAGEMENT PERSONNEL

Medical surveillance for Fort Knox golf course and Natural Resource Branch pesticide applicator personnel is coordinated by the Fort Knox Safety Office Industrial Hygienist, and provided by the Ireland Army Community Hospital. Medical surveillance for Fort Knox personnel includes a physical examination and various tests to determine suitability for pesticide application and to monitor exposure to pesticides. Rabies prophylaxis is provided to employees with potential occupational exposure. Personnel that require respirators are monitored under the respiratory protection program and a respirator fit test is administered. Medical surveillance of contracted pest management personnel is the responsibility of their employer. Pest management contracts specify this requirement and provide minimum standards of acceptance for operators on Fort Knox.

5.2 HAZARD COMMUNICATION

All Fort Knox pest control personnel shall be provided access to all appropriate health and safety information pertaining to pesticide use at the installation. The following items are made available for use and review at the Directorate of Public Works: Fort Knox Integrated Pest Management Plan, copy of Fort Knox Hazard Communication Program, copies of all labels and Material Safety Data Sheets (MSDS)/ Safety Data Sheets (SDS) of pesticides currently used at the installation.

Installation pest management personnel are given hazard communication training, including hazardous materials in the workplace. Following initial hazard communication classes, additional training is given to new employees or when new hazardous materials are introduced into the workplace. Material Safety Data Sheets/ Safety Data Sheets for all pesticides and other toxic substances used in the pest management program can be found in the PMC office. Additionally, labels and MSDS/SDS's are kept in each facility where pesticides are stored or handled. Copies of labels and MSDS/SDS's are to be kept on each pest control vehicle (including contractors) for pesticides used that day and with all other organizations involved in the process of hazard communication.

5.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Approved masks, respirators, chemical resistant gloves and boots, and protective clothing, will be worn by all personnel exposed to pesticides in accordance with the requirements set forth in the Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR 162), Occupational Safety and Health Administration Standards (29 CFR 1910), DoD Directive 4150.7, Army Regulation 200-1, and individual pesticide labels. Pest management contractors are to provide all employees with required PPE. Any contaminated items are to be disposed of according to the contaminants label. Due to the awareness of human disease risks that can be associated with rodents and rodent waste (hantaviruses; hantavirus pulmonary syndrome), emphasis is placed on using the appropriate respiratory protection, specifically N95 rated filter cartridges, when pest management is necessary in enclosed areas that may be rodent infested. Additional protective

measures are followed (e.g., using disposable gloves while disposing of trapped rodents, disinfection measures).

5.4 PEST MANAGEMENT VEHICLES

Pest Control Operators on Fort Knox will comply with Kentucky and EPA regulations regarding marking and placarding of vehicles. Government vehicles used for transporting materials to and from job sites are not required to be placarded unless the quantity of pesticide concentration(s) exceed 55 gallons. Currently this quantity is not used, however, in such cases appropriate placards will be utilized. To avoid damage to pesticide containers and prevent spillage, all chemicals are secured within the storage compartments. At no time will pesticides be left unsecured or in an unattended vehicle. Pesticides or contaminated equipment are never transported in the passenger compartment of any vehicle. Every vehicle will be equipped with a portable eye lavage, spill kit, product MSDS, label, and two-way mobile communications are carried in each vehicle when in use. Under no circumstances are these vehicles used for any purpose other than pest management. These vehicles are identified as being pesticide contaminated. Any contractor pest management vehicles used on post will follow the same procedures as stated above.

5.5 TRANSPORTING PESTICIDES

Any personnel transporting bulk pesticides off post must complete training a 16 hour Department of Transportation level VIIB class on the transport of regulated hazardous materials. All safety precautions should be taken when pesticide vehicles are in motion, regardless of location.

5.6 MATERIAL DATA SAFETY SHEETS/ SAFETY DATA SHEETS

Material Safety Data Sheets (MSDS)/ Safety Data Sheets (SDS) for all pesticides and other toxic substances used in the pest management program can be found in the pest management office in Building 9297. All employees have continuous access to the MSDS/SDS's. Personnel who work with these chemicals are informed of the potential hazards and trained in the use of personal protective equipment. Additionally, MSDS/SDS's are kept in BLDG 117 and 4011 where pesticides are stored.

5.7 PROTECTION OF THE PUBLIC

Precautions are taken during pesticide application to protect the public, on and off the installation. Pesticides are not applied outdoors when the wind speed exceeds five miles per hour when spraying near sensitive areas such as housing, hospitals, and office buildings; otherwise label restrictions will dictate at what wind speeds a pesticide may be applied. Whenever pesticides are applied outdoors, care is taken to make sure that any spray drift is kept away from non-target areas and individuals, to include the applicator. Pesticide application indoors is accomplished by individuals wearing proper personal protective clothing and equipment. At no time are personnel permitted in a treatment area during pesticide application unless they have met the medical monitoring standards and are appropriately protected.

DOD Pest Management rules do not apply to persons living in Quarters they are assigned to and treating with over the counter products they have obtained for their own "relief". Persons that buy and utilize pesticide products are required to read, understand and follow the label. Most products have a statements that read "Apply this product only as specified on this label" and "It is a violation of Federal law to use this product in a manner inconsistent with its labeling." Certain products like foggers should be prohibited in multiplex type structure with regard to potentially exposing adjacent neighbors to hazardous materials. Occupants living in Quarters should read and understand their contract or resident guidelines as it pertains to the use of pesticides.

6 ENVIRONMENTAL CONSIDERATIONS

6.1 SENSITIVE AREAS

6.1.1 OUTDOOR

Several ball fields and playground areas are located on Fort Knox. Pesticides will not be used in or around these areas unless all other options have been exhausted and appropriate placarding will be posted regarding application and safe reentry times.

6.1.2 CHILD DEVELOPMENT CENTERS

Pesticides will not be used in or around the child development centers unless all other options have been exhausted, and/or with special permission from the Army Environmental Command. Consideration is being made to become IPM STAR certified by the IPM Institute of North America, or equivalent, should a certifying program become established within the DoD.

6.1.3 HEALTH CARE FACILITIES

Pesticides applied in patient areas of the hospital are used in strict conformance with the pesticide label.

6.2 ENDANGERED/PROTECTED SPECIES AND CRITICAL HABITATS

Fort Knox and the immediate surroundings provide suitable habitat for certain endangered species, species that are candidates for federal T&E listing, state threatened and state species of special concern.

Protected migratory birds which occur on Fort Knox facilities cannot be controlled without a permit. The PMC periodically evaluates ongoing pest control operations and will evaluate all new pest management operations to ensure compliance with the Endangered Species Act and Migratory Bird Treaty Act. No pest management operations will be conducted that are likely to have a negative impact on endangered or protected species or their habitats without prior approval from the Fort Knox DPW Environmental Management Division and the U.S. Fish and Wildlife Service (USFWS). The Fort Knox installation habitats have been inventoried for rare, threatened, or endangered species. An Integrated Natural Resources Management Plan and Endangered Species Management Plans have been prepared for the installation. Endangered

Species Management Plans have been prepared for the gray bat, Indiana bat, northern cavefish, cave crayfish, Bald Eagle, Henslow's sparrow, and the cerulean warbler. When outdoor pesticide applications are planned in unimproved/wilderness areas, the Natural Resources Branch of the DPW Environmental Management Division is consulted for information on potential impact on any endangered or protected species and habitat. In turn, USFWS, and the Kentucky Department of Fish and Wildlife Resources are consulted whenever a proposed pest management activity could potentially be detrimental to protected, rare, threatened, or endangered species or environmentally sensitive or critical areas.

6.3 ENVIRONMENTAL DOCUMENTATION

In accordance with 32 CFR 651.10, an Environmental Assessment (EA) was prepared for the implementation of the Integrated Pest Management Plan dated 1 December 2005 and a finding of no significant impact signed by the Garrison Commander 17 March 2006. As there is no significant potential effects to the human and natural environment from the update of this plan, a Record of Environmental Consideration will be prepared.

6.4 PESTICIDE SPILLS AND REMEDIATION

Pesticide spill cleanup kits are maintained in the BLDG 117 pesticide storage facility, BLDG 116 mixing facility, BLDG 9297D mixing facility, Lindsey Golf Course BLDG 4011 mixing facility, and on pest management vehicles. Additional information on pesticide spills can be found in AFPMB TIM 15 (Reference 10.6.b). Any pesticide spill shall be reported to the Fort Knox Fire Department (phone: 624-6016/1876) and the Environmental Management Division (phone: 624-3629/4654).

6.5 POLLUTION CONTROL AND ABATEMENT PROJECTS

There are currently no pesticide related pollution control or abatement projects at Fort Knox.

6.6 PESTICIDE DISPOSITION

Improper or careless disposal of pesticides are common causes of pesticide misuse and environmental contamination. Consequently, many pesticides have specific disposal requirements imposed by federal, state, and DoD regulations, such as the Federal Resource Conservation and Recovery Act (RCRA) and Army Regulation AR 200-1. Disposal requirements are normally contained on the product label. Adherence to these requirements is the law. Following these procedures is the responsibility of all personnel applying or handling pesticides.

6.7 PROHIBITED ACTIVITIES

a. A pesticide will not be used in any manner that is inconsistent with its label.

b. Herbicides will not be used to control weeds at the child development centers or in areas where children play.

c. No pesticide will be used whose registration has been suspended or cancelled by the EPA or the Commonwealth of Kentucky.

d. Pesticide misuse, which includes use inconsistent with the label, is a violation of Federal Law. Fort Knox personnel will record and report any instances of pesticide misuse and falsification of records by contractors to the Commonwealth of Kentucky. Furthermore, Fort Knox personnel will cooperate with Kentucky regulators and the EPA in any subsequent investigation or actions.

6.8 PESTICIDE REDUCTION

Contracting pesticide applicators will employee IPM techniques and exhaust control measures with the least impact on the environment prior to application of pesticides. Following an IPM plan encourages a reduction in pesticide usage.

7 PROGRAM ADMINISTRATION

7.1 PEST MANAGEMENT OPERATIONS

Pest management operations are conducted IAW Appendix A (IPM Outlines) and the Pesticide Use Proposal (PUP).

Fort Knox pest management operations are performed from a mixture of DoD certified applicators and contracting companies. The following chart illustrates areas of responsibility and the corresponding service providers.

Area of Responsibility	Service Provider
NAF - Lindsey Golf Course	DoD certified applicator – Golf Course
Forestry/Wildlife	DoD certified applicator – Natural resources Branch
Garrison Cantonment	Various contractors
Fort Knox Schools	IPM Services/ staff applicators(herbicides)
Grounds/Ranges Herbicides	Source America
Family Housing	Various Contractors
Termite Pretreatments	Various contractors
Sewer Plant perimeter	Various Contractors

7.2 BLANKET PURCHASE AGREEMENTS (BPA)

Currently no Blanket Purchase Agreements for pest management related work are established. However, consideration is being made to change several existing contracts to BPA's.

7.3 CONTRACTOR REQUIREMENTS

Contractors who conduct pest control at Fort Knox must:

a. Show proof of liability insurance.

b. Comply with all components of the IPMP and Performance Work Statements (PWS).

c. Have a current Kentucky State commercial certification and licensing in the category or categories of work to be performed for each employee performing pest management operations.

d. Use only EPA and State registered pesticides.

e. Furnish Fort Knox PMC with legible copies of specimen labels and the MSDS/SDS of all pesticides proposed for use.

f. Furnish Fort Knox PMC sufficient information for pest management on DD Form 1532 or equivalent.

g. Apply Pesticides IAW label directions.

h. Follow sound IPM practices with an emphasis on pesticide reduction.

i. Comply with all Federal, State, and local regulations**.**

j. Mix, store, and dispose of pesticides IAW Federal, State, local regulations, and the provisions of this plan. Minimize need for disposal by reuse of pesticide rinsate.

7.4 INTERSERVICE SUPPORT AGREEMENTS (ISA) AND MEMORANDUMS OF AGREEMENT (MOA)

Fort Knox supports all organization and tenant activities on its property. ISAs and MOAs exist for this support.

7.5 AGRICULTURAL OUTLEASES

No agricultural out leases currently exist on Fort Knox properties.

7.6 TENANT ACTIVITY SUPPORT

Primary tenant activities supported by the Fort Knox pest management operation include the Post Exchange, medical clinic, ancillary food service locations, barracks dining, schools, and child development centers. Other minor tenants may be supported, as needed. It should be noted that in some cases tenants may contract pest management services without the knowledge of the PMC. Every effort will be made to prevent this and to ensure that all contract pest control services will abide by the Fort Knox IPMP and be monitored by the PMC.

7.7 MATERIALS AND EQUIPMENT

All pesticide stored on the installation will be processed thru the HAZMART, located at BLDG 2953, and stored in approved storage locations. Pesticides are ordered to maintain approximately a three (3) month supply, but not exceeding one year supply. Pesticides which

are required for use during a specific time of year are ordered in a timely manner to ensure effective application. Pesticides approved for use are updated annually and listed in PUP.

7.8 FACILITIES (MIXING AND STORAGE SITE)

All Fort Knox pesticides used by Natural Resources Branch are stored and mixed in BLDG 9297D storage/mixing rooms designed for this purpose with appropriate climate control, ventilation and spill containment. The GINN Group and Ft. Knox Schools pesticides are stored in BLDG 117. This building is a separate facility used only for pesticide storage. This facility is constructed of fire resistive materials, has continuous four-inch curbing to contain any spill, epoxy sealant coated floors, and a dedicated ventilation system. Pesticides are stored on non-absorbent shelving or pallets. Sufficient space is provided to allow a clear display of pesticide containers as well as spatial separation between pesticide classes. The Ginn Group and Ft Knox Schools pesticides are mixed in the BLDG 116 mixing facility. This facility has a sealed concrete floor and is outfitted with four-inch curbing and a spill containment reservoir to contain any spill. The room has separate, dedicated ventilation. BLDG 4011 is the storage/mixing facility for use by golf course personnel. These mixing facilities are designed to contain any spill and are equipped with backflow prevention devices to protect potable water sources. Indoor storage and mixing facilities are equipped with compliant ventilation systems. All pesticide storage and mixing facilities maintain a pesticide spill kit. These facilities meet the standards set forth in Military Handbook 1028/8A and the criteria described in 40 CFR 165.

7.9 REPORTS AND RECORDS

7.9.1 DAILY RECORDS

Daily pesticide application and surveillance records are maintained by the certified pest management professional using the Pest Management Maintenance Record (DD Form 1532-1 or equivalent). These forms provide a permanent historical record of pest management operations for each building, structure or outdoor site on the installation. Separate records of daily pest management operations are maintained by DCFA NAF, Integrated Pest Management Services, Inc., other contractors, and PVNTMED SVC personnel. These pesticide use records are forwarded electronically to the installation PMC in the DPW Natural Resources Branch on a monthly basis.

7.9.2 MONTHLY RECORDS

The monthly Pest Management Report (DD Form 1532) is used to summarize and report all pest management operations on the installation. These reports are prepared by the Fort Knox PMC. Completed Pest Management Reports are kept on file by the PMC in the DPW Natural Resources Office in BLDG 9297.

7.10 TRAINING AND CERTIFICATION

Government employees who apply or oversee the application of pesticides are DoD-certified for pesticide application. Certified personnel are recertified every three years. Installation pest management personnel will be certified in the appropriate EPA categories (ornamental and turf pest control (EPA category 3), aquatic pest control (EPA category 5), right-of-way pest control

(EPA category 6), Industrial, institutional, structural and health-related pest control (EPA category 7), public health pest control (EPA category 8), and aerial application (EPA category 11). Contractor personnel performing pest management services on Fort Knox will be certified by the Commonwealth of Kentucky in the appropriate categories for which work is performed. Fort Knox personnel performing PMC and pest management QAE functions require certification on a three year cycle. A list of certified personnel, along with their certification expiration dates and training certificates can be found in Appendix D. Personnel who are certified in pesticide application will attend pest management classes, workshops, and seminars in order to keep abreast of pest problems and pest management techniques that are unique to the area surrounding the installation. Other personnel who deal directly with pest control operations, but who may not need to be certified, are also encouraged to attend local seminars to better understand the pest management needs of the installation. The QAE for pest management contracts will be DoD-certified in the EPA categories for which pest control work is performed.

7.11 PESTICIDE SECURITY

All vehicles entering the installation are checked and validated by security personnel. Only approved and licensed pesticide applicators (and delivery vehicles) in vehicles marked according to DOT requirements are permitted to carry pesticides on the installation. All pesticide storage facilities are kept locked when not in use, and surrounded by security fencing when possible.

7.12 COORDINATION – DOD, OTHER FEDERAL, STATE, AND LOCAL

The Army Pest Management Program is responsible for protecting personnel and material from illness and damage by pests, wherever in the world they may be. The program includes both medical and operational responsibilities. While these responsibilities do overlap, U.S. Army Medical Command (MEDCOM) focuses on preventing and minimizing medical consequences of pests and pest management operations while the Assistant Chief of Staff for Installation Management and the Army Environmental Command (AEC) concentrate on safe, effective implementation of day to day pest management operations and environmental considerations of pest management operations.

The AEC-PMC have oversight responsibilities for the Fort Knox Pest Management Program. This includes reviewing the pest management plan, and giving special attention to any operation that: uses restricted use pesticides; uses any pesticide that may significantly contaminate surface or ground water; includes 259 or more hectares (640 acres) in one pesticide application; may adversely affect endangered or other protected species or habitats; or involves aerial application of pesticides.

Liaison is maintained between the Fort Knox PMC and Preventive Medicine personnel to determine the prevalence of disease vectors and other public health pests in the area surrounding the installation.

Contact is maintained with the Kentucky Departments of Health concerning any pest or arthropod-related health issue (e.g., mosquito, tick, and rodent-borne diseases).

The U.S. Fish and Wildlife Service is consulted whenever any proposed pest management activity may be detrimental to protected, rare, threatened, or endangered species or sensitive areas.

Contact is maintained with the Kentucky Pesticide Regulation and Certification Office to ensure local pesticide use regulations are being met.

The Corps of Engineers (COE) will coordinate with Fort Knox Pest Management Personnel to assure that termite pretreatment of new construction is properly performed and documented.

7.13 DESIGN REVIEW OF NEW CONSTRUCTION

Construction project design specifications shall be reviewed with pest prevention and control in mind. Personnel having pest management knowledge (e.g., engineering, preventive medicine environmental health) should review construction projects prior to completion to ensure that design and architectural features do not allow access or harbor arthropods, rodent, or birds. New construction should follow industry standard termite pre-treatment procedures; COE construction projects have a standard design requirements for termite treatments. It is recommended that new construction design consider thorough pest exclusion measures to reduce potential future issues. The PMC can provide recommendations as requested by proponent and forward to AEC Pest Management Consultant for review, as required.

7.14 FIVE-YEAR PLAN

Many administrative elements of the program such as recurring and projected requirements are addressed in the five-year plan. This serves as a tool to identify these requirements and propose timeframes for implementation. The five-year plan also helps installation personnel to anticipate program changes and requirements. The five-year plan is found in Appendix D.

8 SALE AND DISTRIBUTION OF PESTICIDES

There is a small self-help program located at BLDG 2954. Minimal records are being kept, however these are not routinely sent to the PMC. Products containing pesticides are sold to pet owners by the Veterinary Clinic. The Commissary and Post Exchange (PX) sell consumer product pesticides. A new enclosed garden center has been built and the majority of garden pesticides are stored here. However, historically overstock items have been stored outside of this area, exposing pesticides to the elements. Plans are being made to minimize end of the season overstock, and to provide a designated location within the enclosed garden center to store excess materials.

9 REGULATED PESTS

There are no requirements for plant or animal quarantine on Fort Knox. Retrograde cargo such as tactical equipment returning from a foreign country is cleared by the USDA, APHIS prior to arriving at Fort Knox. Fort Knox complies with Federal and State noxious weed laws**.** Historically noxious weeds have not been a problem on Fort Knox. There is increased awareness and concern regarding the detection of invasive non-native plants. The Hardin

County Cooperative Extension Service agronomist is consulted when any unusual weeds are detected by Fort Knox forestry personnel.

10 PEST MANAGEMENT REFERENCES

10.1 FEDERAL AND STATE LAWS

a. Section 136 of title 7, United States Code, “The Federal Insecticide, Fungicide and Rodenticide Act 1976,” as amended.

b. Executive Order 012856, Federal Compliance With Right-To-Know Laws and Pollution Prevention Requirements, 3 August 1993.

c. Executive Order 13148 of April 21, 2000. Greening the Government Through Leadership in Environmental Management.

d. Title 29, Code of Federal Regulations, 2009 revision, Section 910, Occupational Safety and Health Standards.

e. Title 32 Code of Federal Regulations, 2000 revision, Sections 651.10(b) and 651.33(m, n, p), Environmental Analysis of Army Actions.

f. Title 40, Code of Federal Regulations, 2009 revision, Section 165.10, Pesticide Management and Disposal.

g. Sections 4321 to 4370a of title 42, United States Code. “National Environmental Policy Act 0f 1969,” as amended.

h. Kentucky Code of Regulations, KAR 32 Chapters 27-29, July 2002

10.2 DOD DIRECTIVES

a. DoD Instruction 4150.7, DoD Pest Management Program, 29 May 2008

b. Memorandum, DoD Pollution Prevention Strategy, 11 August 1994

c. Memorandum, Assistant Chief of Staff For Installation Management, DAIM-ED-N, 9 November 1994, subject: Pest Management Measures of Merit.

d. MIL-STD-903C, Sanitary Standards for Commissaries, 20 November 1986.

e. MIL-STD-909, Sanitation Standards for Food Storage Facilities, 31 August 1989.

10.3 ARMY REGULATIONS AND PUBLICATIONS

a. AR 11-34, The Army Respiratory Protection Program, 15 February 1990

b. AR 40-5, Preventive Medicine, 25 May 2007

c. AR 200-1, Environmental Protection and Enhancement, 28 August 2007

d. AR 40-12, Quarantine Requirements, 24 January 1992

e. AEC Publication, Guidelines to Prepare Pest Management Plans for Army Installations and Activities, September 1996

f. AR 608-10, Child Development Services, 15 July 1997

10.4 TECHNICAL MANUALS, BULLETINS, AND HANDBOOKS

a. TG 114, Guide for the Medical Surveillance of Pest Controllers, March 1976

b. TG 133, Respiratory Protection Program for Pest Control Personnel, November 1982

10.5 ARMED FORCES PEST MANAGEMENT BOARD TECHNICAL INFORMATION MEMORANDUMS

a. No. 14, Protective Equipment of Pest Control Personnel, March 1992

b. No. 15, Pesticide Spill Prevention Management, June 1992

c. No. 18, Installation Pest Management Program Guide, February 1987

d. No. 42, Self-Help Pest Management, September 1999

10.6 WEBSITE AND ONLINE DOCUMENTS

a. USDA, Natural Resources Conservation Service, Introduced, Invasive, and Noxious Plants: Kentucky State-listed Noxious Weeds
http://plants.usda.gov/java/noxious?rptType=State&statefips=21

Appendix A

Integrated Pest Management Outlines

Index of Integrated Pest Management Outlines

Outline Number	Pest	Site
1	All Vegetation	Utility Poles, Hydrant Bases, Sidewalk, Around Buildings
2	All Vegetation	Road Shoulders and Open Storage Sites
3	American Cockroach	Crawl Spaces, Steam Tunnels, Sewers
4	Ants	Family Housing
5	Bed Bugs	Family Housing
6	Bees and Wasps	Occupied Buildings
7	Birds	Warehouses, Loading Docks, and Other Buildings
8	Broadleaf	Lawns and Common Grassy Areas
9	Carpenter Ants	Wooden Buildings and Structures
10	Filth Flies	Food Service Facilities
11	Fleas	Family Housing and Other Buildings
12	German Cockroach	Family Housing
13	German Cockroach	Food Service Facilities
14	German Cockroach	Barracks, Offices, and Other Buildings
15	Gypsy Moths	Shade and Ornamental Trees
16	Incidental Vertebrate Pests	In, Under, and Around Occupied Buildings
17	Mice	Family Housing, Offices, Barracks, Non-food Services Areas
18	Minor Nuisance Crawling Pests	Family Housing, Offices, and Other Buildings
19	Mites	In or Around Family Housing and Other Buildings
20	Mosquitoes	Around Buildings and Common Areas
21	Ornamental Shrub Insect Pests	Common Areas
22	Rodents	Food Services, Storage Facilities, and Common Areas
23	Spiders	Buildings and Other Structures
24	Stored Product Pests	Food Service Facilities
25	Subterranean Termites	In or Around Buildings
26	Tent Caterpillars	Shade and Ornamental Trees
27	Ticks	Wood and Shrub Margins, Overgrown Areas
28	Turf Fungus	Golf Course
29	Turf Insects	Golf Course
30	Algae	Managed Lakes
31	Army worms	Turf Grass
32	Bagworms	Ornamental Shrubs
33	Bats	Buildings and Other Structures

Integrated Pest Management Outline Number 1

Pest: ALL VEGETATION	Site: Utility poles, hydrant bases, sidewalks, building foundations, parking lots, and fence lines
Purpose: to control vegetation along utility poles, hydrant bases, sidewalks, building foundations, parking lots, and fence lines	
SURVEILLANCE	
Methods & Frequency: Visual observations; bi-weekly through the growing season (March through September)	
Conducted by: Grounds Maintenance Personnel	
NON-CHEMICAL PEST MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Weed eaters can be used, but are very labor-intensive. In addition, once vegetation is cut, new growth will quickly replace those parts of the plants which have been removed. This method is practical when very few sites are maintained.	
Conducted by: Grounds Maintenance Personnel	
CHEMICAL PEST MANAGEMENT	
Basis for treatment: Vegetation is present around the bases of hydrants and utility poles, along fence lines, and on or along sidewalks and building perimeters.	
Method & Location: Hand or power sprayer. Chemical is applied IAW label direction to unwanted vegetation.	
Conducted by: Grounds Maintenance Personnel and/or Pest Management Technicians	
Pesticide Common Name: Roundup Pro (Solution)	EPA Registration Number: 524-475
Control Standard: Vegetation is killed within two weeks following treatment	
PRECAUTIONS FOR SENSITIVE AREAS: Avoid contact with foliage, green stems or fruit of crops, desirable plants and trees. Avoid direct application to any body of water. Avoid drift which could damage desirable plants. DO NOT spray if wind is over 5mph. Post areas with warning signs prior to and after treatment.	
PROHIBITED PRACTICES: None	
ENVIRONMENTAL CONCERNS: None	
REMARKS: Glyphosate causes eye irritation and is harmful if swallowed. It may also cause skin irritation. Wear chemical resistant gloves and goggles. DO NOT mix, store, or apply this product in galvanized steel or unlined steel containers (except stainless steel). This products reacts with such containers to produce hydrogen gas. This gas mixture could flash or explode.	

Integrated Pest Management Outline Number 2

Pest: ALL VEGETATION	Site: Road shoulders and open ground storage sites
Purpose: To reduces damage to paved surfaces and to keep access open and reduce fire hazards at outdoor storage locations.	
SURVEILLANCE	
Methods & Frequency: Visual observations; twice per year during March and August	
Conducted by: Grounds Maintenance Personnel and/or Pest Management Technicians	
NON-CHEMICAL PEST MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Road graders are used to scrape vegetation from road shoulders. This work is done in conjunction with road shoulder maintenance. Open storage areas are also bladed to remove vegetation and improve surface of the ground for equipment or vehicular storage.	
Conducted by: Grounds Maintenance Personnel	
CHEMICAL PEST MANAGEMENT	
Basis for Treatment: N/A	
Method & Location: N/A	
Conducted by: N/A	
Pesticide Common Name: N/A	EPA Registration Number: N/A
Control Standard: N/A	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Balding or scraping ground surfaces not only removes vegetation, but also levels areas which may have eroded. Minor amounts of vegetation grown between maintenance intervals, but this does not interfere with the mission or cause damage to paved roads.	

Integrated Pest Management Outline Number 3

Pest: AMERICAN COCKROACH	Site: Crawl spaces, steam tunnels, and sewers
Purpose: To control nymphal and adult American Cockroaches in crawl spaces, steam tunnels, and sewers, thereby reducing nuisance and contamination to personnel and equipment.	
SURVEILLANCE	
Methods & Frequency: Visual observation in manholes, crawl spaces, and other places where these cockroaches have been a problem; set sticky traps as necessary for confirmation of pest presence.	
Conducted by: Utility workers, Building Occupants, and Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Eliminate moisture in basements and other below-ground areas in buildings that could support roaches. Ventilate wet or damp areas under buildings. Floor drains in basements or ground level should have screening with a mesh size less than 1/8 inch. Utility doors should fit tightly. Pip chases and other entry points should be sealed. Use strategically placed sticky traps in potential harborage areas and areas of human activity.	
Conducted by: DPW Preventive Maintenance and Pest Management Technicians	
Type: Cultural	
Methods & Location: Detect and eliminate food items o trash that may have been left in normally inaccessible areas by workers. Repair leaking pipes in crawl spaces which may provide moisture to these insects.	
Conducted by: DPW Preventive Maintenance	
CHEMICAL MANAGEMENT	
Basis for Treatment: Cockroaches or their evidence (fragments, egg cases, droppings, dead cockroaches) are detected and follow-up trapping determines a viable population exists.	
Method & Location: Apply bait to harborage areas and other areas where cockroaches are found.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Max Force FC Select (Bait)	EPA Registration Number: 432-1259
Pesticide Common Name: Advion (Bait)	EPA Registration Number: 352-652
Pesticide Common Name: Intice (Bait)	EPA Registration Number: 73079-5
Control Standard: Continue use for 30-60 days. If cockroaches are still present, remove and replace with fresh bait and/or initiate alternative control measures.	
Basis for Treatment: Cockroaches present after other measures have been tried or cockroaches are detected in large numbers.	
Method & Location: Apply residual pesticide with a 2-gallon sprayer to harborage areas and other areas where cockroaches are found.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Suspend SC (Liquid)	EPA Registration Number: 432-763
Pesticide Common Name: Talstar (Liquid)	EPA Registration Number: 279-3206
Pesticide Common Name: Phantom (Liquid)	EPA Registration Number: 241-392

Control Standard: No living cockroaches observed two weeks after treatment. Post-treatment sticky trap surveillance reveals no or few cockroaches. Spot treat areas where follow-up control efforts are needed.	
Basis for Treatment: Cockroaches present after non-chemical measures have been tried. Non-humid areas are available near infested areas.	
Method & Location: Apply a light dusting in dry areas where cockroaches are detected or between detection areas and where human activity occurs.	
Conducted by: Pest Management Technician	
Pesticide Common Name: EcoEXEMPT D (Dust)	EPA Registration Number: 25B Exempt
Pesticide Common Name: Borid (Dust)	EPA Registration Number: 9444-129
Control Standard: No living cockroaches observed two weeks after treatment. Post-treatment sticky trap surveillance reveals no or few cockroaches. Spot treat areas where follow-up control efforts are needed.	
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT apply cholinesterase- inhibiting pesticide in residences where pesticide sensitive individuals have been identified.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: American Cockroaches are not a problem as long as they stay in the sewer system. However, at times they may invade family housing units or other buildings. Treatment should proceed from the place where cockroaches cause problems in buildings back to their harborage sites in sewers or other underground places. If this is not done, then treatment in underground harborage sites may drive additional insects into buildings not previously experiencing problems.	

Integrated Pest Management Outline Number 4

Pest: ANTS	Site: Family Housing; Lodging
Purpose: To eliminate ants from family housing units and army lodging, thereby reducing nuisance and contamination to personnel and equipment.	
SURVEILLANCE	
Methods & Frequency: Visual observation following complaints	
Conducted by: Building Occupants and Pest Management Technicians	
NON-CHEMCIAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Calk cracks in molding, walls, and windowsills through which ants gain access to kitchen area.	
Conducted by: DPW Preventive Maintenance	
Type: Cultural	
Method & Location: Spilled food items, including pet foods, should be cleaned up immediately. Partially used food items should be stored in sealed containers.	
Conducted by: Building Occupants.	
CHEMICAL MANAGEMENT	
Basis for Treatment: Ants are identified as pavement, thief, pharaoh, odorous house, argentine, or little black ants.	
Method & Location: Bait should be placed in infested areas.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Ant Fix (Bait)	EPA Registration Number: 74474-1
Pesticide Common Name: Drax Ant Kill (Bait)	EPA Registration Number: 9444-131
Control Standard: No living ants one week after treatment	
Basis for Treatment: Ants are visible	
Method & Location: Spray aerosol using thin nozzle in infested areas near floor/wall surfaces, cracks, and crevices.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: PT Perma-Dust (Aerosol)	EPA Registration Number: 499-384
Control Standard: No living ants one week after treatment	
Basis for Treatment: heavy ant infestation evident.	
Method & Location: Spray foundation and door sills outside of buildings using a 2-gallon sprayer.	
Conducted by: Pest Management Technicians	
Control Standard: No living ants one week after treatment	
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT apply Termidor to interior buildings.	
PROHIBITED PRACTICES: Termidor can only be applied twice per year in a given location	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Ants are a minor problem. Placement of a non-repellant barrier around eternal building openings appears to control ants before they can enter. Ant problems occasionally occur in other buildings than those in family housing. However, the same information contained in this outline applies.	

Integrated Pest Management Outline Number 5

Pest: BED BUGS	Site: Family Housing; Lodging
Purpose: To control nymphal and adult bed bugs in family housing and Army lodging, thereby improving morale and wholesome living conditions.	
SURVEILLANCE	
Methods & Frequency: Visual observation; occupant complaint	
Conducted by: Building Occupants, Housekeeping, and Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Vacuum any bed bugs found. Replace mattress and box springs; encase in bed bug proof encasements.	
Conducted by: Building Occupants, Housekeeping, DPW Preventive Maintenance	
Type: Cultural	
Method & Location: Routine inspection of mattresses, box springs, bed framing, and headboards.	
Conducted by: Building Occupants and Housekeeping	
CHEMICAL MANAGEMENT	
Basis for Treatment: Any bed bugs identified in unit	
Method & Location: Treat cracks and crevices of mattress, box spring, bed frame, molding, furniture, and picture frames.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Phantom (Liquid)	EPA Registration Number: 241-392
Pesticide Common Name: Exciter	EPA Registration Number: 655-798
Control Standard: No bed bugs seen two weeks after last treatment	
Basis for Treatment: Any bed bug identified in unit	
Method & Location: Treat cracks and crevices of mattress, box spring, bed frame, molding, furniture, and picture frames.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Bedlam (Aerosol)	EPA Registration Number: 1021-1767
Control Standard: No bed bugs seen two weeks after last treatment	
Basis for Treatment: Any bed bug identified in unit	
Method & Location: Treat electrical outlets, behind molding, and other areas not treatable with liquid.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Borid (Dust)	EPA Registration Number: 9444-129
Control Standard: No bed bugs seen two weeks after last treatment	
PRECAUTIONS FOR SENSITIVE AREAS: Treatments in sensitive areas must be thoroughly cleaned prior to re-inhabiting.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Bed bugs are a difficult pest to control. Due to their cryptic nature, thorough follow-up inspections must be completed to determine infestation elimination. Adjacent units must be inspected as bed bugs travel easily between units.	

Integrated Pest Management Outline Number 6

Pest: BEES AND WASPS	Site: Occupied Buildings
Purpose: To control stinging insects in and around occupied buildings, thereby reducing health threats and annoyances.	
SURVEILLANCE	
Methods & Frequency: Visual observation following complaints. (Spring and Fall)	
Conducted by: Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Screening windows and doors; removal of wasp nests in their early stages; removal of honeybee swarms by a beekeeper.	
Conducted by: Building Occupants (screens/ nest removal), Pest Management Technicians (nest removal)	
Type: Cultural	
Method & Location: Empty refuse containers frequently near areas of human activities and buildings. Make sure material is properly bagged and sealed. Keep all refuse container doors and lids tightly closed. Rinse and put away recyclable beverage cans.	
Conducted by: Building Occupants, Refuse Collectors, and NSSC Residents.	
CHEMICAL MANAGEMENT	
Basis for Treatment: Bees and wasps found in or around buildings in more than incidental numbers	
Method & Location: Hand-held aerosol applied directly to insect(s) and nests	
Conducted by: Pest Management Technicians, Building Occupants (Through Self-Help)	
Pesticide Common Name: Wasp-Freeze (Aerosol)	EPA Registration Number: 499-362
Pesticide Common Name: 565 Plus XLO (Aerosol)	EPA Registration Number: 499-290
Control Standard: No living bees or wasps one week after treatment.	
Basis for Treatment: Carpenter bee galleries detected in wooden structures	
Method & Location: Dust placed in and around entrance holes. Holes filled with caulk or steel wool.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Borid (Dust)	EPA Registration Number: 9444-129
Control Standard: Evidence and activity is no longer observed	
PRECAUTIONS FOR SENSITIVE AREAS: Protective clothing including thick gloves, thick coveralls, and a veil covering the head should be used if bee or wasp nests are being controlled. Workers sensitive/allergic to bee venom should not attempt control efforts. These individuals should consult medical authorities regarding the possession and use of an epi-pen during routine pest management operations where venomous insects may be encountered.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: Removal of nesting material is necessary when a hive has been removed. Left over honey may melt causing structural damage. Old materials may attract additional pests into the structure.	
REMARKS: Family housing occupants may receive aerosol cans for bee and wasp control through the installation Self-Help program. Proper use instructions and MSDS/SDS's and labels are provided to all Self-Help participants. Because honeybees are beneficial, removal	

should be conducted by a beekeeper. Contact the local extension office; they can provide help in locating a nearby beekeeper.

Integrated Pest Management Outline Number 7

Pest: BIRDS (PIGEONS, STARLINGS, AND HOUSE SPARROWS)	Site: Warehouses, Loading Docks, and other Buildings
Purpose: To control birds which nest, roost, or loaf in or on buildings or other areas where they will damage or contaminate food products or other materials.	
SURVEILLANCE	
Method & Frequency: Visual observation of birds, droppings, or nesting material; monthly in warehouses and as needed in response to complaints.	
Conducted by: Pest Management Technician	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Openings to the outside of buildings should be screened or closed to prevent bird entry. Minor repairs can be done by occupants. Major repairs may require work by DPW Preventive Maintenance. Baited live traps can be used to capture and relocate birds from inside buildings and from roosting areas on or near buildings.	
Conducted by: Building Occupants, DPW Preventive Maintenance, and Pest Management Technicians (trapping)	
Type: Mechanical and Physical	
Method & Location: Architectural modifications of ridges and openings used for nesting and roosting can be done on buildings where this is a problem. In some cases, material designed to discourage nesting can be used. (e.g. Spike strips or netting)	
Conducted by: DPW Preventive Maintenance and Pest Management Technicians	
Type: Cultural	
Method & Location: Loading dock doors and unscreened windows should be kept closed when not in use.	
Conducted by: Building Occupants	
Type: Cultural	
Method & Location: Empty organic refuse regularly from outdoor refuse containers near buildings. Refuse should be bagged and sealed and keep all refuse container lids and doors tightly closed.	
Conducted by: Building Occupants and Refuse Collectors.	
CHEMICAL MANAGEMENT	
Basis for Treatment: N/A	
Method & Location: N/A	
Conducted by: N/A	
Pesticide Common Name:	EPA Registration Number: N/A
Control Standard: N/A	
PRECAUTION FOR SENSITIVE AREAS: Precautions should be taken if any architectural modifications are attempted that may involve historically significant buildings or structures. If in doubt, check with the C, Environmental Management Division.	
PROHIBITED PRACTICES: Electronic bird repelling devices and owl decoys have proven ineffective and should not be used	
ENVIRONMENTAL CONCERNS: The species listed above are non-native and are not protected under the Migratory Bird Treaty Act. Therefore, they can be controlled or managed.	

The identity of any pest species should be certain before any manipulations take place. Most other wild bird species are protect by law.
REMARKS: Personal protective measures, including respiratory protection using HEPA filters, should be used if significant deposits of droppings are encountered during cleanup or structural modifications. Consultation with the Safety Officer is advised. Although Canadian Geese and Gulls do occur at Fort Knox, no control or management measures have been necessary as of yet. If safety, health, or aesthetic impacts become significant, management measures will not be attempted unless full coordination has taken place with Federal and Municipal Wildlife Officials.

Integrated Pest Management Outline Number 8

Pest: BROADLEAF	Site: Lawns; Common Grassy Areas
Purpose: To control broadleaf weeds in lawns and grassy areas	
SURVEILLANCE	
Method & Frequency: Visual observation weekly through the early growing season (March through May) and bi-weekly from June to September.	
Conducted by: Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Mowing grass to maintain a uniform height may result in control of some broadleaf weeds by prevention of flower and seed formation. However, some weeds have the ability to adapt to mowing conditions by flowering just above the surface of the ground, but below the height of most commercial mowers.	
Conducted by: Grounds Maintenance Personnel	
Type: Mechanical and Physical	
Method & Location: Weeding by hand around flowerbeds, shrubs, and grassy areas	
Conducted by: Grounds Maintenance Personnel	
Type: Cultural	
Method & Location: Proper fertilization and watering of grassy areas promote good grass growth. This practice will prevent many broadleaf weeds from taking hold and growing.	
Conducted by: Grounds Maintenance Personnel	
CHEMICAL MANAGEMENT	
Basis of Treatment: Presence of broadleaf weeds in grass.	
Method & Location: Weeds in small grassy areas are treated with herbicide using a hand sprayer.	
Conducted by: Grounds Maintenance Personnel and Pest Management Technicians	
Pesticide Common Name: Plateau (Liquid)	EPA Registration Number: 241-365
Pesticide Common Name: Pathway (Liquid)	EPA Registration Number: 62719-31
Control Standard: Broadleaf weeds are killed within two weeks following treatment	
PRECAUTIONS FOR SENSITIVE AREAS: Post areas with warning signs prior to and after treatment occurs. Avoid areas stipulated on the label.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: N/A	

Integrated Pest Management Outline Number 9

Pest: CARPENTER ANTS	Site: Wooden Buildings and Structures
Purpose: To control carpenter ants that are destroying wood structures, thereby causing economic damage.	
SURVEILLANCE	
Method & Frequency: Visual observation by occupants or during inspections by DPW personnel for other wood destroying pests such as termites. Further and intensive surveys need to be done to locate the nest. Nests are usually hidden, sometimes in the upper portions of the wall voids of wood constructed buildings.	
Conducted by: Building Occupants, DPW Preventive Maintenance, and Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Damaged wood should be replaced (preferably with pressure-treated wood). Carpenter ants usually infest damp, soft wood. Moisture control under and around buildings should be considered to reduce the possibility of carpenter ant infestations or to prevent them from returning.	
Conducted by: DPW Preventive Maintenance and Pest Management Technicians	
Type: Cultural	
Method & Location: DO NOT place firewood or other wood against the outside of buildings. This can: bring wood infested with carpenter ants into proximity of the building; provide an attractant to carpenter ants; hold moisture next to the building. DO NOT allow lawn sprinklers to constantly hit wooden portions of the building or allow water to puddle next to building foundations. Trim any tree branches that are touching buildings.	
Conducted by: Building Occupants, DPW Preventive Maintenance, Pest Management Technicians.	
CHEMICAL MANAGEMENT	
Basis for Treatment: Presence of carpenter ants in and around wooden buildings	
Method & Location: Bait should be applied on ground around exterior of building	
Conducted by: Pest Management Technician	
Pesticide Common Name: Advance Granular (Bait)	EPA Registration Number: 499-370
Control Standard: No living ants two weeks after treatment	
Basis for Treatment: Presence of carpenter ants in and around wooden buildings	
Method & Location: Aerosol should be sprayed directly at nests when detected	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Perma Dust (Aerosol)	EPA Registration Number: 499-384
Control Standard: No living ants two weeks after treatment	
Basis for Treatment: Presence of carpenter ants in and around wooden buildings	
Method & Location: Apply residual pesticide with a 2-gallong sprayer to exterior foundation and door sills	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Phantom (Liquid)	EPA Registration Number: 241-392

Pesticide Common Name: Termidor SC (Liquid)	EPA Registration Number: 7969-210
Control Standard: No living ants two weeks after treatment	
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT apply Termidor in sensitive areas	
PROHIBITED PRACTICES: Apply Termidor no more than twice per year in a given location	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Presence of carpenter ants on interior of building may signify a plumbing concern. Carpenter ants are attracted to wet and moldy wood.	

Integrated Pest Management Outline Number 10

Pest: FILTH FLIES	Site: Food Service Facilities
Purpose: To control filth flies in and around areas where food is served thereby preserving foods wholesomeness and maintaining personnel morale.	
SURVEILLANCE	
Method & Frequency: Visual observations daily by food service personnel; Environmental Health Services sanitary inspections (Monthly or Quarterly).	
Conducted by: Food Service Personnel, Environmental Health Technicians, Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Sticky fly strips may be used in areas which are not directly over prepared food or food preparation surfaces. This method may be effective when only a few flies are found indoors. These glue strips may be a source of contamination and annoyance if they are neglected or bumped into. Ultraviolet electric fly devices may be used in kitchen and eating areas, but again not directly over food preparation surfaces. These have been proven effective under certain circumstances.	
Conducted by: Food Service Personnel	
Type: Mechanical and Physical	
Method & Location: Screens should e used to prevent fly entry when doors and windows are to be left open. Automatic self-closing devices should be placed on outer doors to reduce the time open doors may allow fly entry. Air curtains may also be used at entry points, but must be installed and maintained correctly to blow flies AWAY from the entrance and not INTO the entrance. They should also cover the entire door width and have sufficient air-moving strength.	
Conducted by: Food Service Personnel, Building Maintenance	
Type: Cultural	
Method & Location: Enforce high sanitary standards to reduce food attractants to flies. Clean up spilled food from work surfaces, walls, and floors. Wash dirty dishes and cooking utensils following use. DO NOT leave exposed food in the facility overnight. Place refuse in sealed bags. Place bags in containers with tight fitting lids and keep containers closed when not in use. Clean inner and outer surfaces of trashcans regularly. Check and clean under trach can liners. DO NOT place dumpsters within 50ft of the facility.	
Conducted by: Food Service Personnel	
CHEMICAL MANAGEMENT	
Basis for Treatment: High populations of flies found around dumpsters	
Method & Location: Place fly bait in the vicinity of the dumpster.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Flytek	EPA Registration Number: 2724-274-50809
Control Standard: Fly numbers are reduced	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: DO NOT spray any type of pesticide in refuse containers or dumpsters.	
ENVIRONMENTAL CONCERNS: N/A	

REMARKS: Good sanitation should virtually eliminate fly problems at food service facilities. Refuse containers need to be cleaned weekly in the summer months to prevent flies from breeding.

Integrated Pest Management Outline Number 11

Pest: FLEAS	Site: Family Housing and Other Buildings
Purpose: To control fleas in family housing and other buildings to reduce pain, discomfort, and potential health difficulties to occupants and pets.	
SURVEILLANCE	
Method and Frequency: Visual observation, as required	
Conducted by: Building Occupants	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Frequent and thorough vacuuming of carpets and upholstered furniture will help control fleas. Be sure to empty the cleaner bag immediately after vacuuming because the flease which have been removed are not usually killed. Pet bedding can also be vacuumed and periodically washed in hot water and detergent.	
Conducted by: Building Occupants, Pet Owners	
Type: Mechanical and Physical	
Method & Location: Restricting pet access to areas where flea populations will be particularly annoying to humans or where cleaning to remove fleas is difficult.	
Conducted by: Building Occupants, Pet Owners	
Type: Cultural	
Method & Location: Dogs and cats at risk for fleas should be frequently bathed, and if needed, treated with an approved insecticide to control fleas. The Veterinary Clinic has suitable products for sale of may give advice on the safety and effectiveness of various products that are available.	
Conducted by: Building Occupants, Pet Owners	
CHEMICAL MANAGEMENT	
Basis for Treatment: Flea infestations in family housing or other buildings	
Method & Location: Apply residual pesticide using a 2-gallon sprayer. Prior to application, run a vacuum over surfaces to induce flea activity.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Precor IGR (Liquid)	EPA Registration Number: 2724-352
Control Standard: No living fleas 5 days following treatment	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Fleas may become a serious problem when family housing, which contain pets, are vacated for extended periods. During that time, flea larvae develop into pupae and emerge into adults in the presence of pets or people. When this happens, many newly emerged, hungry adult fleas are suddenly present. Fleas can also be a problem in buildings, which have feral cats living under them. Adult fleas may enter the first floors through small cracks or other openings and/or be brought in by people entering the building. To remedy this problem, capture and remove feral cats. (Also see incidental invertebrate pest sheet.)	

Integrated Pest Management Outline Number 12

Pest: GERMAN COCKROACHES	Site: Family Housing
Purpose: To control nymphal and adult German Cockroaches in family housing, thereby improving morale and wholesome living conditions.	
SURVEILLANCE	
Method & Frequency: Visual observations; adhesive traps set when necessary	
Conducted by: Building Occupants, Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Use of sticky traps in kitchens and bathrooms when a minor infestation occurs. Eliminate cockroach harborage by caulking minor cracks, crevices, and holes in openings which could be used by cockroaches	
Conducted by: Building Occupants, Pest Management Technicians	
Type: Cultural	
Method & Location: Spilled food items, including pet food, should be cleaned up immediately. Partially used food items should be stored in sealed containers. Keep papers, bags, boxes, etc. off the floor in kitchens and bathrooms.	
Conducted by: Building Occupants	
CHEMICAL MANAGEMENT	
Basis of Treatment: Cockroaches present based upon trap surveillance and inspection.	
Method & Location: Apply bait stations in locations where cockroaches have been seen. Place bait stations along junctions between walls and floors for maximum effectiveness.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Max Force Bait Station	EPA Registration Number: 432-1257
Control Standard: Continue use for 30-60 days. If cockroaches are still present, remove and replace bait stations and/or initiate alternative control measures.	
Basis for Treatment: Cockroach present after other measures have been tried or cockroaches detected in large numbers	
Method & Location: Apply bait to locations where cockroaches have been seen	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Advion (Bait)	EPA Registration Number: 352-652
Pesticide Common Name: Intice (Bait)	EPA Registration Number: 73079-5
Control Standard: Continue use for 30-60 days. If cockroaches are still present, remove and replace bait stations and/or initiate alternative control measures.	
Basis for Treatment: Cockroaches still present after non-chemical methods and bait applications have been tried.	
Method & Location: Apply residual pesticide to harborage areas in kitchens, bathrooms, and other areas where cockroaches have been detected.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Suspend SC (Liquid	EPA Registration Number: 432-763
Pesticide Common Name: Talstar One (Liquid)	EPA Registration Number: 279-3206
Pesticide Common Name: Phantom (Liquid)	EPA Registration Number: 241-392

Control Standard: No living cockroaches two weeks after last treatment	
Basis for Treatment: Cockroaches still present after non-chemical methods and bait applications have been tried.	
Method & Location: Apply very light dusting to harborage areas in kitchens, bathrooms, and other areas where they are detected.	
Conducted by: Pest Management Technician	
Pesticide Common Name: EcoEXEMPT (Dust)	EPA Registration Number: 25B Exempt
Pesticide Common Name: Borid (Dust)	EPA Registration Number: 9444-129
Control Standard: No living cockroaches two weeks after last treatment	
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT apply cholinesterase-inhibiting pesticides in residences with infants.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: German cockroach populations can quickly bounce back if infestation is not fully eliminated. Thorough follow-up inspections are necessary to ensure infestation is eliminated.	

Integrated Pest Management Outline Number 13

Pest: GERMAN COCKROACH	Site: Food Service Facilities
Purpose: To control nymphal and adult German Cockroaches in clubs, cafeterias, and dining facilities, thereby reducing contamination of food and distress to personnel and preserving morale and a wholesome atmosphere.	
SURVEILLANCE	
Method and Frequency: Visual observation by workers; sanitary inspections and/or sticky trapping. Pre and post treatment trap results are important to determine if control measures are effective. Consult Environmental Health Services for further details regarding trap indices.	
Conducted by: Food Service Personnel, DPW Preventive Maintenance, Pest Management Technician	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Eliminate cockroach harborage by caulking minor cracks, crevices, and holes in opening which could be used by cockroaches. Identify and remove all old, non-functioning or unnecessary equipment in food preparation areas. Submit work orders for structural repairs which provide harborage.	
Conducted by: Food Service Personnel, Environmental Health Services, Pest Management Technician	
Type: Cultural	
Method & Location: Clean spilled food and place stored food in sealed containers. Clean all organic deposits under and behind appliances. Promptly dispose of empty cardboard boxes, and keep stored material off floors in food preparation areas to allow thorough cleaning. Keep items in food storage elevated off the floor, on shelves. Use raw food commodities on the “first-in, first-out” basis to prevent goods from becoming infested.	
Conducted by: Food Service Facilities Managers and Employees	
CHEMICAL MANAGEMENT	
Basis for Treatment: Cockroaches present based upon trap surveillance and inspection.	
Method & Location: Apply bait stations in locations where cockroaches have been seen. Place bait stations along junctions between walls and floors for maximum effectiveness.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Max Force Bait Station	EPA Registration Number: 432-1257
Control Standard: Continue use for 30-60 days. If cockroaches are still present, remove and replace bait stations and/or initiate alternative control measures.	
Basis for Treatment: Cockroach present after other measures have been tried or cockroaches detected in large numbers	
Method & Location: Apply dry bait to location where cockroaches have been seen	
Conducted by: Pest Management Technician	
Pesticide Common Name: Advion (Bait)	EPA Registration Number: 352-652
Pesticide Common Name: Intice (Bait)	EPA Registration Number: 73079-5
Control Standard: Continue use for 30-60 days. If cockroaches are still present, remove and replace bait stations and/or initiate alternative control measures.	

Basis for Treatment: Cockroaches still present after non-chemical methods and bait applications have been tried.	
Method & Location: Apply residual pesticide to harborage areas in kitchens, bathrooms, and other areas where cockroaches have been detected.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Suspend SC (Liquid	EPA Registration Number: 432-763
Pesticide Common Name: Talstar One (Liquid)	EPA Registration Number: 279-3206
Pesticide Common Name: Phantom (Liquid)	EPA Registration Number: 241-392
Control Standard: No living cockroaches two weeks after last treatment	
Basis for Treatment: cockroaches present after non-chemical measures have been tried. Need for a lower-toxicity material if dealing with a chemical sensitive environment.	
Method & Location: Apply very light dusting to harborage areas in kitchens, bathrooms, and other areas where they are detected	
Conducted by: Pest Management Technicians	
Pesticide Common Name: EcoEXEMPT (Dust)	EPA Registration Number: 25B Exempt
Pesticide Common Name: Borid (Dust)	EPA Registration Number: 9444-129
Control Standard: No living cockroaches two weeks after last treatment	
PRECAUTIONS FOR SENSITIVE AREAS: Food service areas need to be properly prepped for application of pesticides prior to treatment. No food items should remain out and all food preparation surfaces need to be covered.	
PROHIBITED PRACTICES: DO NOT apply pesticides to unprotected food preparation surfaces.	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: German Cockroach populations can quickly bounce back if infestation is not fully eliminated. Surveillance using sticky traps in food service facilities is essential in detecting populations before the outbreak. A minimum of 15-20 sticky traps should be utilized in an average sized kitchen for proper surveillance. Thorough follow-up inspections are also necessary to ensure infestations are eliminated.	

Integrated Pest Management Outline Number 14

Pest: GERMAN COCKROACH	Site: Barracks and Administrative Offices
Purpose: To control nymphal and adult German Cockroaches in barracks and administrative offices.	
SURVEILLANCE	
Method and Frequency: Visual observation; sticky trap when necessary	
Conducted by: Building Occupants, Pest Management Technician	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Eliminate cockroach harborage by caulking minor cracks, crevices, and holes in opening which could be used by cockroaches. Identify and remove all old, non-functioning or unnecessary equipment in food preparation areas. Submit work orders for structural repairs which provide harborage.	
Conducted by: Food Service Personnel, Environmental Health Services, Pest Management Technician	
Type: Cultural	
Method & Location: Clean spilled food and place stored food in sealed containers. Clean all organic deposits under and behind appliances. Promptly dispose of empty cardboard boxes, and keep stored material off floors in food preparation areas to allow thorough cleaning. Keep items in food storage elevated off the floor, on shelves. Use raw food commodities on the “first-in, first-out” basis to prevent goods from becoming infested.	
Conducted by: Food Service Facilities Managers and Employees	
CHEMICAL MANAGEMENT	
Basis for Treatment: Cockroaches present based upon trap surveillance and inspection.	
Method & Location: Apply DATED bait stations in locations where cockroaches have been seen. Place bait stations along junctions between walls and floors for maximum effectiveness.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Max Force Bait Station	EPA Registration Number: 432-1257
Control Standard: Continue use for 30-60 days. If cockroaches are still present, remove and replace bait stations and/or initiate alternative control measures.	
Basis for Treatment: Cockroach present after other measures have been tried or cockroaches detected in large numbers	
Method & Location: Apply dry bait to location where cockroaches have been seen	
Conducted by: Pest Management Technician	
Pesticide Common Name: Advion (Bait)	EPA Registration Number: 352-652
Pesticide Common Name: Intice (Bait)	EPA Registration Number: 73079-5
Control Standard: Continue use for 30-60 days. If cockroaches are still present, remove and replace bait stations and/or initiate alternative control measures.	
Basis for Treatment: Cockroaches still present after non-chemical methods and bait applications have been tried.	
Method & Location: Apply residual pesticide to harborage areas in kitchens, bathrooms, and other areas where cockroaches have been detected.	
Conducted by: Pest Management Technician	

Pesticide Common Name: Suspend SC (Liquid	EPA Registration Number: 432-763
Pesticide Common Name: Talstar One (Liquid)	EPA Registration Number: 279-3206
Pesticide Common Name: Phantom (Liquid)	EPA Registration Number: 241-392
Control Standard: No living cockroaches two weeks after last treatment	
Basis for Treatment: cockroaches present after non-chemical measures have been tried. Need for a lower-toxicity material if dealing with a chemical sensitive environment.	
Method & Location: Apply very light dusting to harborage areas in kitchens, bathrooms, and other areas where they are detected	
Conducted by: Pest Management Technicians	
Pesticide Common Name: EcoEXEMPT (Dust)	EPA Registration Number: 25B Exempt
Pesticide Common Name: Borid (Dust)	EPA Registration Number: 9444-129
Control Standard: No living cockroaches two weeks after last treatment	
PRECAUTIONS FOR SENSITIVE AREAS: Food service areas need to be properly prepped for application of pesticides prior to treatment. No food items should remain out and all food preparation surfaces need to be covered.	
PROHIBITED PRACTICES: DO NOT apply pesticides to unprotected food preparation surfaces.	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: German Cockroach populations can quickly bounce back if infestation is not fully eliminated. Surveillance using sticky traps in food service facilities is essential in detecting populations before the outbreak. A minimum of 15-20 sticky traps should be utilized in an average sized kitchen for proper surveillance. Thorough follow-up inspections are also necessary to ensure infestations are eliminated.	

Integrated Pest Management Outline Number 15

Pest: GYPSY MOTH	Site: Shade and Ornamental Trees
Purpose: To control Gypsy Moth populations which can defoliate, weaken, and kill trees	
SURVEILLANCE	
Method & Frequency: Daily, through the spring months. In the early summer months, erect pheromone traps to capture and quantify adult male moths which can help to determine the population level and anticipated degree of infestation in the following year. As time allows in the fall, look for egg masses on tree trunks and nearby structures. Consult with the US Forest Service to participate in the cooperative survey agreements which determine treatment thresholds and may result in participation in Federally funded suppression programs.	
Conducted by: Pest Management Technicians, US Forestry Service Personnel	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Apply barrier sticky tape around trunks to capture migrating larvae. Wrap burlap or fabric around trunk and remove larvae that harbor beneath it during the daylight hours. Caterpillars can be killed by placing them in a jar with soapy water solution, and discarding.	
Conducted by: Grounds Maintenance, Pest Management Technicians	
Type: Biological	
Method & Location: Apply bacillus thuringiensis (Bt), a bacteria specific to caterpillars of this type; apply approved virus (NPV); or fungal products labeled specifically for Gypsy Moth	
Conducted by: Pest Management Technicians	
CHEMICAL MANAGEMENT	
Basis for Treatment: US Forest Service determines if aerial treatment is warranted for control	
Method & Location: Cooperative aerial spray.	
Conducted by: US Forest Service (Kentucky)	
Pesticide Common Name: UNK	EPA Registration Number: UNK
Control Standard: No living later-larval instars after treatment	
PRECAUTIONS FOR SENSITIVE AREAS: Post areas with signs saying pesticide treatment will or has been done.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Bt should be applied to all leaf surfaces of the trees. Heavy rains following treatment may necessitate retreatment.	

Integrated Pest Management Outline Number 16

Pest: INCIDENTAL VERTEBRATE PESTS (SQUIRRELS, SNAKES, BIRDS, FERAL CATS/DOGS)	Site: All Installation buildings
Purpose: To remove unwelcome wild, feral, stray, or peri-domestic vertebrates from areas and structures where human activities occur and where these activities as well as human health may be affected by the animals' presence. Also to prevent or alleviate a flea infestation related to feral animals.	
SURVEILLANCE	
Method & Frequency: Ongoing observation during normal worker/ resident activities. Visual observation after complaint received.	
Conducted by: Building Occupants, Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Setting live traps in or under buildings and structures. Wild animals are released on more natural areas of the installation. For stray animals see Appendix E of this document.	
Conducted by: Pest Management Technician	
Type: Mechanical and Physical	
Method & Location: Gloved-hand or net removal of accidental unintentional invader in a building; release animal alive in more natural area on post away from human activity.	
Conducted by: Pest Management Technician	
Type: Mechanical and Physical	
Method & Location: Closing/fixing entry points in structures that have experienced invading animals. This includes fixing broken windows or doors, closing holes in floors leading to crawlspaces, and sealing gaps under doors.	
Conducted by: DPW Personnel, Pest Management Technician	
CHEMICAL MANAGEMENT	
Basis for Treatment: N/A	
Method & Location: N/A	
Conducted by: N/A	
Pesticide Common Name: N/A	EPA Registration Number: N/A
Control Standard: N/A	
PRECAUTIONS FOR SENSITIVE AREAS: No animal will be handled inhumanly or treated in such a way that violates state or federal laws governing wildlife.	
PROHIBITED PRACTICES: Inhuman treatment of animals	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Pest Management Technicians should be vaccinated against rabies if handling vertebrates and must wear strong protective gloves when transporting traps or otherwise handling animals.	

Integrated Pest Management Outline Number 17

Pest: MICE	Site: Family Housing, Offices, Barracks, and Other Administrative Buildings
Purpose: To control mice in family housing, administrative areas, and research buildings	
SURVEILLANCE	
Method & Frequency: Visual observation of mouse damage or droppings	
Conducted by: Building Occupants, Environmental Health Services, Pest Management Technicians (Upon request)	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Eliminate openings to buildings which are greater than ¼ inch; particular attention should be given to doors and areas on the outside of the buildings where pipes and other utility lines enter. Small snap traps and glue boards may be used when a mouse infestation is found.	
Conducted by: DPW Preventive Maintenance, Facility Personnel, Pest Management Technicians	
Type: Cultural	
Method & Location: Enforce high sanitary standards thereby reducing food and water essential for mouse survival. Clean up spilled food products immediately or at least daily. Remove bags, boxes, broken or unused equipment, and other potential harborage from food storage areas. Remove broken and unnecessary equipment and other potential harborage from basements, kitchens, and closets.	
Conducted by: Building Occupants	
CHEMICAL MANAGEMENT	
Basis for Treatment: N/A	
Method & Location: N/A	
Conducted by: N/A	
Pesticide Common Name: N/A	EPA Registration Number: N/A
Control Standard: N/A	
PRECAUTIONS FOR SENSITIVE AREAS: Due to concerns with the risk of rodent-borne hantavirus which can cause serious human illness, proper personal protective equipment, such as, a HEPA filter- worn if work is done in confined rodent infested spaces. Additional precautions including providing sunlight, ventilation, and disinfecting the droppings and dead rodents with a 10% bleach solution is also required. Traps containing rodents should be only handled with disposable gloves and traps should be disinfected/ disposed of in a doubled plastic bag.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Emphasis should be placed on blocking building access to rodents. As long as entry points into buildings exist, then trapping or baiting may be the only alternatives for control. The presence of spilled food products and/or poor housekeeping will adversely impact any baiting or trapping program. If rats are detected, Pest Management Personnel should be contacted to determine appropriate control efforts.	

Integrated Pest Management Outline Number 18

Pest: MINOR NUISANCE CRAWLING PESTS (Crickets, earwigs, ground beetles, millipedes, centipedes, and silverfish)	Site: Family Housing, Administrative Buildings, and Other Sites.
Purpose: To control crawling insects and thereby reducing the nuisance to personnel	
SURVEILLANCE	
Method & Frequency: Ongoing visual observation following occupant complaint. Sticky trap surveillance for general crawling pests or cockroaches can prove helpful.	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Sticky traps can be placed along baseboards where pests are seen or where crickets are heard.	
Conducted by: Building Occupants and Pest Management Technicians	
Type: Cultural	
Method & Location: Some of these pests often hide in areas which are cluttered with trash, old boxes, and debris. Cleanup of these types of items may reduce pest infestation.	
Conducted by: Building Occupants	
CHEMICAL MANAGEMENT	
Basis for Treatment: For extreme circumstances. Large numbers of pests are detected. Household goods are at risk; non-chemical measures failed to control the problem. See remarks section below.	
Method & Location: Using a 2-gallon sprayer; treat foundations outside buildings, base boards and voids inside the building where pests may hide. Verify label for target pests	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Talstar One (Liquid)	EPA Registration Number: 279-3206
Control Standard: Pests no longer a problem	
Basis for Treatment: Pests infestation areas are focused and identifiable	
Method & Location: Using aerosol spray; treat harborage areas and cracks with fine-tipped nozzle.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Perma Dust (Aerosol)	EPA Registration Number: 499-384
Control Standard: Pests no longer a problem	
Basis for Treatment: Pests infestation areas are focused and identifiable	
Method & Location: Dust cracks and crevices where pests occur	
Conducted by: Pest Management Technician	
Pesticide Common Name: EcoEXEMPT D (Dust)	EPA Registration Number: 25B Exempt
Control Standard: Pests no longer a problem	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	

REMARKS: Pesticide use reduction requirements make treatment for nuisance pests highly questionable. Chemical treatment is detailed here in instances where populations are exceedingly high and damage to goods, such as carpets, may occur.

Integrated Pest Management Outline Number 19

Pest: MITES	Site: In and around buildings and residences
Purpose: To control mites in and around buildings; causing discomfort to occupants.	
SURVEILLANCE	
Method & Frequency: Visual observation (usually during the spring and fall)	
Conducted by: Building Occupants and Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Keep window sills and door frames tightly sealed with weather stripping	
Conducted by: building Occupants or DPW Preventive Maintenance Personnel	
Type: Cultural	
Method & Location: Monitor house plants to ensure they are not infested; discourage pestiferous birds (starlings, house sparrows) from nesting on window sills.	
Conducted by: Building Occupants	
CHEMICAL MANAGEMENT	
Basis for Treatment: Mites are detected	
Method & Location: Apply pesticide using a 2-gallon sprayer to the exterior of buildings where mites are seen	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Suspend SC (Liquid)	EPA Registration Number: 432-763
Pesticide Common Nambe: Talstar One (Liquid)	EPA Registration Number: 279-3206
Control Standards: No mite activity one week after treatment	
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT treat interior while building is occupied	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: N/A	

Integrated Pest Management Outline Number 20

Pest: MOSQUITOES	Site: Fort Knox
Purpose: To control biting mosquitoes thereby reducing human annoyance and the risk of disease	
SURVEILLANCE	
Method & Frequency: Residents detect and report biting mosquitoes. Pest Management Technicians monitor potential breeding sources, particularly during spring and summer months. Environmental Health Services can, if requested, conduct larval and adult mosquito surveillance using dippers and traps.	
Conducted by: Fort Knox Residents, Pest Management Technicians, Environmental Health Services (Upon Request)	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Screens should be placed in widows on buildings occupied at night to exclude adult mosquitoes. Temporary standing water sites should be graded or filled to eliminate mosquito breeding. Precautions must be taken not to damage wetlands. Eliminate artificial container breeding sites.	
Conducted by: DPW Preventive Maintenance	
Type: Cultural	
Method & Location: Remove and discard any refuse or materials capable of holding water. (e.g., unused flower pots, tires, broken appliances, and waste tires)	
Conducted by: DPW Preventive Maintenance	
CHEMICAL MANAGEMENT	
Basis for Treatment: Non-chemical methods were unsuccessful. Mosquito larvae have been detected in large numbers.	
Method & Location: Bodies of water where larvae are not controlled through non-chemical means.	
Conducted by: Pest Management Technician	
Pesticide Common Name: BTIBriquets (Bt)	EPA Registration Number: 6218-47
Pesticide Common Name: Altocid	EPA Registration Number: 2724-375
Control Standard: No living larvae after treatment	
Basis for Treatment: Non-chemical methods were unsuccessful. Mosquito adults detected in large numbers.	
Method & Location: Shrubs and other vegetative growth where large numbers of adults are detected	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Malathion (Liquid)	EPA Registration Number: 655-598
Control Standard: No living adults after treatment	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: When surveillance results indicate, selective, targeted fogging is done in vegetation to kill resting mosquitoes. This is only done if other measures prove ineffective and surveillance is conducted to determine need and effectiveness. Contact is maintained with local health authorities regarding the potential threat of mosquito-borne disease or exotic mosquito species. Note: Health Authorities on Fort Knox- Environmental Health Services,	

Ireland Army Community Hospital Preventive Medicine. Targeted mosquito species- Aedes albopictus and Aedes aegypti.

Integrated Pest Management Outline Number 21

Pest: ORNAMENTAL SHRUB INSECTS (Lace bugs, Aphids, and Scale insects)	Site: Common Areas
Purpose: To maintain vitality and reduce mortality of ornamental shrubs	
SURVEILLANCE	
Method & Frequency: Visual observations (April, June, and August)	
Conducted by: Pest Management Technician, Grounds Maintenance	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical, Physical, and Cultural	
Method & Location: Prune and remove heavily infested branches. Maintain shrub vigor with fertilizer. Replace dying plants with pest resistant, native species. Locations include high visibility landscaped common areas	
Conducted by: Grounds Maintenance, Pest Management Technicians	
Type: Biological and Cultural	
Method & Location: Closely examine beneficial fauna of individual shrubs. If the population of beetles appears high and/or aphid mummies are present, delay pesticide treatment and conduct a follow-up examination in 7-10 days.	
Conducted by: Pest Management Technicians	
CHEMICAL MANAGEMENT	
Basis for Treatment: High populations of lace bugs, aphids, or mealybugs are detected on shrub and beneficial fauna; not adequate to maintain a healthy shrub.	
Method & Location: Spray foliage and branches of ornamental shrubs.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Suspend SC (Liquid)	EPA Registration Number: 432-763
Control Standard: Shrub no longer infested after follow-up examination (7-10 days)	
PRECAUTIONS FOR SENSITIVE AREAS: Post warning signs in treatment area prior to, during, and 24hrs after treatment. In order to avoid possible shrub damage, no spraying should occur when horticultural oil is below 50 degrees and above 90 degrees Fahrenheit.	
PROHIBITED PRACTICES: DO NOT spray when wind is in excess of 5mph	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: N/A	

Integrated Pest Management Outline Number 22

Pest: RODENT(S)	Site: Food Service and Storage Facilities
Purpose: To control mice and rats in food service and storage facilities where food commodities may be damaged or contaminated, thereby reducing economic loss and preserving goods.	
SURVEILLANCE	
Method & Frequency: Visual observation for damage, droppings, or rub marks done by facility personnel, veterinary personnel, and/or Environmental Health Services personnel; monthly by Pest Management Technicians. Detection in sticky traps, or by Environmental Health Services during sanitary inspections.	
Conducted by: Foo Service and Storage Personnel, Veterinary Food Inspectors, Environmental Health Services Inspectors, Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Eliminate openings to buildings which are greater than ¼ inch. Small snap traps and glue boards may be used when a mouse infestation is found. If rats are detected, larger glue boards should be used for effective capturing.	
Conducted by: DPW Preventive Maintenance, Pest Management Technicians, Building Occupants	
Type: Cultural	
Method & Location: Enforce high sanitary standards to reduce food and water essential for rodent survival. Clean up spilled food products immediately or at least daily. Remove bags, boxes, broken or unused equipment, and other potential harborage from food storage areas. Remove broken and unused equipment from storage areas, work areas, and outdoor areas. Keep salvage and break areas clean at all times. Keep food in closed containers. Store pallets of food at least 24inchs from walls to permit routine cleaning, inspection, and control.	
Conducted by: Food Service and Storage Facility Personnel	
CHEMICAL MANAGEMENT	
Basis for Treatment: Rodents or evidence of rodents found during surveillance. Non-chemical measures have been attempted and have been unsuccessful.	
Method & Location: Bait should be placed in infested areas and refreshed with fresh bait as needed until rodent activities cease.	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Contrac Blox (Bait)	EPA Registration Number: 12455-79
Pesticide Common Name: Final Blox (Bait)	EPA Registration Number: 12455-89
Control Standard: No further product damage. Noticeable decline in detectable droppings. If there is no evidence of rodents following 30 days of baiting, then bait stations should be removed. Bait stations should be serviced at least monthly.	
PRECAUTIONS FOR SENSITIVE AREAS: Proper personal protective (PPE) equipment must be worn if work is done in confined rodent infestation spaces. Traps containing rodents should only be handled with disposable gloves; the rodent and trap should be disinfected and placed into a plastic bag for disposal. Note: In some cases respirators outfitted with HEPA filters is necessary. Additional precautions include providing sunlight, ventilation, and disinfecting the rodent contaminated areas with a 10% bleach solution.	

PROHIBITED PRACTICES: DO NOT place rodenticides where bait will be accessible to children or pets. Bait should be placed in tamper proof containers. Tracking powder is NOT to be used in food preparation areas of areas that risk food contamination.
ENVIRONMENTAL CONCERNS: N/A
REMARKS: Pesticides should be considered the last option in controlling rodents. Emphasis should be placed on blocking building access to rodents.

Integrated Pest Management Outline Number 23

Pest: SPIDERS	Site: Buildings and Other Structures
Purpose: To remove or eliminate spiders from buildings or other workplaces; reducing occupant discomfort and the potential for bites	
SURVEILLANCE	
Method & Frequency: Visual observations; spiders are frequently found in undisturbed places inside buildings, basements, carports, utility sheds, and under buildings	
Conducted by: Building Occupants, Grounds Maintenance	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Spiders and their webs can be eliminated by using a broom or vacuum cleaner in most cases. Maintenance of screens and weather stripping around doors and windows will keep out small insects which spiders pray upon. Sticky traps can also be placed near doors to intercept incoming spiders. The traps can be used to determine if further control efforts are needed.	
Conducted by: Building Occupants, Pest Management Tehcnicians	
Type: Cultural	
Method & Location: Spiders can be discouraged from occupying a particular space through good housekeeping inside and outside of buildings. Keep boxes, old equipment, and other items neatly stored on shelves, clean up and dispose of trash and debris to include old equipment.	
Conducted by: Building Occupants	
CHEMICAL MANAGEMENT	
Basis for Treatment: Spiders are present; in and around building	
Method & Location: Treatment using aerosol spray. Application WILL NOT be done unless there is a significant number of spiders and the occupants have first tried Self-help measures and their efforts have failed to control the spiders.	
Conducted by: Pest Management Technician	
Pesticide Common Name: CB-80 (Aerosol)	EPA Registration Number: 9444-175
Pesticide Common Name: Intruder HPX (Aersol)	EPA Registration Number: 9444-183
Control Standard: No complaints received within 30days of treatment	
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT apply in areas with children less than 1yr old.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Spiders eat insects and other arthropods. If these organisms are present in the home environment, the spider population will be sustained. For this reason, good housekeeping is essential in preventing or suppressing spider infestations. The black widow and brown recluse are found on Fort Knox.	

Integrated Pest Management Outline Number 24

Pest: STORED PRODUCT PESTS	Site: Food Service Facilities (Storage Areas)
Purpose: Control insects that damage and contaminate food and fiber products; reduce economic loss due to damage or contamination	
SURVEILLANCE	
Method & Frequency: Visual observation for insects and/or conditions that could favor insect infestations in stored food products. Pheromone traps and bait boxes will be used for surveillance as well as Environmental Health Services sanitary inspections.	
Conducted by: Veterinary Food Inspectors, Environmental Health Services Inspectors, Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Clean up spilled food materials that may attract insects at least daily. Vacuuming works better than sweeping in particle-filled cracks and crevices. Use bait boxes, if needed.	
Conducted by: Facility Personnel, Pest Management Technician	
Type: Cultural	
Method & Location: All products should be kept in tight-fitting containers; infested products should be removed immediately upon discovery.	
Conducted by: Facility Personnel	
CHEMICAL MANAGEMENT	
Basis for Treatment: Insects found in products or storage areas	
Method & Location: Using a 2-gallon sprayer apply around pallets, floor and wall junctions, and other areas where insects may be present. In the stable grains bins- remove grain and clean bin thoroughly before treating cracks and junctures surrounding the bin.	
Conducted by: Pest Management Technician	
Pesticide Common Name: Phantom (Liquid)	EPA Registration Number: 241-392
Control Standard: No evidence of insects for 30 days following treatment	
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT spray pesticides on food packages or outer food wrapping	
PROHIBITED PRACTICES: DO NOT treat when building is occupied	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: N/A	

Integrated Pest Management Outline Number 25

Pest: SUBTERRAINEAN TERMITES	Site: Buildings and Other Structures
Purpose: To prevent termites from damaging wooden structures and causing economic and historical damage.	
SURVEILLANCE	
Method & Frequency: Visual observation for termites and/or conditions that could favor termite infestations. Ideally all buildings should be examined annually, however, it is recommended that buildings be inspected on a three year cycle.	
Conducted by: Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Ventilate wet or damp areas under buildings. Repair and replace infested wood and structural materials. Monitor new construction to ensure wood is not used as fill for cement foundation and steps.	
Conducted by: DPW Preventive Maintenance, Pest Management Technician	
Type: Mechanical and Physical	
Method & Location: Termite swarms within existing structure should be removed by vacuuming. See Chemical Management for treatment after termite removal.	
Conducted by: DPW Preventive Maintenance, Pest Management Technician	
CHEMICAL MANAGEMENT	
Basis for Treatment: Pre-treat soil under new construction. Treat active termite infestations when identified.	
Method & Location: Power soil injection around building foundation	
Conducted by: Pest Management Technician	
Pesticide Common Name: Termidor SC (Liquid)	EPA Registration Number: 796-210
Control Standard: No subsequent termite infestation or damage from treated structure is identified; five years after completion.	
PRECAUTIONS FOR SENSITIVE AREAS: Avoid getting pesticide in areas where water can become contaminated or in air ducts. DO NOT apply when the building is occupied.	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Termite bait systems provide a proactive method for termite treatment. Use of such systems can reduce or prevent economic damage from occurring. Bait systems reduce the impact of pesticides on the environment by using non-pesticide bait until activity is present.	

Integrated Pest Management Outline Number 26

Pest: TENT CATERPILLARS	Site: Shade and Ornamental Trees
Purpose: To control tent caterpillars which are unsightly and can defoliate and weaken ornamental trees	
SURVEILLANCE	
Method & Frequency: Weekly; through spring months	
Conducted by: Ground Maintenance, Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Remove tents from trees. Removal should be done in the evening to maximize the number of caterpillars in the tents. Alternate methods may be used when tents are higher in the branches. Caterpillars can be killed by placing them in a jar of soapy water and then discarding.	
Conducted by: Grounds Maintenance, Pest Management Technicians	
Type: Biological	
Method & Location: Apply Bacillus thuringiensis (Bt) to tents	
Conducted by: Pest Management Technicians	
CHEMICAL MANAGEMENT	
Basis for Treatment: Presence of tent caterpillars in trees; Bt and hand removal have failed to control caterpillar populations	
Method & Location: Apply pesticide with a power sprayer to affected trees	
Conducted by: Pest Management Technician	
Pesticide Common Name: Talstar One	EPA Registration Number: 279-3206
Control Standard: No live caterpillars 5days after treatment	
PRECAUTONS FOR SENSITIVE AREAS: Post signs in areas where pesticide treatment will occur	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Bt should be applied to all leaf surfaces; heavy rains following treatment may necessitate retreatment.	

Integrated Pest Management Outline Number 27

Pest: TICKS	Site: Wood and Shrub Margins, and Overgrown areas
Purpose: To control ticks; reduce the threat of disease	
SURVEILLANCE	
Method & Frequency: Visual or specimen confirmation after complaint. Drag areas using a white cloth attached to wooden dowels to confirm tick presence.	
Conducted by: Environmental Health Services, Pest Management Technician	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Mow and otherwise keep clear overgrown areas next to wood margins	
Conducted by: Grounds Maintenance	
CHEMICAL MANAGEMENT	
Basis for Treatment: Confirmed tick presence in a defined area	
Method & Location: Apply pesticide using 2-gallon sprayer	
Conducted by: Pest Management Technician	
Pesticide Common Name: Suspend SC (Liquid)	EPA Registration Number: 432-763
Control Standard: No ticks present 10days after treatment; as determined by tick dragging	
PRECAUTIONS FOR SENSITIVE AREAS: Post signs in areas where pesticide treatment will occur	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Tick are found in abundance on Fort Knox. Areas where Soldiers are conducting training and physical fitness should be mowed routinely, as per the Fort Knox Grounds Maintenance Contract(s). Ticks are known to carry several different pathogens that cause disease to humans. Individuals that have a tick(s) attached should remove immediately and should monitor for signs of sickness, or seek medical attention for proper pathogen testing.	

Integrated Pest Management Outline Number 28

Pest: TURF FUNGUS	Site: Golf Course
Purpose: Maintain vitality and attractiveness of fairways, greens, and tees.	
SURVEILLANCE	
Method & Frequency: Daily visual turf inspection during growing months. Samples of diseased turf can be cut (approximately 4inch squares), packed in a box, and taken to a nearby cooperative extension for diagnosis.	
Conducted by: Golf Course Maintenance Personnel	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Properly mow at appropriate intervals and height. Reduce excessive thatch buildup; remove infected grass clippings to reduce sources of disease. Rinse mower and the soles of shoes with a bleach solution to prevent the spread of disease.	
Conducted by: Golf Course Maintenance Personnel	
Type: Mechanical and Physical	
Method & Location: Properly water; continued availability of water or high relative humidity favors fundal disease growth- water only in the morning to ensure that grass dries before nightfall. Fill low spots of turf where water collects to discourage fungal growth.	
Conducted by: Golf Course Maintenance Personnel	
Type: Cultural	
Method & Location: Select fungal-resistant grass cultivars or blends	
Conducted by: Golf Course Maintenance Personnel	
CHEMCIAL MANAGEMENT	
Basis for Treatment: Turf fungus is detected or seasonal conditions are favorable.	
Method & Location: Fairways, greens, and tees.	
Conducted by: Golf Course Maintenance Personnel	
Pesticide Common Name: Instrata (Liquid)	EPA Registration Number: 100-1231
Pesticide Common Name: Headway (Liquid)	EPA Registration Number: 100-1216
Control Standard: No fungus detected	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: N/A	

Integrated Pest Management Outline Number 29

Pest: TURF INSECT PESTS (Webworms, Grubs, and Chinch Bugs)	Site: Golf Course
Purpose: To maintain vitality and attractiveness of greens, tees, and fairways	
SURVEILLANCE	
Method & Frequency: Webworms- Use soap drench monitor by marking off three 2 square feet section of turf, mix 2tbsp of liquid soap in a gallon of water in a sprinkling can, and pour evenly over the sample areas. Soap irritates caterpillars causing them to crawl to the surface. Grubs- In late May examine the underneath of turf by using a spade to cut three sides of a 1sqft to a depth of 4inches, fold back turf and count grubs. Low numbers may be beneficial to maintain grub bacterial pathogens. Watch for large flocks of foraging birds throughout the warm season. Chinch bugs- Select random sample locations and cut the ends off a 2lbs coffee can, push one end of the can a few inches into sod, fil the can with water, and watch for chinch bugs. If present, bugs will float to the surface. Start in May and continue to survey every month.	
Conducted by: Golf Course Maintenance Personnel	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Properly mow and water fairways and tees at appropriate intervals. Modify/ drain continual wet spots to reduce favorable grub habitat	
Conducted by: Golf Course Maintenance Personnel	
Type: Mechanical and Physical	
Method & Location: Top dress turf with a thin layer of composted organic matter mixed half-and-half with medium grade sand. Sand helps prevent compaction and organic matters acts as an inoculant to insect fighting microbes.	
Conducted by: Golf Course Maintenance	
Type: Cultural	
Method & Location: Select pest-resistant grasses, grass species blends, and high endophytic bearing ryegrass- when appropriate. Endophytic grasses contain a symbiotic fungus in their tissues that repel or kill common leaf and stem eating lawn insects. This does not prove effective for root feeding grubs	
Conducted by: Golf Course Maintenance Personnel	
CHEMICAL MANAGEMENT	
Basis for Treatment: Excessive numbers of target pest insect are present and non-chemical methods are not adequate to control populations	
Method & Location: Apply to problem areas; according to label specifications	
Conducted by: Golf Course Maintenance Personnel	
Pesticide Common Name: Scimitar GC (Liquid)	EPA Registration Number: 100-1088
Pesticide Common Name: Meridian 25 EG (Granules)	EPA Registration Number: 100-943
Pesticide Common Name: Permethrin E-Pro (Liquid)	EPA Registration Number: 79676-2
Control Standard: Excessive number of pests is reduced to a tolerable level.	

PRECAUTIONS FOR SENSITIVE AREAS: Post warning signs for golfers before, during, and after pesticide treatment occurs. DO NOT let people onto pesticide treated areas of the golf course within 24hrs of treatment. Do NOT treat turf with certain pesticides if rain is expected
PROHIBITED PRACTICES: N/A
ENVIRONMENTAL CONCERNS: N/A
REMARKS: N/A

Integrated Pest Management Outline Number 30

Pest: ALGAE	Site: Managed Lakes
Purpose: To control algae blooms in managed lakes.	
SURVEILLANCE	
Method & Frequency: Visual observations weekly through the warm season.	
Conducted by: Fish and Wildlife Personnel	
NON-CHEMICAL	
Type: Mechanical and Physical	
Method & Location: Hand removal where present	
Conducted by: Fish and Wildlife Personnel	
Type: Mechanical and Physical	
Method & Location: Place a bail of barley straw in problem area(s).	
Conducted by: Fish and Wildlife Personnel	
Type: Biological	
Method & Location: Introduce triploid grass carp to contained bodies of water. DO NOT place where escape is possible.	
Conducted by: Fish and Wildlife Personnel	
CHEMCIAL MANAGEMENT	
Basis for Treatment: Management of algae required in managed lakes	
Method & Location: Application to water per label instructions.	
Conducted by: Fish and Wildlife Personnel, Pest Management Technician	
Pesticide Common Name: Reward (Liquid)	EPA Registration Number: 100-1091
Control Standard: Excessive amount of algae no long visible	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: DO NOT use triploid grass carp in areas where escape is possible	
ENVIORNMENTAL CONCERNS: N/A	
REMARKS: N/A	

Integrated Pest Management Outline Number 31

Pest: ARMYWORM	Site: Turf grass
Purpose: To control armyworm caterpillars from feeding on grass.	
SURVEILLANCE	
Method & Frequency: Visual observations weekly (May through September)	
Conducted by: Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Plant caterpillar resistant turf grass; where applicable	
Conducted by: Grounds Maintenance Personnel	
Type: Biological	
Method & Location: Apply Bacillus thuringensis (Bt) to areas where army worms have been detected. Apply using Bt spreader/sticker oil to infested turf grass	
Conducted by: Grounds Maintenance Personnel, Pest Management Technician	
CHEMICAL MANAGEMENT	
Basis for Treatment: Visual inspection identifies heavy armyworm infestation where previous methods have failed to control the pest.	
Method & Location: Apply using a backpack or power sprayer (with spreader/sticker)	
Conducted by: Grounds Maintenance Personnel, Pest Management Technician	
Pesticide Common Name: Scimitar GC (Liquid)	EPA Registration Number: 100-1088
Pesticide Common Name: Permethrin E-Pro (Liquid)	EPA Registration Number: 79676-2
PRECAUTIONS FOR SENSITIVE AREAS: DO NOT apply when drift is possible. Keep out of Wetlands	
PROHIBITED PRACTICES: DO NOT apply to Wetlands or where runoff is likely	
ENVIRIONMENTAL CONCERNS: N/A	
REMARKS: N/A	

Integrated Pest Management Outline Number 32

Pest: BAGWORM	Site: Ornamental Shrubs
Purpose: To eliminate bagworms from ornamental shrubs	
SURVEILLANCE	
Method & Frequency: Visual observations	
Conducted by: Building Occupants, Grounds Maintenance Personnel, Pest Management Technicians	
NON-CHEMICAL MANAGEMENT	
Type: Mechanical and Physical	
Method & Location: Hand remove any bagworms observed	
Conducted by: Building Occupants, Grounds Maintenance Personnel, Pest Management Technicians	
Type: Biological	
Method & Location: Apply Bacillus thuringensis (Bt); mid-June through mid-July to young bagworms	
Conducted by: Grounds Maintenance Personnel, Pest Management Technicians	
CHEMICAL MANAGEMENT	
Basis for Treatment: Infestation Is not controlled by non-chemical methods	
Method & Location: Apply using hand or power sprayer to infested areas	
Conducted by: Pest Management Technicians	
Pesticide Common Name: Tempo SC (Liquid)	EPA Registration Number: 432-1363
Control Standard: No living bagworms on treated shrubs	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: Survey in spring for early stages of bagworms to treat. Late stages can only be eliminated by physical removal.	

Integrated Pest Management Outline Number 33

Pest: BATS	Site: Buildings and Other Structures
Purpose: To remove/eliminate bats from structures; reducing potential for health threats to building occupants	
SURVEILLANCE	
Method & Frequency: Visual observation of bats; evidence- droppings	
Conducted by: Building Maintenance Personnel, Pest Management Technicians	
NON-CHEMICAL MANAGEMETN	
Type: Mechanical and Physical	
Method & Location: Exclusion. Construct or remodel buildings to eliminate holes where bats may enter. Use of bird netting check valves will allow bats to exit the building, but not re-enter. Erect bat proof structures in spring before bats return to nest, or in late fall- at night after the young and adult bats leave to hunt insects.	
Conducted by: Building Maintenance Personnel, Pest Management Technician	
Type: Mechanical and Physical	
Method & Location: Removal. Allow a migrating bat that has entered a house temporarily to fly out through opened windows and doors. When this technique fails, place a box or can over the bat and slide a stiff piece of cardboard underneath the bat, enclosing it in the container. Following removal, exclusion of bat entry points should be executed.	
Conducted by: Pest Management Technician	
Type: Cultural	
Method & Location: Keep doors, windows, and other screened openings closed when not in use. Prior to roost elimination construct artificial roots to attract house displaced bats	
Conducted by: Building Maintenance Personnel, Pest Management Technician	
CHEMICAL MANAGEMENT	
Basis for Treatment: N/A	
Method & Location: N/A	
Conducted by: N/A	
Pesticide Common Name: N/A	EPA Registration Number: N/A
Control Standard: N/A	
PRECAUTIONS FOR SENSITIVE AREAS: N/A	
PROHIBITED PRACTICES: N/A	
ENVIRONMENTAL CONCERNS: N/A	
REMARKS: All personnel protective equipment should be used when handling bats. Thick, metal mesh gloves should be used when handing a live bat.	

Appendix B

Plan Update Form (for Army Environmental Center)

FY__ Annual Plan Update (PUF) Submission Date_____

1. INSTALLATION: The following information describes your installation.

Installation Name	State/Country	County	IMCOM Region

Do you have an approved Integrated Pest Management Plan?	
When was the original plan prepared, reviewed, and approved (signed) by the Garrison Commander/ Manager?	
What is the name and rank of the Garrison Commander/ Manager?	
What is the date the plan was last reviewed and technically validated by USAEC?	
Are you planning to rewrite/revise your IPMP? If yes, explain.	

2. STAFFING: The following information defines installation resources used to support the pest management program. Resources can be either in-house or contracted. NOTE: If space in tables is inadequate, list additional staff on a separate page.

	Name	E-mail	Telephone	Organization	Certification/ Accreditation Number
PM Coordinator					
PM Quality Assurance Evaluator					
PM Quality Assurance Evaluator					
PM Quality Assurance Evaluator					

Provide the following information about the pesticide applicators. NOTE: Also include any Army employees who are in training for certification.

Name	Organization	DoD/ State Cert. Number	Catergory/Subcategory Number or Letters

3. PEST MANAGEMENT OPERATION:

a. The following table shows the distribution of the pest management workload in terms of specific in-house and contracted operations. (For each area, check appropriate- leave blank if not applicable.)

Area	In-house	Contract	Government Purchase Card w/o Formal Contract
Government Housing			
Residential Community initiative Housing			
Golf Course			
Ranges & Other Training Areas			
Dependent Schools			
Child Development Centers-Youth Services Centers			
All Food Handling Buildings			
Barracks, BEQ, BOQ, Guest Housing			
Misc. Buildings			
Lawn & Ornamental			
Nuisance Wildlife			
Hospital or Clinic			
Grounds Maintenance			
Forestry & Conservation Areas			
AAFES			
Commissary			

4. PESTICED USE:

a. The installation baseline (average of FY02 and FY03) was ____ Pounds of Active Ingredient (PAI).

b. Reported PAI for last FY was _____

c. Do you have an Agriculture Out-lease program on your installation?

d. What was the amount of PAI from Agriculture Out-lease during the last FY?

e. Do you use any biological control agents (fungi, bacteria, insects)? If so, list.

f. Additional comments on PAI (i.e., Increase or decrease in the last FY).

5. PLANNED MAINTENANCE: List any minor program changes to the plan for the new FY. Major plan revisions require resubmission of the entire plan.

6. PESTICIDE USE PROPOSAL (PUP): Attach the current FY PUP.

7. ON-SITE HELP: Indicate if you would like an assistance visit this year and briefly describe the reason for such visit.

8. AERIAL APPLICATION OF PESTICIDES DURING UPCOMING FY?

9. IF YES, DO YOU HAVE AN APPROVED AERIAL SPRAY STATEMENT OF NEED?

Appendix C

Installation Points of Contact (POC)

Installation Points of Contact (POC)

Emergency	911
Fire Department (Non-emergency)	502-624-6016
Military Police Operations (DES)	502-624-1776
Installation Safety Office	502-624-4920
Pest Management Coordinator (Acting)	502-6247368
Environmental Health Services	502-624-5371
Ireland Army Community Hospital	502-624-9333
EMS/ Ambulance Services	502-624-9555
RCI Office	502-624-7009

Appendix D

Five-Year Plan

Five-Year Plan

This appendix addresses the direction and needs of the pest management program for the period of 2016-2021. Listed are the primary areas of the program which will have a major impact on the ability to do work.

1. CERTIFICATION.

a. The Pest Management Coordinator (PMC) will become certified and accredited for both PMC and the Quality Assurance Evaluator (QAE).

b. Each contract will have a certified QAE actively overseeing pesticide operations.

c. All contractors will maintain Kentucky State certification and licensing in the appropriate categories.

2. RECURRING PEST MANAGEMENT REQUIREMENTS.

a. Pest control standing service orders- year round.

b. Service requests through work orders- year round.

3. EQUIPMENT- Hand held sprayers.

a. Major pieces of equipment must be replaced in a timely manner to ensure continuity of operations. For this reason, the equipment will be programmed for replacement according to the schedule. Equipment purchase dates and replacement schedules are maintained by contractors.

4. PESTICIDE REPORTING.

a. All pesticide applicators on the installation will provide on a monthly basis usage information as identified by the IPMC

b. QAE’s will provide the PMC with DD form 1532 for annual pesticide usage.

5. CERTIFICATIONS.

a. All DoD certified pesticide applicators will maintain occupational health requirements including pulmonary function testing and respirator fit testing.

6. SAFETY.

a. Proper safety and usage documentation, including MSDS/SDS’s, will be provided to all Self-help participants.

Appendix E

Small Animal Control

(IMKN-ES, SUBJECT: Annex 52; SOP #54, Small Animal Control, Dated 28 April 2015)

IMKN-ES 28 April 2015
SUBJECT: Annex 52; SOP #54 Small Animal Control

1. PURPOSE. The purpose of this SOP is to outline the procedures and responsibilities for the Desk/Patrols regarding pet control at Fort Knox, KY.

2. APPLICABILITY:

a. This Standing Operating Procedure (SOP) applies to all Department of the Army Civilian Police and members of the United States Armed Forces who are stationed, assigned, attached or under the operational control of the Directorate of Emergency Services, Law Enforcement Division, Fort Knox, KY, performing Law Enforcement duties.

b. Violations of this SOP may result in administrative action or action under the Uniform Code of Military Justice (UCMJ).

3. REFERENCES: Memorandum of Agreement (Knox Hills LLC and Hardin County, KY)

4. GENERAL:

a. Knox Hills LLC:

(1) Solely responsible to respond to complaints/reports from housing residents regarding stray/unwanted/nuisance dogs, cats, or other pets within the housing areas.

(2) Receive stray dogs, cats, or other pets captured by Police Patrols from areas near the housing areas where it is obvious the animal is stray from a housing area.

b. Police Desk/Patrols:

(1) Residents that contact the Police Desk for assistance regarding stray/unwanted/ nuisance dogs and cats within the housing areas will be referred to Knox Hills LLC for assistance.

(2) Upon request from Knox Hills LLC or a perceived emergency from residents of an aggressive animal, a patrol will be dispatched to assist as needed. Patrol will respond with animal noose and PPE. Upon gaining control, the animal will be transferred to the Knox Hills LLC personnel for further disposition.

(3) Complaints/calls regarding stray dogs/cats from areas other than housing areas, a Patrol will respond with animal noose, cage and PPE. Upon gaining control, the animal will be transferred to Hardin County Animal Control personnel for further disposition.

(4) Allegations of animal abuse/neglect, patrol will be dispatched to investigate and verify if elements of a criminal offense exist. If evidence does exist, Knox Hills LLC will be contacted for temporary custody and the on call Ft. Knox Vet Clinic Staff will be contacted to coordinate the disposition of the animal. Patrol will complete an ALERTS Report documenting the incident and or crime.

IMKN-ES 28 April 2015
SUBJECT: Annex 52; SOP #54 Small Animal Control

(5) Complaints/Reports of animal bites or other injuries sustained: Patrol is dispatched and will investigate the incident documenting on ALERTS Report and have the owner produce vaccination records to assist with the medical treatment. Personnel bit or sustaining injuries will be directed to IACH ER for treatment and official recording of injuries sustained to assist with the Ft Knox Vet Clinic follow up investigation. The animal (pet) involved will not be taken into custody by Police Patrols.

(6) Patrols will collect wild deceased animals found on the installation using proper PPE and transport them to the DES animal disposal container if the owner is unknown.

(7) Wounded Animals.

a. Wild Animals- Upon making contact with wounded wild animals that require euthanasia, the on duty Game Warden will be notified to terminate the animal. Patrols will only terminate the life of an animal with the prior approval of Desk Sergeant/Supervisor if the Game Warden is unavailable. A shotgun will be used for such purposes and should be done out of public view. Terminated animals will be transported to the DES animal disposal container.

b. Domestic Animals (Pets) - Upon making contact with a wounded domestic animal (pet), an attempt will be made to contact the owner to determine the course of aid. If the owner cannot be contacted, Patrols will notify the on-call vet for assistance and guidance.

5. Point of contact for this memorandum is the Operations Captain at 624-4337.

Appendix F

Memorandum of Agreement

Stray Animals

MEMORANDUM OF AGREEMENT
BETWEEN
KNOX HILLS LLC,
AND
HARDIN COUNTY, KENTUCKY

PURPOSE: This Memorandum of Agreement (MOA) is entered into by and between Knox Hills LLC and Hardin County, Kentucky, for the purpose of establishing a working relationship between the respective parties. This MOA is entered into under the following premises:

WHEREAS, both parties agree that establishing an agreement to assist in the storage, housing and disposition of stray or unwanted dogs and cats, either captured on Fort Knox and transported to Hardin County Animal Shelter, or turned in by confirmed residents of Fort Knox to Hardin County Animal Shelter, will benefit the safety and wellbeing of both parties and the communities of Fort Knox and Hardin County; and

THEREFORE, the parties agree to abide by the following terms and conditions:

1. RESPONSIBILITIES:

a. Knox Hills LLC agrees:

(1) It will be solely responsible for the transportation of any stray, or abandoned dogs or cats captured by Fort Knox Directorate of Emergency Services or Knox Hills LLC and transported by Knox Hills LLC, to the designated Hardin County Animal Shelter. Any mishaps or injuries that may occur to Fort Knox or Knox Hills personnel during the transport to and storage of stray or abandoned animals in the County facility will be the sole responsibility of Knox Hills LLC and Hardin County will not be held liable in any way, unless otherwise in accordance with Federal or Kentucky law.

(2) It will provide complete records on all animals surrendered to the Hardin County Animal Shelter. All records will be recorded on animal intake forms provided by Hardin County. A copy of this form is attached to this document as Exhibit 1.

(3) Prior to transporting animals to the Hardin County Animal Shelter, Knox Hills LLC will ensure the animal appears to be in good health and solicit Fort Knox Veterinary Services as required. If veterinary care is required as determined by either party, Hardin County will notify Knox Hills who will either approve medical attention charges or transport the animal to Fort Knox veterinary facility for the required attention. Once accepted by the Hardin County Animal Shelter, all veterinary care is the responsibility of Hardin County.

(4) It will pay a fee of $142.00 per cat and $142.00 per dog for each animal Knox Hills LLC transfers to the care of Hardin County or for each animal surrendered to the Hardin County Animal Shelter by a confirmed resident of Knox Hills. These fees shall be the total cost that Knox Hills LLC shall pay Hardin County to accept the animal other than any veterinary care agreed to prior to acceptance of the animal by Hardin County. Knox Hills LLC will pay these fees not less than monthly to Hardin County.

(5) For the initial term of period of 12 months Knox Hills agrees to pay a setup fee of $1666 per month to Hardin County to compensate them for start-up costs to enable them, to accommodate the increase of volume. This will be added to the monthly invoice for that period.

(6) Knox Hills will purchase cages for use at the Hardin County Animal Shelter up to a cost of Nine Thousand Dollars, $9,000.

(7) Should Knox Hills terminate this agreement for any reason other than breach, it shall not be entitled to any refund of fees, including set up. It shall be entitled to the return of its cages as stated in 1 a (6) above.

b. Hardin County agrees:

(1) To accept stray or unwanted cats and dogs in the Hardin County Animal Shelter during normal business hours (Mon.-Fri. 9:00 AM to 4:30 PM; Sat. 12:00 PM to 4:00 PM). Arrangements may be made for around the clock drop off of cats and dogs transported by Knox Hills, using the current Hardin County Animal Shelter Animal Drop-Off Procedure.

(2) Once stray, unwanted, or abandoned animals are accepted by the Hardin County Animal Shelter, all veterinary care becomes the responsibility of Hardin County.

(3) It will provide Knox Hills LLC with a list of required paperwork and expenses a pet owner must pay in order to retrieve his or her animal(s) from the facility. It will also provide a list of all residents that retrieve their animals to Knox Hills LLC to enable them to recover their expenses from the animal owner.

(4) When a purported Knox Hills resident drops a dog or cat at Hardin County Animal Shelter, Hardin County is to contact Knox Hills between the hours of 7 AM and 4:30 PM Monday through Friday to confirm current residency. Once confirmed, Hardin County will charge Knox Hills for accepting the pet at the rates detailed in 1.a. (4). Hardin County will only be entitled to recover charges for animals that are confirmed as a current Knox Hills resident. In accordance with Fort Knox and Knox Hills policy, Hardin County cannot accept animals Hardin County deems to require veterinary attention and will direct the pet owner to seek

veterinary care for the animal at the Fort Knox Veterinary Facility prior to returning the animal to Hardin County Animal Shelter.

(5) It will provide on an annual basis an 8 hour training session on animal capture and safety techniques to Fort Knox and Knox Hills LLC personnel who capture stray animals. Occasional interim training sessions may be provided for new Knox Hills LLC personnel who capture stray animals.

(6) Should it terminate the agreement for any reason other than breach within 60 months from inception that it will repay to Knox Hills the prorated amount of the setup fee at the rate of $332.00 for each month less than 60.

(7) It agrees that any cages or other equipment purchased by Knox Hills LLC shall remain the property of the same and returned on any termination of this agreement.

c. Knox Hills LLC and Hardin County agree:

(1) All animals accepted by Hardin County will then become the responsibility of Hardin County upon acceptance.

(2) Collection of all recovery charges that are applicable to owners of recovered pets shall be the responsibility of Hardin County.

(3) The animal control shelter shall continue to be solely operated by Hardin County Fiscal Court and once an animal is physically relinquished to Hardin County Animal Control, all decisions made in regard to the custody and care of the animal shall be made by Hardin County Animal Control including but not limited to, the time the animal is held at the shelter, adoption, return to owner, and euthanasia.

(4) Upon taking possession of the animals, the animals become the property of Hardin County. However, animals will be relinquished to their rightful owners if claimed within five days for dogs and 3 days for cats, provided the owner pay Hardin County the recovery charges as mentioned in c. (3) above.

d. The preferred method of payment for all fees shall require Hardin County to provide Knox Hills with a monthly invoice that shall be paid on net 30 terms.

e. The charge for services as listed in 1.a.(4) of this MOA shall increase or decrease in accordance with changes in the Consumer Price Index, all urban consumers, all items, unadjusted (1967=100) as published by U.S. Department of Labor, Bureau of Labor Statistics, hereinafter referred to as "CPI"

(1) As promptly practicable after July 1, 2015, and each July thereafter during the term of this MOA, Hardin County shall compute the change, if any, in the cost of living for the preceding one-year period, based upon the CPI.

(2) The CPI number for January 2014, and each January thereafter during the term of this franchise, shall be the "base index number", and the corresponding CPI number for December 2014 and each December thereafter during the term of this franchise shall be the "current index number" for the first CPI adjustment period.

(3) The current index number shall be divided by the base index number. From the quotient thereof, there shall be subtracted the integer 1, and any resulting positive or negative number shall be deemed to the percentage of increase or decrease in the CPI.

(4) The percentage of increase or decrease multiplied by the rate shall be the change required to determine the new rate.

(5) Hardin County shall, within a reasonable time after obtaining the appropriate data necessary for computing such increase or decrease, give Fort Knox notice of any increase or decrease so determined.

(6) The CPI adjusted rate for services shall become effective and billed as of July through July of each year.

2. GENERAL PROVISIONS

(1) Points of Contact: The following points of contact (POC) will be used by the Parties to communicate in the implementation of this MOA. Each Party may change its point of contact upon reasonable notice to the other Party.

(a) For Knox Hills LLC

(b) Mr. Peter Ross, Knox Hills, Project Director (502) 799 6589

(2) For the Hardin County Animal Control, including the shelter

(a) Gerald Foley, Animal Control Director, (270) 769-3428

(b) James Roberts, Deputy Judge/Executive, (270) 765-2350

a. Correspondence: All correspondence to be sent and notices to be given pursuant to this MOA will be addressed, if to the [first party], to

(1) PO Box 608 W Chafee Avenue, Fort Knox, Kentucky 40121
If to the [second party], to

(2) 220 Peterson Drive, Elizabethtown, Kentucky 42701

b. This MOA shall become effective on the date it is signed by all parties and shall remain in effect for one year (initial term), thereafter renewing annually. However, Hardin County will be given up to 30 days from the signing of the document to prepare for the acceptance of Fort Knox dogs and cats. Either party may terminate the Agreement after the initial term at any time upon 90 days written notification to the other party at the addresses provided for the principal signatories. All charges incurred to the date of termination will be due and owing and paid on the due dates.

c. Any changes or amendments to this agreement may be made at any time upon written agreement of the parties.

d. Disputes: Any disputes relating to this MOA are subject to the law of Kentucky.

e. Transferability: This Agreement is not transferable except with the written consent of the parties.

f. Entire Agreement: It is expressly understood and agreed that this MOA embodies the entire agreement between the Parties regarding the MOA's subject matter.

AGREED:

HARRY L. BERRY
Hardin County Judge/Executive

May 30, 2014
Date

PETER R ROSS
Project Director
Knox Hills LLC

2 JUNE 2014
Date

Appendix G

Zika Virus Surveillance

Zika Virus Surveillance- Fort Knox, Kentucky June 2016

1. BACKGROUND. Zika virus is spread from an infected person to an uninfected person through the bite of an infected Aedes species mosquito. Although most infections do not cause symptoms, Zika virus infection may result in fever, rash, joint/muscle pain, and conjunctivitis (Pink Eye). Currently, Zika has affected more than a million people in South and Central America, Mexico, and the Caribbean. The number of Zika cases among travelers to these areas and returning to the United States will likely increase. These imported cases may result in local spread of the virus within the United States. Zika virus can be prevented by protecting against mosquito bites and eliminating mosquito breeding areas.

Aedes aegypti and *Aedes albopictus* are known to transmit Zika and are well established in the United States. There are other species of Aedes located throughout the United States, but at this time we have no reason to suspect they can transmit Zika. Fort Knox is located in an area where *Aedes albopictus* has been identified, thus making personnel at risk for Zika transmission.

2. PURPOSE. This appendix provides and outline for the procedures and responsibilities for Zika Virus surveillance on Fort Knox, Kentucky.

3. APPLICABILITY. This appendix applies to all Department of the Army Civilians and members of the United States Armed Forces who are stationed, assigned, attached or under the operational control of Fort Knox units or tenant units.

4. REFERENCES.

a. Department of the Army Memorandum, SUBJECT: Surveillance, Testing and Control of Zika Virus Transmitting Mosquitos on Army Installations and Housing Areas, Dated 31 March 2016.

b. Secretary of Defense Memorandum, SUBJECT: Strategy for Control of Zika Virus Transmitting Mosquitoes on Military Installations and Housing Areas, Dated 17 March 2016

c. Department of Defense Guidance for the Surveillance, Control and Testing of *Ae. aegypti*, *Ae. Albopictus*, or *Ae. Polynesiensis* for Zika Virus, Dated February 2016.

5. GENERAL.

a. Mosquito Surveillance. Environmental Health Services located on Fort Knox will expand their existing vector surveillance program to specifically include *Ae. aegypti*, *Ae. albopictus*, and/or *Ae. polynesiensis*. The Biogent (BG) Sentinel trap with BG lure is the most effective for capturing these species, and have been ordered by the C, EHS. Until this order is filled current trapping equipment will be used. Target areas for surveillance will be housing, Child Development Centers (CDC), youth centers, barracks, and Cadet Summer Training sites (i.e., assembly areas and tactical training bases). EHS will coordinate with Knox Hills, LLC. for surveillance being conducted in privatized housing areas.

b. Mosquito Testing. An approved DoD Laboratory will be used to test mosquitoes for Zika Virus. EHS will coordinate with U.S. Army Public Health Center-Atlantic, Entomological Services Division at Fort Meade, Maryland for all testing needs. Collected mosquitoes will be

submitted at least weekly. Confirmed positive mosquito pools will be reported back to the installation and to the Armed Forces Health Surveillance Branch within 24hrs of confirmation.

c. Mosquito Control. Routine mosquito control involves identifying and eliminating temporary water-holding breeding sites. In areas where mosquito larvae have been detected, larval control should be initiated. Mosquito fogging for adults is typically not an efficient method of mosquito control and poses a greater risk to the environment than larval control methods. Adulticides should only be used in situations where high numbers of adults have been detected and in areas where application will provide sufficient knockdown of adult mosquitoes.

6. The point of contact for Appendix G is the Chief, Natural Resources Branch at 502-624-7368.

APPENDIX F

Integrated Wildland Fire Management Plan

US ARMY GARRISON

FORT KNOX, KENTUCKY

Prepared by:

NATURAL RESOURCES BRANCH
ENVIRONMENTAL MANAGEMENT DIVISION
DIRECTORATE OF PUBLIC WORKS

November 2009

INTEGRATED WILDLAND FIRE MANAGEMENT PLAN

US ARMY GARRISON
FORT KNOX, KENTUCKY

APPROVAL

This Integrated Wildland Fire Management Plan meets the requirements set forth in DoD Instruction 6055.6, 10 October 2000, *DoD Fire and Emergency Services Program*; Army Regulation 200-1, *Environmental Protection and Enhancement*, 13 December 2007; Army Wildland Fire Policy Guidance Memorandum DAIM-ZA (200-3), 4 September 2002; Fort Knox Integrated Natural Resources Management Plan, October 2008; Fort Knox Integrated Cultural Resources Management Plan, 2009-2013; 1995 Federal Wildland Fire Management Policy, January 2001; National Wildfire Coordinating Group (NWCG) *Wildland Fire Qualifications System Guide*, (PMS 310- 1/NFES 1414), May 2008.

Eric C. Schwartz
Colonel, US Army
Garrison Commander

Date

Integrated Wildland Fire Management Plan
US Army Garrison, Fort Knox, Kentucky

Reviewed by:

Patrick A. Walsh
Director of Public Works

Patrick A. Walsh
17 Nov 2009
Date

Kenneth L. Boeglen
Director of Plans, Training, Mobilization,
& Security

Kenneth L. Boeglen
5 Jan 2010
Date

Michael C. Petty
LTC, US Army
Director of Emergency Services

Michael C. Petty
8 Jan 2010
Date

TABLE OF CONTENTS

Integrated Wildland Fire Management Plan
US Army Garrison, Fort Knox, Kentucky

1.0 Introduction

The Fort Knox Integrated Wildland Fire Management Plan (IWFMP) was developed for the US Army Garrison, Fort Knox, Kentucky to meet the requirements set forth in the Army Wildland Fire Policy Guidance Memorandum, DAIM-ZA (200-3), 4 September 2002. The policy requires installations that have unimproved grounds that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool to prepare an IWFMP. The IWFMP lays out specific guidance and procedures in the prevention, detection, and suppression of wildfires and the planning and operating procedures involved with prescribed burning on the installation. The IWFMP will comply with the principles, policies, and recommendations articulated in the Integrated Natural Resources Management Plan (INRMP), Integrated Cultural Resources Management Plan (ICRMP), and all installation Fire and Emergency Services program plans, and will be in accordance with the following regulations and policies:

- DoD Instruction 6055.6, *DoD Fire and Emergency Services Program*, October 2000
- Army Regulation 200-1, *Environmental Protection and Enhancement*, 13 December 2007
- Army Memorandum, DAIM-ZA (200-3), *Army Wildland Policy Guidance,* 4 September 2002
- 1995 Federal Wildland Fire Management Policy, January 2001
- National Wildfire Coordinating Group, *Wildland Fire Qualifications System Guide*, PMS 310-1/NFES 1414, April 2006
- NFPA Standard 295 – *Standard for Wildfire Control*, Standard 299 – *Protection of Life and Property from Wildfire*, and Standard 1051- *Wildland Fire Fighter Professional Qualifications*

2.0 Goals and Objectives of Fire Management Program

2.1 Goals

Safety - Provide wildland fire suppression support that prevents wildland fires from escaping the installation and minimizes the threat to human life and property. Conduct prescribed burns in a safe manner to reduce fuel loading, thereby reducing the risk of catastrophic wildfire.

Military Mission - Manage wildland fire in a manner that supports the military training mission and enhances training lands. Use prescribed fire in appropriate areas to manage vegetational succession to improve training lands for military training activities.

Ecosystem Management - Use prescribed fire to maintain the integrity and biological diversity of the ecosystem and to reduce the incidence of wildfires. Proper fire management will benefit many species of game and non-game wildlife, reduce nondesirable hardwood tree species, and help restore and maintain oak/hickory forests.

2.2 Objectives

- Keep all wildland fires as small as possible by maintaining fuel loads at levels appropriate for the prevention of major wildfires and to be able to easily extinguish them quickly.

- Use prescribed fire to improve or maintain the quality of training lands on the installation to achieve a high level of combat readiness and minimize the loss of training time due to wildfires.

- Manage smoke from prescribed fires in a manner that does not impact military training or smoke sensitive areas.

- Restore and maintain native grass communities on Fort Knox by the use of prescribed fire.

- Maintain fire management qualifications for all firefighters and fire managers and ensure all personnel assigned to those positions are trained to a level appropriate for their expected duties.

- Maintain approximately 51 miles of firebreaks on the installation annually.

- Protect all natural and cultural resources, to the extent feasible, through a program of fire prevention and suppression.

3.0 Location

Fort Knox is approximately 108,955 acres and is located in north-central Kentucky, approximately 31 miles south of Louisville, Kentucky and occupies portions of Bullitt, Hardin, and Meade Counties. It is located in the Pennyroyal Plain of the Mississippian Plateau Region and the Knobs area of the outer Bluegrass Physiographic Region. Elevations range from 380 feet above mean sea level along the Ohio River to 990 feet at Dawson Knob. The topography ranges from flat, alluvial flood plains along rivers to rugged knobs and broad ridge tops, narrow valleys, and steep to sloping cliffs. Most of the installation lies within a rolling to hilly landscape featuring karst topography of intermittent sinkholes, outcropping knobs, narrow steep ridges, sinking streams, caves, and other karst features.

Fort Knox is the nation's center for armor and cavalry training and provides high-quality, realistic training opportunities for the Army, Air Force, Navy, Marine Corps, National Guard, Coast Guard, Reserve forces, and military units of other nations. In 2009, Fort Knox began

transition to an Infantry Brigade Combat Team (IBCT) and in 2011 the Armor Center and School will move to Fort Benning, GA.

4.0 Organizational Structure and Responsibilities

4.1 Garrison Commander, or appropriate designee

Defines the roles and responsibilities for wildland fire management on the installation, plans and programs resources, and will designate an installation Wildland Fire Program Manager from either the Fire and Emergency Services Division or Natural Resources Branch (NRB). Approves the installation's IWFMP and assures the maintenance of training records (e.g., through the Civilian Personnel Office, Wildland Fire Program Manager, or Fire Chief). Approves the deployment of Army civilian firefighters to any off-installation incident.

4.2 Wildland Fire Program Manager

The Chief of the NRB has been appointed as the Wildland Fire Program Manager. The Wildland Fire Program Manager will be responsible for developing and implementing the IWFMP and ensuring it complies with applicable federal, state, and local regulations and policies. The Wildland Fire Program Manager will review and approve burn plans for prescribed fires to insure consistency with the IWFMP, the INRMP, and other applicable operating instructions such as state and local regulations.

4.3 Fort Knox Fire Department, Fire and Emergency Services Division (FESD), Directorate of Emergency Services (DES)

The Fort Knox Fire Department will be the lead organization for wildfire suppression on the installation. Fire Department personnel will respond to all wildfires and will notify the NRB on the location and approximate size of the fire. The Fire Department will work with Range Branch personnel to suppress most wildfires in the training complex. If necessary, they may contact the NRB for assistance in wildfire suppression. The Fire Chief, or his delegate, will serve as the incident commander when the Fire Department is on the scene. In the absence of the Fire Department, the senior Range Branch official will serve as the incident commander. If NRB personnel are the first to arrive on the scene of a wildfire, one of their representatives will serve as incident commander until the Fire Chief, or his delegate, arrives. The incident commander will assess the situation and make a decision as to how, or if, the fire will be suppressed, based on location, wind direction, fire intensity, distance from smoke sensitive areas, etc.

4.4 Range Branch, Training Division, Directorate of Plans, Training, Mobilization, and Security (DPTMS)

The Range Branch, Training Division will evaluate fires in the training areas outside of the impact area for possible intervention; fires within impact areas are fought only if there is reason to think they might extend beyond the impact area. Any wildland fire activities in impact areas will be closely coordinated with Range Branch. Range Branch personnel will

work with the Fire Department to suppress most wildfires in the training complex. The Range Branch will also conduct prescribed burns in the range areas and will coordinate these burns with the NRB.

4.5 Natural Resources Branch (NRB), Environmental Management Division (EMD), Directorate of Public Works (DPW)

The NRB will be responsible for planning and initiating prescribed burns on the installation and will support the Fire Department as necessary with regard to wildfires. Prescribed burns will be done in accordance with Army Wildland Fire Policy Guidance and the IWFMP. The NRB will be responsible for the development and maintenance of firebreaks and will track and maintain a database of wildfires on the installation.

5.0 Interagency Cooperation and Mutual Aid Agreements

5.1 Army Environmental Center (AEC) and the US Department of Agriculture-Forest Service (USDA-FS)

Through this agreement, Fort Knox obtains wildland and prescribed fire training and annual prescribed burning support from these agencies.

The AEC, through the Reimbursable Programs Tracking System (RPTS), maintains a list of qualified wildland firefighters available for regional or national deployment. Prior to notification to AEC through the RPTS, those wildland firefighters volunteering for deployment must be approved by the Garrison Commander.

A Memorandum of Understanding will be established between the Fort Knox DPW, Kentucky Division of Forestry (KDF), Daniel Boone National Forest, and Fort Campbell Aviation Brigade to provide air support for Fire Bucket operations.

Fort Knox DPW, EMD will establish a reciprocal Interagency Agreement with the KDF. The intent of the Agreement is to share planning/management strategies and resources to include human, logistical, and operational resources.

5.2 Mutual Aid Agreements

Mutual Aid Agreements exist between Fort Knox and Fire Departments within Hardin, Bullitt, and Meade Counties. These include wildland fire support, on and off the installation. Copies are located at the Fire Department and the Installation Operations Center (IOC).

5.3 Emergency Fire Fighting Details

Military units will be requested to assist as necessary for fire fighting in the case of an emergency.

6.0 Smoke Management and Air Quality

Smoke management is an integral part of each Prescribed Burn Prescription prepared by the Fort Knox NRB. A detailed Prescribed Burn Prescription is prepared for each prescribed burn planned on the installation. Prescribed burning will be done in accordance with the National Wildfire Coordinating Group (NWCG) publication PMS420-2/NFES 1279 *Smoke Management Guide for Prescribed and Wildland Fire, 2001 Edition* and USDA-FS guidelines and applicable state and local regulations. The state of Kentucky permits open burning for agricultural, silvicultural, range, and wildlife management practices under Regulation 401 KAR 63:005. Smoke generated from prescribed burns may degrade air quality; however, impacts to air quality from smoke would be temporal in nature and would not significantly impact the overall air quality.

Smoke-sensitive areas surrounding Fort Knox are the city of Radcliff to the southwest; the town of Muldraugh to the northwest, which lies completely within Fort Knox; Highway 31W which runs north/south through the west-central portion of the installation; Highway 313, which runs east/west through the installation near its southern boundary; the Town of Lebanon Junction to the southeast; the city of Shepherdsville to the northeast; several sub-divisions, primarily around the city of Radcliff; and Interstate 65, which runs north/south parallel to the installation's eastern boundary. Fort Knox's cantonment area is located in the west-central portion of the installation near Highway 31W and includes the hospital, housing areas, Headquarters, and other smoke-sensitive buildings.

7.0 Safety and Emergency Operations

The on-site Incident Commander will ensure all firefighter and public safety precautions are taken and are the highest priority in wildland fire management. Except in the event of a threat to human life, no wildfire situation will require placing civilian or military personnel and equipment in extreme danger. Firefighters must wear all necessary protective equipment outlined in the National Fire Protection Association (NFPA) 1977 – *Standard on Protective Clothing and Equipment for Wildland Fire Fighting*, while responding to a wildfire or conducting a prescribed fire. Students not yet certified in training status shall receive closer than normal supervision. All prescribed burns on Fort Knox will be conducted by a trained prescribed burn boss. Creeks, firebreaks, and roads will be used to contain wildfires and prescribed burns where practicable. Backfires, spot fires, and strip fires will be used to prevent wildfires from escaping and for conducting prescribed burns.

There are approximately 51 miles of installation boundary and interior firebreaks on Fort Knox. Approximately 14 miles are within or on the boundary of impact areas; terrain and other factors determine widths. The NRB is responsible for firebreak maintenance and construction, although contract support will be used as needed.

8.0 Risk Assessment Decision Analysis Process

The burn boss will review the Fire Weather issued by the National Weather Service. Prescribed burning will not be conducted under any one of these circumstances:

- A predicted temperature greater than 85 degrees F
- A predicted wind speed greater than 18 mph at the 20' level
- A predicted relative humidity less than 25% on dormant season burns
- A predicted fuel moisture of less than 9%, ignition component greater than 50%
- An atmosphere with Red Flag conditions issued by the KDF or USDA-FS
- Inadequate personnel or equipment are available to manage the prescribed burn

However, the NRB Chief may decide to perform prescribed burning operations outside of the above stated parameters based on the location of the planned burn, the conditions of the area to be burned and the conditions of the surrounding areas, the desired results, etc.

9.0 Wildland Fire History

Fort Knox lies within the Central Hardwoods Region and is comprised predominately of mixed upland and mesic hardwood forests, interlaced with scattered grasslands, narrow streams, and broad riparian areas. The oak/hickory forest type is the dominant tree cover type on the installation and most forest management actions are geared toward its establishment and management. The oak/hickory forests on Fort Knox, as in much of the eastern United States, are declining; the decline is mainly the result of past forestry practices and the lack of fire in the forests, which has resulted in more shade-tolerant species in the understory and overstory. Fire has played a very important role in establishing and maintaining oak/hickory forests in this area of the country. Oaks, in particular, have adapted several characteristics that allow them to benefit from periodic, low-intensity surface fires. Lightning-ignited fires have been shaping eastern forests for millennia and fire was also used extensively by Native Americans to clear land for crops, drive large game, improve hunting lands, stimulate berry production, and, in some cases, to fight enemies. Early settlers also used fire for some of the same reasons, but to a lesser degree. In the early 1900s, however, a fire suppression policy was adopted and fire was removed from much of the landscape. Subsequently, due to the lack of disturbance the forests have succeeded to a mixture of pioneer species and more shade-tolerant species.

Wildfires on Fort Knox are relatively common, due primarily to the incendiary ammunition and pyrotechnics fired on the ranges; however, these fires are typically small, but larger, more significant fires can occur during extreme weather events. The wildfire season for Fort Knox is generally mid-February through April, when the leaf litter on the ground dries out, but before spring green-up when young herbaceous plants start to grow; and October through mid-December, after the leaves fall, but before they are flattened by snow or rain.

Prescribed burning is an important land management tool utilized by Fort Knox natural resource managers. Prescribed burning is used to eliminate, or reduce the severity of wildfires by reducing fuel loads in forests and to manage native grasslands and forests. Prescribed fires

are generally conducted from December through April, with a few occurring in the fall. The decision to use prescribed burning will be based on the potential safety hazards involved, the hazard that will develop if burning is not accomplished, the type of habitat involved, applicable state and local regulations, and coordination with the Fire Department and Range Branch.

10.0 Natural and Cultural Resource Considerations

Sensitive natural resource areas are listed in the INRMP and will be protected from fire if necessary. Known cultural resource sites are protected under the National Historic Preservation Act and the Fort Knox ICRMP and the Cultural Resources Program Manager will be consulted when fires involve these sites. Personnel will avoid these areas when maintaining and constructing firebreaks, or while conducting any other soil-disturbing activities. Prescribed burning is a recognized land management practice discussed in the INRMP and ICRMP for natural resources management and fire protection.

11.0 Mission Considerations

This plan provides for timely wildfire response with minimal impact to training activities. The prescribed burn program provides for good vegetation and invasive species management and reduces the intensity of wildfires, therefore reducing training interruptions.

12.0 Wildland Fuel Factors

Desires to control fuel factors are described within each fire burn plan. Where warm-season grass restoration is conducted, or conversion of fescue, the areas may be burned annually until the grasses become established.

a. Fire Management Zones: Fort Knox is divided into generally three management zones without respect to habitat type and fuel model: the training Complex and range areas, the cantonment area, and duded impact areas. Management of wildland fire is different within these management zones. Wildfires are not suppressed in the duded impact areas except in extreme conditions. Wildfires within the training complex will be suppressed, or controlled, when they present a possibility of becoming severe, damaging infrastructure, exiting the installation, or damaging sensitive natural resources, typically high value mature hardwood stands. Wildfire within the cantonment area will be extinguished to protect public safety and protect structures.

b. Fuel Models: Fort Knox is very diverse and contains most fuel types found in this physiographic region. The most prevalent fuel types are Fuel Models (FM) 8, 9, and 10 (approximately 65%), FM 3 (20%), and FM 1 (15%). FMs 8, 9, and 10 are in the timber litter group and consist mostly of leaves, needles, and twigs. FM 8 is 0.2 feet in height and is slow burning with low flame heights, FM 9 is similar to FM 8, but has a higher flame length, and FM 10 is 1 foot in height and has more dead-down fuels of 3-inch or larger limb wood. FM 3 consists of tall grasses, 2.5 feet or higher in hay fields, and fires in this FM are the most intense of the grass group. FM 1 is fine herbaceous fuels that have cured, or nearly cured, are 1 foot in height, and are similar to

those found in cattle pastures. FM 6, a shrub layer of 2.5 feet, or taller, consisting mostly of blackberry and young trees in old fields.

13.0 Monitoring Requirements

Each wildfire and prescribed burn produces a different set of monitoring requirements. Several factors affect monitoring required, such as size, location, weather, mission operations, safety, fire behavior, and resources available. Fires are evaluated by the NRB. Evaluations are used to determine the extent of damage to resources in the case of wildfire. Prescribed burns are evaluated to determine if objectives were attained and to ensure desired results in future burns.

14.0 Public Relations

Interaction with the public is performed by the Public Affairs Office (PAO). If a severe wildfire situation requires public notification, the information will be forwarded to the command staff. Fort Knox Dispatch, Fort Knox Fire Department, and Range Branch firing desk will be informed of all prescribed burns and wildfires. Information will be made available for persons working on Fort Knox through the KNOXINFO email message system. The EMD office is notified before a scheduled prescribed burn is initiated. Off-post agencies, such as County Dispatch for the effected county or counties and the KDF will be directly contacted as noted on the prescribed burn plan prior to conducting a prescribed burn.

15.0 Funding Requirements

Funding for wildfire suppression will be directly supported by the installation. Wildfires generated by tenant units will be funded by OMA funds and prescribed burns will be funded by the proponents of the burns. Prescribed burning will be utilized in areas conducive to burning because it provides a more cost effective and efficient method of vegetation management as compared to mowing.

16.0 Personnel Training and Certification Standards and Records

Records of training experience for Fort Knox personnel will be maintained by their respective organization and provided to the Wildland Fire Program Manager as needed. Records will be periodically reviewed to ensure personnel are current in required aspects of necessary certification and training. NRB, Range Branch, and Fire Department personnel will receive, at a minimum, NWCG Courses I-100, S-130 and S-190. Prescribed burn bosses will have completed training in prescribed fire management, fire weather behavior, and will have participated in at least five prescribed burns. The installation wildland fire manager will review these documents to ensure all personnel are current in all aspects of training requirements. Fort Knox should provide continuous training opportunities for wildland fire staff to remain up-to-date on wildland firefighting tactics and to encourage wildland firefighter certification.

17.0 Physical Fitness Standards

The physical fitness standards for wildfire suppression performed by Fire Department personnel are according to DoD firefighter physical standards. Records are maintained as required by Fire Department guidelines.

A moderate level fitness standard will be required for wildland firefighting and a light level for prescribed burns on Fort Knox (NWCG standards). For off installation assignment, personnel must meet the NWCG standards and physical fitness condition level appropriate to their assignment (Arduous, Moderate, and Light).

Staffing Requirements. Required minimum staffing necessary for wildland fire management is the current Fire Department selected daily assigned personnel and Range Branch personnel. Prescribed burning on the installation will require at least three trained personnel onsite, including one qualified burn boss. These positions are necessary to provide adequate protection to military and civilian personnel and natural resources on Fort Knox. No additional staff is anticipated in the implementation of this plan.

Training Requirements. NRB will provide a means for each employee to maintain wildland fire training levels and encourage use of new technology through internet access and personal contacts. The Wildland Fire Program Manager will explore new equipment ideas and remain open-minded regarding their procurement and use.

18.0 Prescribed Burn Plans

- Provides clear understandable burn goals and objectives
- Developed, reviewed, and certified annually, or as needed
- Permits burning during acceptable weather conditions, wind speed directions, and fuel moisture
- Provides necessary resources of staffing and equipment resources
- Documents map/maps of area
- Details smoke management plan
- Safety considerations
- Pre-burn authorization/notification checklist
- Coordination procedures
- Alternative plan to cover when you go out of prescription

- Check list of actions
- Wildlife consideration of endangered species, cultural resources, and environmental considerations
- After action training review of lessons learned during previous burns/burn success

19.0 Conclusions

This IWFMP lays out specific guidance and procedures in the prevention, detection, and suppression of wildfires and the planning and operating procedures involved with prescribed burning on Fort Knox. Implementation of the IWFMP will be directly supported by the installation and no additional staffing will be required, as mentioned under the staffing requirements section. Fort Knox NRB and Range Branch will continue to use prescribed burning to manage the natural resources on the installation and make every effort to protect known cultural resource sites. Range Branch will seek to use prescribed burning as an integral management strategy for the maintenance of range areas where appropriate, as personnel receive adequate training. The manpower for the prescribed burns will be provided by the NRB and Range Branch, with contingency support from the Fire Department as needed. The NRB will be responsible for identifying target areas for prescribed burns for ecosystem management and will coordinate with Range Branch to determine areas that need fire to reduce fuel loading and to gain access to training lands to conduct prescribed burns. Fort Knox will continue to use prescribed fire to manage the installation's natural resources using an ecosystem management approach to maintain, protect, and improve the ecological integrity of the installation. Over the next few years, Fort Knox will work to improve their natural resources GIS program as funding permits. This will include updating maps and associated databases for wetlands, soils, forestry and wildlife resources, wildland fire occurrences, and endangered species.

20.0 Environmental Assessment

Implementation of this IWFMP requires an assessment of the environmental effects. Current operations and fire management activities at Fort Knox will not significantly change from what is outlined in the INRMP as a result of the development and implementation of this IWFMP. In order to meet the NEPA requirement for the implementation of this IWFMP, a Record of Environmental Consideration (REC) will be completed and attached in Appendix E. This action is covered under 32 CFR Part 651, Environmental Analysis of Army Actions: Final Rule, (March 29, 2002), Appendix B – Categorical Exclusions, Section II: Paragraph (b) Administration/operation activities: (3) Preparation of regulations, procedures, manuals, and other guidance documents that implement, without substantive change, the applicable HQDA or other federal agency regulations, procedures, manuals, and other guidance documents that have been environmentally evaluated (subject to previous NEPA review).

21.0 Agency Coordination

A copy of the draft IWFMP was submitted for review to Fort Knox personnel. Comments received were addressed and incorporated into the final IFWMP.

22.0 References

Beal, E.O., and J. W. Thieret. 1986. *Aquatic and Wetland Plants of Kentucky.* Kentucky State Nature Preserve Commission and Technical Series Number 5, Frankfort, Kentucky.

Evans, M. 1991. *Kentucky Ecological Communities.* Unpublished manuscript, Kentucky State Nature Preserves Commission, Frankfort, Kentucky.

Kentucky State Nature Preserve Commission. 1994. *Rare and Extirpated Plants and Animals of Kentucky, Transactions of the Kentucky Academy of Science,* 57:69-91; and 1997 update *Rare and Extirpated Plants and Animals of Kentucky, Transactions of the Kentucky Academy of Science,* 58:96-100.

US Army Garrison, Fort Knox, Kentucky. *Fort Knox Draft Integrated Cultural Resources Management Plan, 2009-2013.* Environmental Management Division, Directorate of Public Works.

US Army Garrison, Fort Knox, Kentucky. October 2008. *Fort Knox Integrated Natural Resources Management Plan*, Environmental Management Division, Directorate of Public Works.

Appendix A - Sample Prescribed Burn Plan

Fort Knox
Natural Resources Branch

Burn Prescription

1. Location – Fort Knox Military Reservation

Burn Unit location – Hunting area 90 – east of Cedar Creek adjacent to the installation boundary

Map location HA 90 Ft Knox hunting and fishing map **Unit area** Approx. 81 ac.

County Hardin

2. Sources of Agency Assistance

Fire Fort Knox Fire Department 502-624-1876 or 624-6016

Law Enforcement Provost Marshal 624-2111
State Police

Medical Ireland Army Hospital 624-9000 624-9001

Attorney Staff Judge Advocate J. Peter Hill 624-4668

3. Official Notifications:

1. Fort Knox Fire Department 624-1876
2. Provost Marshal 624-2111
3. Range Control 624-2135
4. Chief, EMD 624-3629
5. Kentucky Division of Forestry (E-town) 766-5010

4. Neighbor Notifications

Neighbors will be notified prior to the burn.

Under the conditions of this prescription there are no neighbors that are expected to be impacted by burning operations.

Name Address Phone

5. Unit Description:

Vegetation Types	Fuel Models	% of area	% slope	Aspect
Thick Grasses	3	2%	5-15%	SSW
Brush	6	5%	10-15%	VARIES
Hardwood litter	9	91%	5-15%	VARIES
Short grass	1	2%	5-10%	SSW

Fire Unit Narrative:

This unit consists primarily of hardwood forest, there are two small areas of cedar glade habitat that comprise the fuel models 1 and 3.

Maps Attached:

General location map, burn unit/ignition plan map, smoke screening map.

6. Prescribed burn justification:

Type of burn e.g. ecological management, fuel reduction, training, research
Ecological management

Burn unit goals:

1. Remove forest floor coverage for UXO clearance prior to conveyance to adjacent land owners.
2. Enhance native grasses and forbs that are in the area.

Specific burn objectives:

1. Remove timber litter and duff layer without harming more than 25% of overstory woody stems overall.
2. Majority of mortality of woody stems will be adjacent to the glade habitats and in areas that may have a jackpot of fuels where a tree top has fallen.

7. Acceptable Fire Behavior

	Fuel Model # 3	# 1	# 9
Max. Head fire flame length	12 ft	8 ft	6 ft
Min. Head fire flame length	4 ft	1 ft	2 ft
Max. Back Fire flame length	3-4 ft	3 Ft	3 ft
Min. Backfire flame length	1 ft	0	0-1
Max Head fire rate of spread ch/hr	*90*	*60*	*4*
Min. Head fire rate of spread ch/hr	*3*	*>0*	*1*
Max. Back fire rate of spread ch/hr	*5*	*5*	*1*
Min. Back fire rate of spread ch/hr	*>1*	*>0*	*0*
Max. Scorch height	***15***	***8ft***	***4ft***

8. Fuel and Weather Prescription

Wind Direction (s) Southeast to south southwest
20 ft windspeed 5-15 mph
Midflame windspeed 0-8 mph

Air temp range 25-70F

Rel. Humidity 25-60%

1-hour fuel moisture% 6-15 FM3
10-20 FM9

Days since last rain >4

10 hour fuel moisture 15-25

100 Hour fuel moisture N/A

Live fuel moisture >60%

Atmospheric mixing height At least 1000 ft with transport winds from the southeast to southwest.

Note: Combinations of parameters that produce very active head fires in areas of FM3 are acceptable. The torching of cedars and mortality of deciduous trees is acceptable after a secure blackline is created along the downwind sides of the unit.

9. Smoke Management

Smoke screening procedure completed: (check) YES x

List downwind / downdrainage smoke sensitive areas and distance:

HWY 313 is approximately 2500 to 3300 feet down wind and down drainage from the burn site. Wooldridge Ferry Rd is within 900 feet to the east and north east.

List other smoke sensitive areas:

Scattered residences within 200 feet to the east and south.

Map of smoke sensitive areas attached: check Yes X

Describe desirable smoke behavior and smoke management actions:

Burn will be canceled if winds from the southeast clockwise to the northeast exist or are expected for the duration of burn and mop up to avoid potential smoke impacts to residences. With moderate burning conditions of 8-12 mph winds, wind direction from the south to west, and mixing heights greater than 1000 feet smoke should rise and dissipate before impacting any of the housing areas to the east and north and the private property to the west. Caution signs will be posted in both directions on Hwy 313 to alert traffic to potential smoke during the burn. Back and flanking fires will be used to secure the downwind fire lines, this type of firing produces the least amount of smoke. Head and strip head/flank fires will be touched off after fire lines are secure to speed up burn and reduce to the maximum extent the potential for heavy smoke conditions. Wind speed and direction will be monitored closely during the burn.

10. Crew organization

1 Fire Leader

Crew number 4 to 8. Organization chart attached

Fitness and experience requirements: Fire leaders have successfully completed S-390 Fire Behavior, S-131, S-130, S-190 and participated in the conduct of at least five previous prescribed burns. Crew leaders will have completed S-130 and S-190 and participated in at least 2 previous prescribed burns.

11. Equipment

Required Items (check)	**First Aid Kit**
Pumper truck on site	**Fire Weather kit**
Minimum four radios	**ATV pumper**

Protective clothing *All personnel will have nomex, hardhat, goggles and leather boots.*

Justification for exceptions: none

Equipment item	**Number**	**Source**
Fire Rakes	***1***	***NRB***
Council Rakes	***5***	***NRB***
Backpack pumps	***5***	***NRB***
Fire Flappers	***6***	***NRB***
Drip Torches	***4***	***NRB***
Fuel Cans (Pumper)	1-2.5gal	**NRB**
(drip torches)	3-5gal mix	**NRB**

Chainsaw and safety equip. Check if needed.

12. Burn Duration

Expected timelines

Baseline preparation	***1 Hour***
Spreading fire	***4-6 hours***
Mop-up	***2 Hour***
Total duration	***7-9 hours***

13. Managing the burn (Describe each of the following):

Firebreak Preparations: A dozer line has been prepared along the southern and eastern boundary of the unit. Cedar Creek and a dozer line will serve as the break to the west. A tributary will serve as the break to the north along with the existing grass and soil firebreak.

Firing techniques and ignition pattern: The burn will be broken into several sub units using natural terrain features as fire lines. The first sub unit is from the firebreak on the eastern extreme of the area to Tabor lane and the house that is encroaching on the installation. The second will be from the west edge of the house yard north to the grassed firebreak, west to a tributary and then southeast to the installation boundary and the dozer line and east to the house yard. The third will be northwest along a tributary to Cedar Creek south along cedar creek and a dozer line and east along a woods road and the boundary dozer line to the tributary where started. The fourth sub unit will be south along the installation boundary and dozer line west along the dozer line to a tributary, north along Cedar creek and east along a woods road. Each of the units will be burned out by securing a blackline along the downwind side of each sub unit and working up the flanks and then using strip head/flank fires to speed up the progress of the burn.

Crew Communications: Radios held by fire leader, pumper driver (mobile radio in vehicle) and igniters and holding crew.

Fire behavior and weather monitoring:

Holding: Each line will be assigned to a line boss and an igniter. Should control problems occur, the ATV pumper and then the Truck pumper will be used as reinforcement along the grass firebreak to the north.

Fire Sensitive Areas or Hazards: There is an old VW car and a pile of corrugated pipes in sub unit four that has been raked around. The steep terrain is a significant obstacle that will slow progress of ignition.

Contingencies: All spots and slop-overs will be immediately and aggressively attacked. If fire escapes across the firebreak to the north there is good access for the use of the ATV pumper. Escapes to the north and west (most likely scenario) will be attacked with the ATV pumper and hand equipment. Fort Knox Fire Department Personnel and Kentucky Division of Forestry Personnel will be on site to assist with any escapes on the private property side of the burn. The fuels that exist there (timber litter) should lend themselves well to hand and equipment attack. Probability of escape on this side is reduced as there is an 8-10 foot dozer break along the entire length except for two locations where a four foot wide hand line has been placed. These areas will be watched continuously as they are burned out to attack small slop overs immediately. Secondary containment is afforded by the existing grass and soil firebreak to the north of sub units one and three.

Mop-up: Mop-up will be complete within 50 feet of the control lines. Area wide mop up activities will be conducted in the following day as terrain allows.

14. Site Wildfire Contingency Plan. In the event of a wildfire in this area it is preferable to attack the fire where terrain allows as the fuel types in most instances would allow a flanking direct attack. This would be a concern if winds are from the north and west as the fire may leave the installation.

15. Prepared By:

Michael Brandenburg	Fish and Wildlife Program Manager	March 2007

Appendix B - Designation of Wildland Fire Manager Memorandum

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON COMMAND
125 6TH AVENUE, SUITE 320
FORT KNOX, KENTUCKY 40121-5719

REPLY TO
ATTENTION OF:

IMSE-KNX-PWE

0 9 MAR 2010

MEMORANDUM FOR Michael G. Brandenburg, Chief, Natural Resources Branch, Environmental Management Division, Directorate of Public Works

SUBJECT: Designation of Installation Wildland Fire Program Manager

1. References: Army Wildland Fire Policy Guidance, August 2002.

2. The above referenced document directs the Garrison Commander to designate an Installation Wildland Fire Program Manager. The Installation Wildland Fire Program Manager will be responsible for preparation of an Integrated Wildland Fire Management Plan (IWFMP), approving plans for prescribed burning, and ensuring burn plans are in compliance with the IWFMP, Integrated Natural Resources Management Plan, and other applicable laws and regulations.

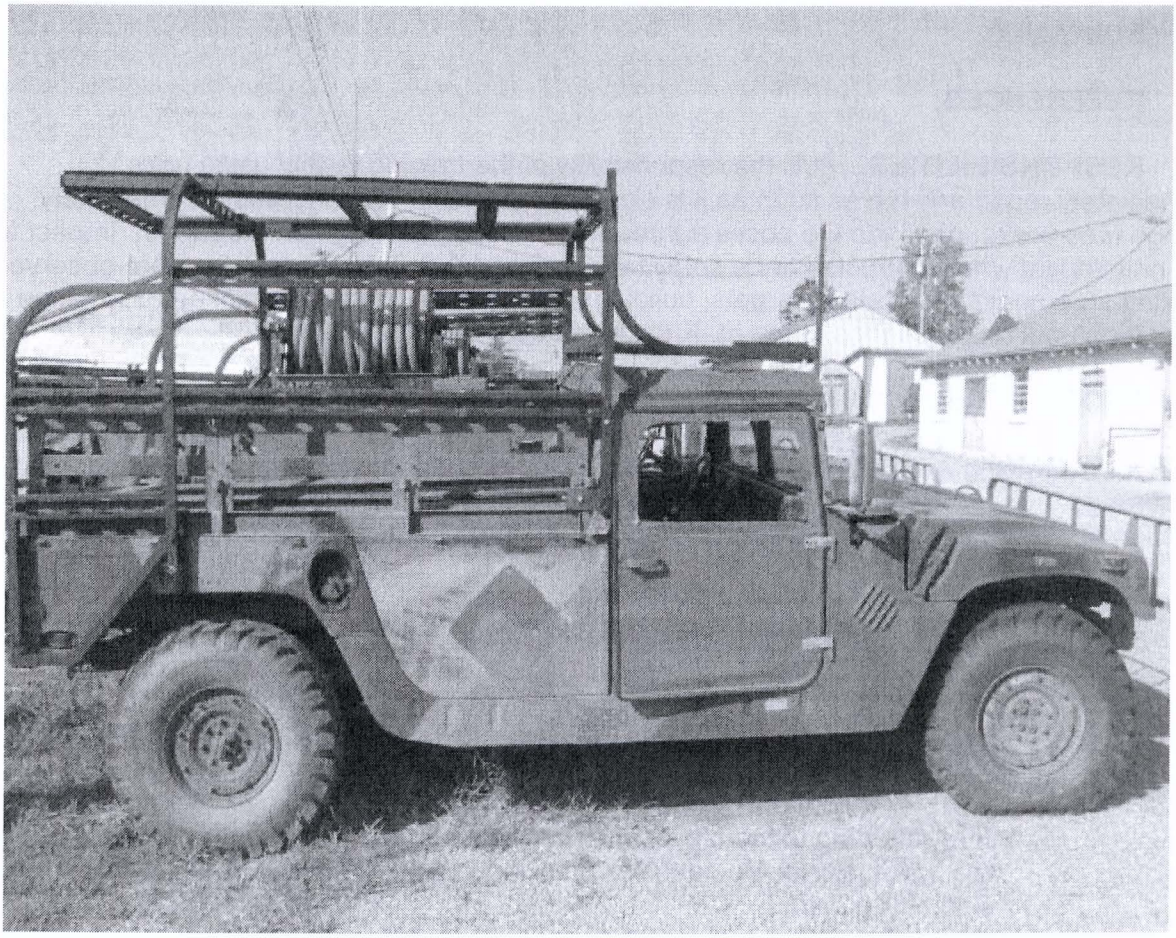
3. This memorandum hereby designates Michael G. Brandenburg, Chief, Natural Resources Branch, Environmental Management Division, Directorate of Public Works, as the Installation Wildland Fire Program Manager.

ERIC C. SCHWARTZ
Colonel, AR
Garrison Commander

CF:
Dir, DES
Dir, DPW
Chief, EMD, DPW

Appendix C - Range Branch Fire Fighting SOP

Range Control
Fire Fighting SOP



1. PURPOSE. To outline the duties and responsibilities of the Range Technician (RT) during fire fighting on ranges, in training areas, and impact areas.

2. SCOPE. This SOP applies to all Range Technicians at the Range Branch, Training Division, Directorate of Plans, Training, Mobilization and Security.

3. DEFINITIONS/EQUIPMENT.

a. RT vehicles have 5 fire flappers and 5 fire rakes carried in the bed of the pickup at all times.

b. The two firefighting Hummers (Fire Fly 1& 2) carry spare flappers, rakes, and two water backpacks strapped to the sides of the water tank area.

4. SUMMARY.

5. REFERENCES.

6. RESPONSIBILITIES. It is the responsibility of the training facility using units to immediately report any fire as soon as it is sighted. All fires in TAs are fought immediately. Range fires are fought if the fire poses a threat to targets or buildings on the range. Impact fires are only fought when instructed to do so by ranges 5 and 6 or T-10. Impact fires are observed, making sure no fires migrate to targets, buildings, or TAs outlining the impact areas. Range Operations will report all fires to the Ft. Knox Fire Department.

7. PROCEDURES.

a. Training Area -When a fire is observed, Range Operations initiates a network call to all of range division, alerting them of the fire and providing the fire's location. RTs respond to the location of the fire and start to assess and put out the fire. The two closest RTs to the Fire Fly will take them to the fire.

(1) To assess the fire, estimate the fire size, width, length, height, direction of travel, and speed.

(2) Report to Range Operations the accurate location, assessment, and best routes in to the fire area.

(3) RTs reporting to the fire location are required to drive at posted speeds to the fire. Upon arrival, do not block the road into the fire when you park. Park on the side of the road.

(4) RTs are required to fight the fire using the buddy system of twos, making sure each has a radio and map.

(5) When the fire is out, walk the edges of the burned area, making sure the fire has not re-started, and that there is no burning timber lying from burnt out area to non-burnt out area. Look for any burning stags that may fall out of the burnt out area.

(6) When fire is out, account for your personnel, and equipment and report to Range Operations the condition of the fire, the status of the personnel and that you are departing the fire scene.

(7) Water pumpers are restored with water prior to returning to your organization.

b. Ranges – When a range fire is reported, the closest RT assesses the fire without stopping training.

(1) Assessing the fire by estimating the fire size, width, length, height, direction of travel, and speed.

(2) Observe for location to target, buildings, and ammo pads.

(3) Inform Range Operations of your finding and what you recommend.

(4) Range Operations will inform the Senior RT or RT Supervisor of the situation, who will make a decision of fighting the fire.

(5) If fighting the fire, the RT on-site gets a detail to help fight the fire only on Modern Ranges, (i.e., St. Vith, Cedar Creek, and Yano Ranges).

(6) All actions in Paragraph 'a' applies when the decision to fight is identified.

c. Impact Areas- No fires are fought in the impact area unless authorized by Range 5, Range 6, or T-10.

Appendix D - Fire Threat Condition Definitions

FIRE THREAT CONDITION DEFINITIONS

GREEN: No Restrictions are imposed

ORANGE: The use of Aerial Flares is prohibited. Smoke Grenades & Pots, Surface Flares, Fused Practice Grenades, Artillery/Mortar Simulators, and other pyrotechnic devices normally employed in surface mode may be used on cleared surfaces, i.e., earth and hard stands. Blanks and tracer ammunitions may be fired under the Commanders Risk Assessment concerning local fire threat and the impact of wild fire on the training event.

RED: The use of Aerial Flares is prohibited. The use of Smoke Grenades & Pots, Surface Flares, Fused Practice Grenades, Artillery/Mortar Simulators and other pyrotechnic devices normally employed in a surface mode is prohibited. Red Smoke Grenades may be used on cleared surfaces, i.e., earth and hard stands, to mark an Air MEDEVAC LZ. The use of Hoffman charges is prohibited. Blank and Tracer ammunitions may be fired under the Commanders Risk Assessment concerning local fire threat and the impact of wild fire on the training event.

BLACK: The use of all pyrotechnic devices, to include Hoffman charges, blanks and tracer ammunitions, is prohibited. Red Smoke Grenades may be used on cleared surfaces, i.e. earth and hard stands, to mark an Air MEDEVAC LZ.

Appendix E - Record of Environmental Consideration

APPENDIX G

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Kentucky Ecological Services Field Office
330 West Broadway, Suite 265
Frankfort, Kentucky 40601
(502) 695-0468

March 15, 2012

Mr. Michael Brandenburg
Natural Resources Branch
Department of Public Works
Environmental Management Division
U.S. Army Garrison
Fort Knox, KY 40121

Subject: FWS 2012-B-0318; Fort Knox Cantonment Area/Fitness Trail Tree Removal Policy; Meade and Hardin Counties, Kentucky

Dear Mr. Brandenburg:

The U.S. Fish and Wildlife Service Kentucky Field Office (KFO) has reviewed the tree removal policy for the Fort Knox Cantonment Area and associated fitness trail. The cantonment area encompasses approximately 6,497 acres and serves as a residential, commercial, and industrial area for the installation. The cantonment area has a heavily traveled, well-developed road network, which supports approximately 40,000 soldiers, family members, and civilian employees.

The cantonment area consists of scattered trees in a landscaped setting with isolated stands of mostly mixed upland hardwoods. Trees consist of species native to Kentucky and commonly planted ornamental species. Trees over 5 inches dbh within the area characterized as relatively mature, to overly-mature, and are in a general state of decline with a high mortality rate.

The associated fitness trail, which is adjacent to the cantonment area, would involve the installation of an approximately 10-foot wide, gravel trail. The majority of the trail follows existing training trails; however there are two areas, totaling less than two miles, which will require the removal of trees.

Federally Listed Species

The only federally listed species which has the potential to occur within the project area is the Indiana bat. The Fort Knox cantonment area lies almost entirely within a documented Indiana bat maternity colony and overlaps the swarming range of documented Indiana bat hibernacula. Although gray bats have been documented on Fort Knox, suitable habitat doesn't exist in the cantonment area or adjacent areas.

The tree removal policy will require qualified personnel from the Natural Resource Branch (NRB) to conduct a visual inspection of trees prior to removal. Personnel will determine bat usage through the presence of exfoliating/loose bark, staining, guano deposits, and listening for bat vocalizations. If there is no evidence of bats using the tree, or it is deemed a hazard tree (i.e., endangering personnel or property), it would then be removed, regardless of season, for the majority of the cantonment area. If a situation occurs where bats, or evidence of bats, are observed the NRB will coordinate with the KFO regarding the tree removal process. In addition, if a tree is removed, and bats are observed, the NRB will also notify the KFO for additional consultation.

The majority of the cantonment area is considered highly developed and is not likely to be utilized by Indiana bats. However, there are five forested areas (identified on the attached map), that are adjacent to larger forested blocks, outside of the cantonment area, that may be used as maternity roosts, but are more likely to be utilized by transient bats during fall swarming/spring emergence, or by individuals venturing out from primary roost trees. In order to avoid/minimize potential impacts to Indiana bats in these areas, NRP personnel will conduct emergence counts prior to tree removal. If a situation occurs where bats, or evidence of bats, are observed the NRB will notify the KFO for additional consultation.

The proposed fitness trail would result in removal of 16 trees over 5 inches dbh. None of these trees exhibit characteristics such as loose, exfoliating bark or splits and hollow cavities that would make them suitable as Indiana bat roost trees. However, as a precautionary measure, all trees over 5 inches dbh will be felled prior to 1 April 2012, to avoid any potential for direct effects to Indiana bats.

Summary

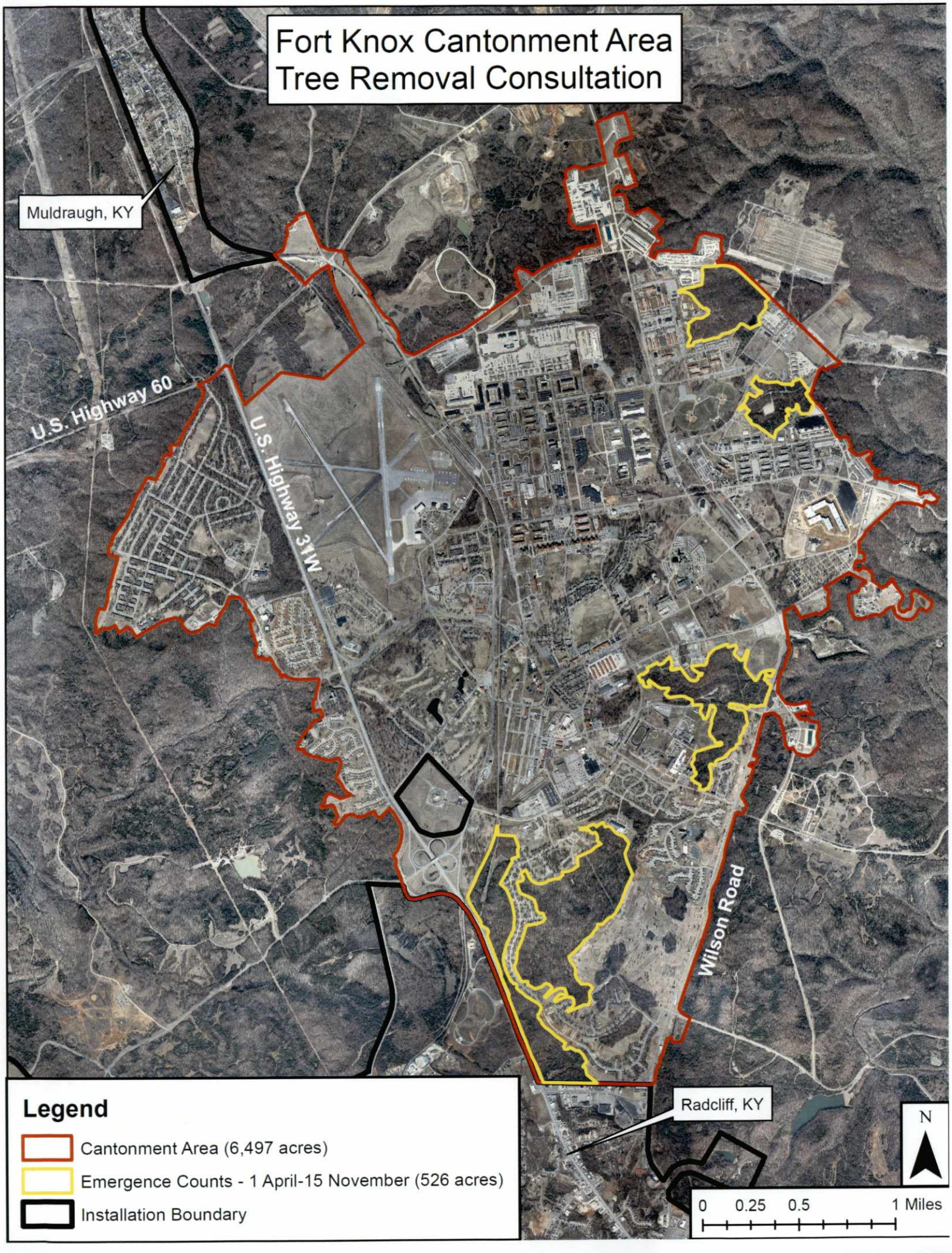
The KFO agrees that, given the developed nature of the project area, there is minimal potential Indiana bat utilization. Because the NRB has agreed to (a) inspect trees for evidence of bat utilization prior to removal, (b) conduct emergence counts prior to removal of trees within the five identified forested areas, and (c) remove trees over 5 inches dbh associated with the fitness trail prior to April 1, 2012, the KFO agrees that the establishment of the cantonment area tree removal policy and fitness trail are not likely to adversely affect listed species, including the Indiana bat.

We appreciate the opportunity to comment on the proposed action(s). Should you have any questions or require additional information, please contact Carrie Allison of my staff at 502-695-0468, ext. 103.

Sincerely,

Richard A. Hyde

for Vigil Lee Andrews, Jr.
Field Supervisor


Fort Knox Cantonment Area
Tree Removal Consultation
Muldraugh, KY
U.S. Highway 60
U.S. Highway 31W
Wilson Road
Radcliff, KY
Legend
Cantonment Area (6,497 acres)
Emergence Counts - 1 April-15 November (526 acres)
Installation Boundary
N
0 0.25 0.5 1 Miles

APPENDIX H

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON COMMAND, FORT KNOX
111 E. Chaffee Avenue
FORT KNOX, KENTUCKY 40121-5256

IMKN-ZA

JUN 29 2015

MEMORANDUM FOR See Distribution

SUBJECT: Godman Army Airfield Wildlife Aircraft Strike Hazard (WASH) Plan

1. The Godman Army Airfield WASH Plan (Encl. 1), dated 25 June 2015, is in effect upon the date of my signature, and is in operational support of all airfield users. The proponent for the WASH Plan is the Airfield Division, DPTMS, and is the appropriate authority for its execution and maintenance.

2. A review of the WASH Plan will be conducted semi-annually with recommendations, updates, and changes being brought to the Wildlife Hazard Working Group, which meets in conjunction with the Aviation Operations Board/Aviation Safety Council.

3. Point of contact for this action is Mr. David Botelho, at 624-8073.

THOMAS J. EDWARDS JR.
COL, AG
Commanding

1 Encl
as

Distribution:
GC
DGC
DIR. DPTMS
GAAF MGR
GAAF SAFETY
GAAF OPS
GAAF ATC
11TH AVN
DPW
DES

Safety

Wildlife Aircraft Strike Hazard (WASH) Plan

Summary. This document describes procedures and examples for Godman Army Airfield Wildlife Hazard Management plan. It incorporates the provisions of the Environmental Protection and Enhancement AR 200-1, Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control, and Navigational Aids AR 95-2, Army Safety Program AR 385-10, Department of the Army Pamphlet (DA Pam) 385-10, Army Aviation Accident Prevention (DA Pam 385-90), and the Wildlife Aircraft Strike Hazard (WASH) Template (IMCOM Pamphlet 385-90-1)

Applicability. This document applies to all IMCOM Directorates on Fort Knox, KY.

Proponent. The proponent for this document is the Airfield Division

Safety

Wildlife Aircraft Strike Hazard (WASH) Plan

Contents (listed by paragraph and page number)

Appendix List

Chapter 1: Wildlife Aircraft Strike Hazard (WASH) Plan

1-1 Purpose.
This pamphlet is a plan to help minimize the risk of a strike to fixed- and rotary-winged aircraft or human health and safety posed by populations of hazardous wildlife on and around the airfield. There is no single solution that can accomplish this goal. Therefore, an integrated approach of techniques, tactics and entities is needed in the overall WASH plan.

The WASH plan is a part of the airfield safety and accident prevention program.

The WASH plan:

a. Helps develop a wildlife hazard working group (WHWG) and designates responsibilities to its members. The group's meetings will be combined with the Airfield Operations Board.

b. Helps develop procedures for reporting hazardous wildlife activity and altering or discontinuing flying operations. Reporting should be a collective effort between all air and ground personnel operating in the airfield environment.

c. Helps develop procedures to identify hazardous situations and to aid supervisors and aircrews in disseminating information, issuing alerts and altering or discontinuing flying operations when required.

d. Develops active/passive techniques to disperse wildlife from the airfield and decrease airfield attractiveness to wildlife.

e. Develops procedures to identify, provide information and eliminate or reduce environmental conditions that attract wildlife to the airfield/heliport.

f. Identify organizations with authority to initiate or terminate wildlife watch conditions.

1-2. Conditions of Execution.

This plan is based on hazards posed by both resident and seasonal wildlife populations. Portions of this plan should be implemented on a continuous basis, while others can be implemented in the event of increased wildlife activity. Increased wildlife activity is usually associated with the arrival of migratory species and those predators that hunt them.

Chapter 2. Organizational Tasks.

2-1 General

The installation should ensure that airfield vegetation, fencing and drainage are managed to minimize wildlife attractants. An excellent cooperative relationship should exist between all installation agencies for the area around Army airfields.

2-2. Garrison Commander (GC).

a. Uses methods and procedures outlined in this plan.

b. Chairs the wildlife hazard working group (WHWG) meetings these meetings will be incorporated into the Airfield Operations Board (AOB).

c. Approves recommendations of the WHWG.

d. Will appoint the wildlife detection and dispersal team (WDDT).

2-3. Director Public Works Operations and Maintenance Division.

a. Advises WHWG of physical modifications.

b. Corrects physical conditions that increase WASH potential.

c. Maintains physical conditions based on the recommendations of the WHWG.

2-4. Director Public Works Environmental Division.

a. Advises airfield manager/heliport manager and WHWG on wildlife biology and behavior, habitat requirements or modifications or management schemes to make informed decisions and minimize aircraft-wildlife strikes.

b. Advises or assists WDDT on all lethal taking of wildlife pursuant to WASH activities.

c. Helps to acquire all necessary state/federal permits for harassment/depredation of nuisance wildlife and provides permits as required to DES or to the Airfield Manager.

d. Identifies remains of all dead wildlife and ensures proper disposal of remains pursuant to permits.

2-5. Director Emergency Services.

a. Provides an MP for the purposes of eradicating animals when other authorized personnel are not available.

b. Ensures the MP assigned the task of eliminating the animal is trained to do so.

c. DPW environmental will provide the necessary permit for the MP to carry out his/her duties.

d. DPW environmental will assist the MP in identifying the remains of all dead wildlife and ensure proper disposal of remains pursuant to permits.

2-6. Public Affairs Office.

Public affairs office participates as required and upon request should provide a public information program designed to inform post personnel, family members and the general public on the hazards and costs of uncontrolled bird activity and the measures being taken to minimize them.

2-7. Directorate of Plans Training, Mobilization and Security (DPTMS)

Directorate of Plans Training, Mobilization and Security should ensure that the airfield organization structure is aligned under the DPTMS, which includes airfield management, operations, airfield safety, air traffic control and air traffic equipment maintenance functions. The DPTMS will support and promote the implementation of the airfield WASH plan.

a. The Airfield Manager oversees the operation and execution of the WASH plan for the airfield division. He or she is also an integral part of the WHWG to ensure effectiveness of the WASH plan. The Airfield Manager will conduct the following:

(1) Declares a wildlife watch condition (WWC) based on WWC criteria IAW this plan and recommendations from airfield operations/flight dispatch, and air traffic control (ATC)
Note: If the Airfield Manager is absent, the Airfield Safety Officer or the Airfield Operations Officer will declare an appropriate WWC.

(2) Will disseminate wildlife hazard warnings on the airfield IAW this plan.

(3) Will provide guidance to airfield personnel on the reporting of WWC and wildlife strikes to aircraft.

(4) Will issue specific guidance to flight operations personnel on procedures to be followed under each WWC.

(5) Should make operational changes to avoid areas and times of known hazardous wildlife concentrations, mission permitting.

(6) Determines when and where WDDT members can respond.

(7) Coordinates with DPW and environmental on actions to modify habitat and trap/remove wildlife.

b. Airfield Operations Officer. The Airfield Operations Officer can be responsible for the operation of the WASH plan and whatever is delegated by the Airfield Manager. He or she is also an integral part of the WHWG.

(1) Should acquire, maintain and coordinate with DPW environmental on all dispersal and depredation equipment. See Appendix G for a description of some dispersal and depredation equipment.

(2) Can check the training of all members of the WDDT on all dispersal and depredation equipment.

c. Airfield Safety Officer. The Airfield Safety Officer can be responsible for the management of the WASH plan and whatever is delegated by the Airfield Manager. ASO can also be an integral part of the WHWG as the coordinator for the WHWG meetings.

(1) Monitors compliance with the WASH plan.

(2) Assembles and disseminates wildlife data to WHWG and aviation units via the AOB/Airfield Safety Council to include information on how each unit may obtain predictive wildlife hazard information using the USAF Bird Avoidance Model, see Appendix F.

(3) Monitors wildlife activity and strike statistics and advises the Airfield Manager when additional meetings are deemed necessary.

(4) Establishes a WASH hazard education program to include films, posters and information on local wildlife hazards and reporting procedures in coordination with DPW environmental.

(5) Coordinates with Airfield Operations or aircrew for collecting non-fleshy remains after strikes.

(6) Establishes and maintains a continuity folder with trend data and other pertinent wildlife data and information to assure continuity of knowledge with personnel turnover.

(7) Creates a WASH bulletin board electronically or in flight operations planning room and develops an airfield wildlife activity map tailored to local wildlife hazards. Posts, disseminates and updates map, as appropriate. When possible the map should be reviewed annually and include the date of publication/review.

d. Air Traffic Control.

(1) Reports observed wildlife activity to base operations and pilots.

(2) Issues wildlife watch condition advisories to aircrews.

(3) Should identify potential bird activity in Godman Army Airfield airspace in order to provide warnings to pilots.

(4) Recommends missed approaches or delayed takeoffs when possible wildlife hazards are reported in Godman Army Airfield airspace.

(5) Under WWC SEVERE, ATC should ensure that pilots understand the condition and are provided the option to delay, divert or continue the proposed operation into the hazardous area.

(6) Should recommend appropriate operational changes or options to pilots/aviation units to avoid areas of known hazardous wildlife concentrations, mission permitting.

(7) Upon request from the pilot in command, considers the following during periods of increased wildlife activity:

(a) Raise pattern altitude.

(b) Change pattern direction to avoid bird concentrations.

(c) Avoid takeoffs/landings at dawn/dusk ± 1 hour.

(d) Limit or prohibit formation takeoffs and landings.

(e) Depart pattern in trail; rejoin 3000 feet above ground level.

(f) Flying unit: Reschedule local training or transition elsewhere.

(g) Raise altitude enroute to low level or training areas

(h) Flying units: Limit time on low level routes to minimum for training requirements.

(i) Flying units: Select low level routes or training areas based on bird hazard data.

(j) Split formation during recovery.

(k) Make full stop landings.

(8) Should ensure ATIS information contains current wildlife watch condition.

e. Airfield Operations:

(1) During daily airfield inspections and checks: Observes, reports and disperses wildlife on or near the airfield as necessary.

(2) Based on observation or reports of wildlife activity, during normal hours of operation, Monday through Friday, recommends a WWC condition to the Airfield Manager or Airfield Safety Officer. On weekends Airfield Operations are closed.

(3) Posts the current WWC on the WASH bulletin board in the flight planning room for aircrews and transient personnel to see. Note: A NOTAM (Notice to Airmen) can be posted if the WWC warrants one.

(4) Airfield Operations personnel will log all wildlife strike incidents and when time permits notify the Airfield Manager, Airfield Safety Officer, and Airfield Operations Officer of the incident.

(5) Should maintain wildlife dispersal equipment and wildlife identification books.

(6) Recover wildlife remains after a strike for pick-up and identification by DPW environmental (fish and wildlife) personnel.

(7) Should receive a report of a wildlife aircraft strike mishap from the pilot or other personnel and submit to the ASPM to enter the data online at the US Combat Readiness Safety Center through (Report-It). Report-It is the centralized mechanism for collecting injury, illness and loss reports to help the Army meet its applicable regulatory requirements and effectively manage its safety and occupational health program. Army Safety Management Information System Revised (ASMIS-R), is necessary to reduce accidental loss. This automated incident reporting system will meet the functional needs of both command organizations and users. It will also improve regulatory compliance by offering a single, standard, and efficient process for reporting incidents.

(8) Maintain daily records of wildlife activity and harassment (responses of birds/wildlife to control activities and number of birds/wildlife shot/dispersed). Report depredated species to DPW-environmental/(fish and wildlife).

(9) Will create a map using airfield crash grid map or equivalent to identify high risk areas.

f. Wildlife Detection and Dispersal Team

(1) The GC selects the WDDT and includes personnel authorized to employ non-lethal control techniques and when required, lethal control measures as a last resort and in accordance with federal and state depredation permits. The Airfield Safety Manager and the DPW Conservation Branch will create training for all members of WDDT. The Members should have documented training on the following initial and recurring (annual) training:

(a) Species identification

(b) Wildlife active/passive control techniques

(c) Weapon and WASH equipment safety (all weapons/equipment used)

(d) WWC identification, reporting and downgrading

(e) Safe handling and disposal of wildlife

(2) The WDDT should be activated when wildlife on the airfield/heliport create hazardous conditions. WDDT personnel should have immediate access to binoculars and wildlife dispersal equipment.

(3) The following offices will be permanent members of the WDDT:

(a) Airfield Manager

(b) Airfield Safety Officer

(c) Air Traffic Control Chief

(d) Airfield Operations Officer

(e) DPW Environmental Chief

g. WDDT should follow procedures outlined in section 5 of this plan.

2-8. Wildlife Hazard Working Group (WHWG)

The Wildlife Hazard Working Group is organized to implement and monitor the WASH Program.

a. Authority.

The GC will be the WHWG chairman, responsible for the WASH program and is the approval authority for all WHWG recommendations. The WASH plan is a part of the airfield safety and accident prevention program, and as such, the Airfield Safety Manager should act as the WHWG coordinator and monitors the effectiveness of the plan. The WASH plan should also be included in the integrated natural resource management plan with DPW environmental involvement.

(1) The WHWG will consist of the following personnel:

- Chairman: GC
- Directorate of Plans, Training, Mobilization and Security
- Airfield Manager
- Coordinator: Airfield Safety Officer
- Airfield Operations Officer
- Air Traffic Control Chief
- Public Works operations and maintenance representative
- Public Works environmental division representative
- Air Force weather representative
- Flying organization representatives

- Airfield Security Officer
- Flying organization aviation safety officers when available

(2) WHWG meetings will be part of the AOB when required but will meet no less than twice a year. Minutes will be included in the AOB minutes.

b. WHWG: Function**.**

(1) Execute and update the WASH program.

(2) Monitor compliance with the WASH plan.

(3) Collect, compile and review trend data on wildlife strikes, wildlife watch condition changes and wildlife dispersal activities on or near the airfield/heliport.

(4) Identify and recommend actions to reduce the wildlife hazards.

(5) Recommended changes in operational procedures and airfield environment.

(6) Prepare informational programs and safety briefings for aircrews as required.

(7) Recommend modifications to the program to improve effectiveness.

Chapter 3. Participants Outside Of Airfield Management

The WASH plan is a joint cooperative relationship. Aircrews and tenant units are the focal point in the development of the WASH plan. The cooperation of these outside parties in the success of the WASH program is paramount.

3-1. FLYING ORGANIZATION:

a. Should assign a WASH POC (should be the Aviation Safety Officer) and an alternate to represent the organization during the garrison WHWG, and develop WASH program that includes these basic elements.

1. At a minimum, an annual brief to aircrews should be conducted to report all wildlife strikes and hazardous conditions per this plan.

2. Should obtain and post current wildlife activity data from airfield management and ensure it is readily available for briefing aircrews. Each unit should post the wildlife condition on a status board and inform all aircrews of any change in status.

3. Should ensure current wildlife activity data is available and briefed for each planned phase of flight.

4. Should ensure that an adequate supply of WASH report forms and wildlife activity maps are readily available for aircrews which can be combined with the Hazards map.

5. Should brief aircrews on seasonal wildlife hazards. Movies, articles and other information can be used, as appropriate, to maintain awareness.

b. Aircrews are essential to detecting wildlife hazards on the airfield and in the local flying area. When aircrews sight birds/wildlife, they should notify other aircrews and Godman Army Airfield Operations.

3-2. Aircrews:

a. Should consider and incorporate wildlife hazards into the mission planning and briefing process. This would include applicable bird advisories and hazard information, available through Internet sources, automated terminal information system or as disseminated locally. Internet sources include predictive bird hazard information using the USAF BAM. See Appendix F for more information about BAM.

Section 4. WASH Operations

4-1. General.

The WASH program management is an ongoing process, which includes planning/ assessment information dissemination and active/passive wildlife control techniques and tactics. The habitat management of the program to deter wildlife involves three steps: (1) identifying the attractive features and (2) imposing changes to either remove the attraction or to deny wildlife access to it (3) identifying methods to mitigate and manage wildlife hazards. There are many actions that can be taken to decrease wildlife hazards. These are determined by the time of year, the species involved and their attraction to the airfield, habitat characteristics on and around the airfield and a host of other variables. It is necessary to have a comprehensive understanding of a particular animal's biology and its relationship to specific environmental characteristics before initiating a wildlife control program. The following paragraphs can help in the development of a program that is clear, concise and comprehensive.

4-2. WASH Planning

Controlling an airfield's attractiveness to wildlife is fundamental to good wildlife control. It is more important than wildlife population management for controlling the overall risk. If an airfield/heliport provides easily accessible resources to wildlife — food, water, shelter or breeding sites — the wildlife will continue trying to return despite any strategies used to discourage them. The control program will fail unless the airfield is made as unattractive to wildlife as possible.

a. A wildlife hazard assessment (WHA) provides the foundation from which a more complete and site-specific understanding of potential wildlife hazards on an airfield/heliport is developed. The WHA should identify the wildlife species observed and their numbers, locations, movements, daily and seasonal occurrences. A WHA generally takes up to one year to complete because wildlife populations, especially migratory birds, exhibit seasonal fluctuations in behavior and abundance. The installation environmental office may be able to help reduce the time to complete based on a historical data of the wildlife habits in the local area. Upon completion of the study, recommendations are developed which are designed to reduce wildlife hazards on airfield property. It should also identify features near the airfield that attract wildlife. The WHA needs to be conducted by an individual(s) familiar with wildlife hazard damage management around an airfield or by someone having experience in wildlife hazard management.

b. Army Airfield Description

A description of the airfield is especially important to the development of a WASH plan and is the key to reducing strike hazards and ensures continuity of knowledge. Knowledge not only of the airfield, but the surrounding areas can be developed and utilized for the WASH plan. The description should include the following topics: turf; bare areas and old surfaces; drainage; security fencing; trees and landscaping; perch and nest sites; waste management; wildlife attractants and common migratory species.

(1) Airfield Turf.

Mowing the vegetation short or allowing it to reach heights where it goes to seed and becomes uneven encourages the growth of broad-leafed weedy vegetation. Such vegetation provides feeding and covers resources that increase bird hazards and other wildlife at the airfield. Mowing vegetation, especially if mown short, actually stimulates production and encourages weedy vegetation to invade grass stands. Allowing grasses to grow to recommended heights (6" – 12") will reduce necessary mowing frequency and costs. In this section describe in detail the airfield turf as to the composition, issues and problems:

(a) Is the turf well maintained?

(b) How much of the airfield is unmowed?

(c) Is the turf mowed to the recommended heights?

(d) How are the areas immediately alongside taxiways, runways and parking aprons?

(e) Is the turf developing any weeds or brush vegetation?

(2) Bare Areas and Old Surfaces.

Bare areas often provide ideal roosting and loafing sites for mourning doves, killdeer, crows, gulls and other species. They also provide nesting sites for birds such as killdeer and grassland passerines and prevent turf management as described above. Bare areas also contain gravel and grit that are highly attractive to birds such as mourning doves and wild turkeys. These areas also capture windblown seeds that are visible and attractive to a variety of birds. Bare areas in the infield areas of the airfield should be eliminated and seeded with grass to establish a thick turf as described above. Construction sites should be targeted for reseeding as soon as possible after project completion, as observed.

(3) Drainage.

Established ditches should be properly maintained with steep sides and trimmed vegetation. Removal of vegetation is necessary on occasion to prevent standing water on or near the airfield. Wetland vegetation should be routinely removed from any such areas and flow of drainage water maintained to prevent recurrence of aquatic vegetation. Wetland vegetation should continue to be removed whenever it develops in any airfield areas through the use of gang or boom mowers to reduce the attractiveness to birds and to prevent heavy vegetative growth from complicating maintenance. Alteration of any potential wetland habitat should comply with federal and state regulations.

(4) Security Fencing.

The fence line should be checked regularly for breeches by wildlife, to ensure all gates are closed, to keep vegetation from developing on or near the fence, and for security reasons. It may not be possible to exclude all wildlife from the field, and controlled hunting or depredation may be necessary. State natural resources personnel or USDA Wildlife Services can assist in this area.

(5) Trees and Landscaping.

Wherever possible, all trees and brush should be eliminated inside security fences. It is generally recommended that such provisions occur within a minimum of 500 feet of the operating surfaces or overruns, and 1,000 foot separation is preferable where possible. Additionally, an abrupt transition between the forest and grass should be maintained to limit edge effect. Edge effect, or the gradual transition from one cover type to another, is highly attractive to species of both cover types and can significantly increase local population densities. Brush and small trees should be removed from these transition areas and anywhere they occur on the airfield.

(6) Perch and Nest Sites.

Sites such as isolated trees, airfield structures, runway markers, poles, equipment and others should be monitored for birds using them as perches or nesting sites. Several species of birds such as red-tailed hawks, American kestrels, turkey vultures and song birds frequently use these sites. Where practical, remove these structures or configure them to limit suitable perching sites as observed in some areas of the airfield.

(7) Waste Management.

All organic wastes should be stored in enclosed containers until collected and removed. Construction containers as well as public trash containers should be covered to limit access by birds and other wildlife.

(8) Wildlife Attractants.

All personnel should be prohibited by this plan from building structures, erecting nesting platforms or boxes, feeding birds, improperly disposing of wastes, or otherwise encouraging birds or other hazardous wildlife in areas of the installation that may threaten flight operations. Also consider placing signs around local lakes and ponds, such as at the nearby golf course, industrial facilities and other managed grassy areas to prohibit feeding of waterfowl on the installation or near the airfield.

(9) Airfield Physical Description.

Report the physical description of the airfield and its surroundings. This information can be found in the DOD FLIPs.

(a). Name of airfield/heliport:	Godman Army Airfield
(b). Name of Army installation:	Fort Knox
(c). Name of runways:	18/36, 15/33, 05/23
(d). Location. County, state:	Hardin County, Kentucky
(e). Airfield size:	550 Acres
(f). Airfield elevation:	755’
(g). General topography:	
(1) Significant terrain features:	None
(2) Water areas:	None
(3) Developed areas:	Airfield Hangars
(h). Species mix on undeveloped land:	Natural Grasslands, Hardwood Trees
(i). Vegetative types:	Natural Grasslands
(j). Landfill locations:	None
(k). Sewage ponds:	None
(l). Golf course:	Lindsey Golf Course
(m). Other wildlife attractions:	Dry Creek Bed

4-3. WASH Plan Execution

Once the wildlife hazard assessment has been completed, the plan should be put into action. The following sections ensure plan execution: identify attractants; habitat modification; wildlife watch warning system; wildlife watch conditions reporting; WWC modifications by others; wildlife hazard communication; and downgrading WWC.

a. Identify attractants.

Most wildlife aircraft strikes occur on the airfield, so the logical place to begin looking for wildlife attractants, and setting up control programs, is on the airfield. Available food (invertebrates, small mammals, seeds, fruits, nuts or plants), water (ponds, ditches or puddles on the airfield), shelter (nesting sites, trees, bushes or buildings) or the security offered by large open spaces will attract wildlife to an airfield/heliport. Sometimes it might be obvious what is attracting the wildlife. In other cases, it might not be obvious. The attraction will vary from one species to another.

b. Habitat modification**.**

Habitat modification means changing the environment to make it less attractive or accessible to the problem wildlife. After identifying hazardous wildlife attractants on or near the airfield, develop a management plan to remove, reduce in quantity or deny wildlife access to them, depending on the circumstances at the airfield. All airfields are different. The wildlife species attracted to them will vary from region to region. Therefore, it is not possible to define precisely what types of habitat management will be effective at a particular site. Typical examples include stopping agricultural activity on or near the airfields manipulating the species and/or height of the airfield's ground cover, removing trees and bushes, eliminating or netting/bird balls over water bodies, excluding wildlife from buildings by netting or other means and selecting non-attractive planting around terminals.

c. Wildlife Watch Warning System.

The wildlife watch warning system is one of the most critical WASH procedures as it is an immediate exchange of information between ground agencies and aircrews concerning the existence and location of wildlife that pose a hazard to flight safety. Air Traffic Control, Airfield Manager, Airfield Safety Officer, or the Airfield Operations Officer can declare a wildlife watch condition during normal flight operations based on ground observations, pilot reports, etc.

(1) Wildlife watch conditions (WWC): The following WWCs should be used to warn aircrew and support personnel of the current wildlife threat to operations. These codes are identical to those used by the USAF found in AFPAM91-212. Wildlife locations should be given with the condition code. Air Traffic Control, Airfield Manager, Airfield Safety Officer, or the Airfield Operations Officer should make the final determination for declaring WWCs and increasing/decreasing WWC's. When the individuals listed above are not available to make WWC's determinations, Airfield Operations personnel will make the determination and log it accordingly.

(a) WWC SEVERE**.** Bird/Wildlife activity **on** or Bird activity **immediately above** the active runway or other specific location representing high potential for strikes. Supervisors and aircrews must thoroughly evaluate mission need before conducting operations in areas under condition SEVERE.

WARNING: Landing or departing in condition SEVERE may result in aircraft damage from a bird/wildlife strike.

SEVERE may also be declared when birds/wildlife of any size or quantity present an immediate hazard.

(b) WWC MODERATE**.** Bird/Wildlife activity **near** the active runway or other specific location representing increased potential for strikes. WWC moderate requires increased vigilance by all agencies and supervisors, and caution by aircrews.

(c) WWC LOW. Bird/Wildlife activity on and around the airfield representing low potential for strikes.

Note: Air Traffic Control, Airfield Manager, Airfield Safety Officer, or the Airfield Operations Officer may lower the WWC for the primary runway while keeping the higher WWC for other areas. When the individuals listed above are not available to make WWC's determinations, Airfield Operations personnel will make the determination and log it accordingly.

d. WWC reporting**.**

Declaration of a WWC should be made by the Airfield Manager or designated representative(s) based on the following:

(1) Visual observation of wildlife activity on or near the airfield/heliport by any personnel.

(2) Information relayed by ATC, airborne and taxiing aircraft.

e. WWC notifications by others.

If a wildlife hazard exists, notify Airfield Operations personnel, as applicable. This notification can be made on a radio net or by telephone per the current flip. All reports should be verified either by ATC or Airfield Operations personnel and, if needed, the appropriate WWC should be declared. Reports should include:

(1) Identity of caller (agency for ground personnel, call sign for aircrews).

(2) Location.

(3) Altitude.

(4) Time of sighting.

(5) Approximate number of wildlife.

(6) Type of wildlife (if known).

(7) Behavior of wildlife (soaring, flying to or from a location, etc.).

f. Wildlife hazard communication**.**

Disseminating WWC is critical to WASH effectiveness. The air traffic control tower should disseminate WWC by the following means:

(1) Include WWC on ATIS broadcasts.

(2) Notify inbound/departing aircraft of WWC if aircraft has received ATIS and WWC has changed.

(3) Provide additional wildlife advisories.

(4) Airfield Operations, Airfield Manager, Airfield Safety Officer, or the Airfield Operations Officer should direct the WDDT (DPW environmental) to the location where the wildlife is posing a problem.

(5) Pass WWC to Airfield Operations if notified by some other entity.

(6) For rapidly changing WWC place a statement on ATIS advising aircrew to contact Airfield Operations, Air Traffic Control tower for the latest WWC.

(7) Under wildlife watch condition SEVERE, Air Traffic Control tower should ensure that the pilot understands the condition and is provided the option to delay, divert, or continue the proposed operation into the hazardous area.

g. Downgrading WWC.

Once a WWC has been declared MODERATE or SEVERE, and the hazard no longer exists or has been lowered, the WWC should be downgraded commensurate with updated information. Airfield Operations, Airfield Manager, Airfield Safety Officer, or the Airfield Operations Officer can make the final determination on WWCs.

Section 5. Wildlife Detection Dispersal Team Procedures (WDDT)

WDDT should actively patrol on an as-needed basis and use appropriate active deterrence methods. See Appendix G for WASH dispersal/depredation equipment and methods available.

5-1. General dispersal guidelines.

a. Prior to initiation of dispersal actions, the WDDT team representative should coordinate the location and methods with airfield management and ensure the appropriate wildlife watch condition has been declared prior to dispersal activities on the active runway.

b. Vehicle horns and sirens can be used to initially harass wildlife; however, this is the least effective method of moving the wildlife off the airfield. Normally, once the birds are airborne or wildlife is running from the sound of the horn, the use of pyrotechnics can move the wildlife a further/safer distance from the airfield.

c. Horns should be used before pyrotechnics are used.

d. Pyrotechnics can be used in conjunction with vehicle harassment. These consist of screamers, whistle bangers and cracker shells.

e. If portable propane sound cannons are used on the airfield, they should be relocated periodically to prevent habituation.

f. All non-lethal deterrents should be attempted first before lethal methods can be employed. If, however, the methods above do not work or the wildlife become accustomed to the hazing, it shall become necessary to remove wildlife via lethal methods to reinforce the dispersal methods. The GC or his delegate will approve the request for the use of lethal force. Lethal taking of wildlife should be carried out by authorized personnel, and should occur only after coordination with DPW-environmental (fish and wildlife). DPW-environmental (fish and wildlife) can collect all wildlife for identification, disposal and reporting requirements.

g. When the target flock or problem birds are dispersed, Airfield Operations shall be notified so the WWC can be lowered.

5-2. Approval authority for the use of weapons.

The Garrison Commander is the approval authority for the use of weapons to remove wildlife from Godman Army Airfield. Lethal methods for depredation should be carried out IAW local, state and federal laws.

a. Weapons may include the following:
- 12-gauge shotgun
- Noise crackers for the shotgun
- Propane cannons with gas bottles

b. Each individual should only use the weapons if they have been trained and are authorized to do so by the GC or designated representative.

c. These weapons should only be used for their intended purpose as part of the WASH program. The weapons should not be used for any other purpose or at any other location without the approval of the GC or designated representative.

d. Personnel authorized to use the weapons should be designated in writing.

e. The weapons and all ammunition will be stored in the DES arms room.

5-3. Procedures for the use of pyrotechnics:

a. Contact Air Traffic Control tower to receive clearance and coordinate location prior to discharging pyrotechnics. If aircraft operations are imminent, ensure the WWC is raised prior to initiating dispersal operations.

b. Airfield Operations personnel will inform the Airfield Manager, and notify GAAF personnel and assigned units, prior to discharging pyrotechnics on the flightline.

c. Use ear, eye and hand protection as necessary.

5-4. Procedures for the use of weapons/ long range exploder launcher are as follows.

a. The shotgun and launcher should only be used by those individuals who have been trained by installation directorate of emergency services personnel and authorized by the Garrison Commander or designated representative.

b. The weapons can be used during day or night but, not during fog or hazy weather.

c. **Do not load the gun in the vehicle or fire gun while in vehicle.** Step outside the vehicle, cock the gun, load the cap and then load the explosive in the barrel of the gun.

d. Point the weapon at 45 degrees or higher into the air, preferably toward the flock of birds. Face away from the gun and pull the trigger.

e. The weapons can only be transported empty with the safety on.

f. The weapons should not be loaded or fired in or from any vehicle.

g. Prior to shooting any weapon, the Air Traffic Control tower should be notified.

h. Pre-established firing fans are the only areas and direction the shotgun should be fired. See Appendix C for restrictions on firing.

i. No person should shoot the shotgun if there are any obstacles, fence, equipment or other facilities within 25 yards left or right, or within 200 yards of the intended firing line. Make sure projectile is fully extinguished and removed as FOD.

j. All shots can be recorded and shotgun shell casings and wads, and long-range explosive cartridges, should be collected and disposed of properly.

k. A log should be kept with the weapons, detailing the number and location of shots fired. See Appendix I for a sample.

l. Hearing and eye protection should always be used when shooting weapons.

m. Any mishap involving the weapons and/or the ammunition should be reported immediately.

Section 6. Wildlife Strike Reporting

6-1. Reporting of wildlife aircraft strikes:

a. The pilot should inform the Air Traffic Control tower of any wildlife strike and, if airborne, land to assess the damage. If the strike occurs on the ground, the pilot should stop the aircraft to assess the damage. Note: Report known or suspected strikes even if no wildlife remains are found on the aircraft. Airfield Operations may be able to retrieve the wildlife remains on the airfield.

b. After assessing the aircraft for damage, preserve wildlife remains (including feather, hair, tissue and/or blood) and notify Airfield Operations. Personnel collecting bird/wildlife remains should receive instruction on procedures to safely collect remains.

c. Report the strike by filling out FAA Form 5200-7, Bird/Wildlife Strike Report (Appendix J), which is available at Airfield Operations. After filling out the form, submit it to the Airfield Safety Officer as per 2-7e.(7) of this document.

d. If an aircraft is damaged, the unit aviation safety officer should be informed and an accident investigation will be performed IAW DA Pam 385-40 or pertinent regulation.

Section 7. Record keeping.

a. Depredation of any birds or animals should be recorded. Dead birds/wildlife can be bagged and DPW-environmental (fish and wildlife) should be notified to pick up the remains if necessary.

b. Airfield Operations should annotate in the daily log any wildlife sightings and WDDT. Wildlife dispersal operations, to include species, location, methods and number of birds dispersed should be annotated.

c. Airfield Safety Officer should summarize quarterly the data collected and disseminate it at the Airfield Operations Board and Aviation Safety Council meetings.

Proponent

The proponent of this regulation is the Airfield Division, attn: (IMKN-PLA).

Appendix A. Acronyms and Abbreviations

AAF	Army Airfield
AFPAM	Air Force Pamphlet
ASPM	Airfield Safety Program Manager
AOB	Airfield Operations Board
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
BAM	Bird Avoidance Model
DOD	Department of Defense
DPTMS	Directorate of Plans, Training, Mobilization and Security
DPW	Directorate of Public Works
FAA	Federal Aviation Administration
FOD	Foreign Object Damage
IMCOM	Installation Management Command
NOTAM	Notice to Airmen
USDA	United States Department of Agriculture
USAF	United States Air Force
WASH	Wildlife Aircraft Strike Hazard
WDDT	Wildlife Detection and Dispersal Team
WHA	Wildlife Hazard Assessment
WHWG	Wildlife Hazard Working Group
WWC	Wildlife Watch Condition

REFERENCES.

AR 95-2	Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control, and Navigational Aids
AR 385-10	The Army Safety Program
AR 200-1	Environmental Protection and Enhancement
DA Pam 385-40	Army Accident Investigations and Reporting
DA Pam 385-90	Army Aviation Accident Prevention Program
UFC 3-260-01	Airfield and Heliport Planning and Design
AC 150/5200-36	Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazard on Airports.
AC 150/5200 33B	FAA Advisory Circulars Hazard Wildlife Attractants on or near Airports
AFP 91-212	WASH Management Techniques
ATP 5-19	Risk Management
DoDI 4715.03	Natural Resources Conservation Program
DoDI 4150.07	DoD Pest Management Program
Exec Order 13514	Federal Leadership in Environmental, Energy, and Economic Performance

Appendix B. Explanation of Terms in WASH Plan

a. WASH

Wildlife aircraft strike hazard. General term to describe wildlife hazards and wildlife hazard prevention programs.

b. Wildlife Hazard Working Group (WHWG).

Local committee concerned with the control of wildlife hazards to aviation. Executes and makes recommendations to the WASH program.

c. Wildlife Watch Condition (WWC).

A bird hazard alert condition used to warn aircrew of bird activity.

d. WWC LOW.

A bird watch condition that indicates sparse bird activity on the airfield/heliport and a low probability of hazard.

e. WWC MODERATE.

A WWC that indicates moderate concentrations of birds are in a location that represent a probable hazard to flight operations.

f. WWC SEVERE.

A WWC indicating heavy concentrations of birds on or immediately adjacent to the runway, which presents an immediate hazard to flight operations; or any concentration of birds that presents a danger to aircraft.

g. Bioacoustics.

Recorded tapes of bird distress and predator call used by WDDT to disperse birds off runways and airfield/heliport areas.

h. Wildlife Strike.

Any contact between wildlife and an aircraft, whether or not damage occurred.

i. Depredation.

Technique used to remove problem wildlife permanently from the airfield/heliport and hangars when other scare tactics are ineffective. Depredation permits are required for most species.

j. Falconry.

Active dispersal of problem birds using trained falcons.

k. Propane cannons.

Stationary non-projectile sound producing device used to disperse birds from airfield/heliport areas.

l. Pyrotechnics.

Noise-producing devices fired from pistol or shotgun. Used by the WDDT to scare wildlife away from runways and airfield/heliport areas. Pyrotechnics are Class 1.4 explosives.

m. Wildlife Detection And Dispersal Team (WDDT).

A roving airfield/heliport patrol, which reports WWCs, disperses problem wildlife via chase, pyrotechnic, bioacoustics, depredation and other methods.

Appendix C. Wildlife Management Techniques and Recommendations.

a. Techniques and recommendations.

Bird control and dispersal should primarily be accomplished by airfield operations personnel or the agency responsible for performing airfield inspections/checks. However, a variety of dispersal and control measures should also be available to other personnel (environmental, security, crash, fire, rescue, deployed duty officers, etc.) to use on an as-needed basis. These measures should be readily available at any time when birds or other wildlife threaten airfield/heliport operations. Pyrotechnic equipment should be properly stored.

b. Active harassment.

(1) Each airfield should have enough harassment tools to effectively control and harass wildlife on the airfield. Many airfield personnel only use their vehicle horn/siren to harass birds. This is not considered an effective WASH program. While a vehicle horn/siren may work temporarily to get the birds to fly or move, it normally does not scare the birds enough to deter their return to the same location when the vehicle is gone. Active harassment requires adequate tools (pyrotechnics/bioacoustics/propane cannons) to effectively deter birds from the airfield.

(2) In most situations, the combination of human presence and pyrotechnics will be enough to prevent birds from landing and feeding. These two methods should form the foundation of the bird harassment program. However, judicious and varied use of several different types of harassment tools is preferred to prevent acclimation. A combination of frightening devices should be available for use whenever birds are present on the airfield/heliport or in surrounding areas. Primary among those are pyrotechnic devices that can be fired from 15mm “starter” pistols, standard 12-gauge shotguns or modified flare pistols. Pyrotechnics are listed in the Air Force Table of Allowances; no such Army equivalent exists for airfield use, though explosive procurement and storage requirements for other such materials can be followed. Airfield bird control devices may also be ordered through local purchase mechanisms, however prior coordination with munitions experts and safety personnel should be accomplished. Such devices project pyrotechnics many meters over flocks of birds that present hazards. Skillful use of the devices can disperse birds from the field in desired directions. They produce a variety of loud sounds and explosions, bright flashes of light, and/or trailing smoke. Training for safely using the devices and coordination with airborne aircraft through direct communications is imperative to avoid scaring birds into active flight paths. Pyrotechnic devices can be extremely effective in dispersing waterfowl, gulls, crows, shorebirds, starlings and flocks of blackbirds. Gulls, starlings, crows and blackbirds may also be dispersed using a combination of pyrotechnics and bioacoustics.

(3) Bioacoustics are the recorded distress and alarm calls of species to be dispersed. Ensure species-specific calls are used. They are projected over a speaker system that may be mounted on the roof or through the window of a vehicle. Birds will sometimes disperse upon hearing species-specific calls, but may come to investigate the source of the sound and can then be encouraged to leave using pyrotechnic devices. These active harassment techniques should be used on the airfield/heliport and in all hazardous surrounding areas. These techniques may also be used in coordination with local property owners, to disperse any known bird roosts from dense trees such as found in nearby parks, golf courses, ponds and other structures.

(4) Additional harassment techniques such as networks of remotely-triggered gas cannons, radio-controlled model aircraft or others can be considered as effective supplements to other dispersal techniques. Creativity and intensity of such programs will make the overall effort much more successful and delay habituation to the combination of techniques.

c. Rodent control.

Rodents such as moles (*Microtus spp*.), mice (*Peromyscus spp.*) and ground squirrels (*Spermophilus spp*.) are abundant throughout most regions and have established populations in the surrounding areas and on the airfield itself. Rodents attract a variety of raptors such as red-tailed hawks and kestrels that feed on them. Rodents may also damage wiring and undermine the integrity of pavement and overruns. Removal by trapping or poisoning in accordance with federal/state law may be conducted by DOD or state pest management control personnel or under contract with USDA Wildlife Services or other state-approved contractors.
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d. Invertebrate control.

Various invertebrates including insects and earthworms may attract a wide variety of birds including blackbirds, starlings, crows, gulls and raptors. Insecticides can be applied on a limited basis as necessary and in compliance with state and federal law.

e. Waterfowl control on ponds and surrounding properties.

(1) There are a variety of waterfowl species that may pose very significant and potential hazards to aircraft operating from IMCOM Army Airfields and surrounding areas. Canada geese and particularly resident populations may be most significant. In fact, these may be the most significant hazard to aviation noted at airfields. These birds are attracted to open water ponds and associated managed grassy areas by lakes and other such areas. Warm water discharge ponds from power plants, rivers and associated wetlands also attract large numbers of resident and migratory geese and other waterfowl. They will also visit surrounding agricultural fields as grains mature or are left exposed after harvest operations are complete. Some of these hazards are not possible to control as birds may merely be migrating through the region during spring and fall, or exhibiting local movement patterns between features in the vicinity of the installation. However, local non-migratory resident Canada geese pose the most significant problems and will attract many of these migratory birds to areas where they feel secure in areas occupied by resident birds. It is imperative to control resident goose populations if hazards are to be avoided. It must also be emphasized that there are potentially significant health risks associated with large geese populations in heavily used areas of the installation in addition to the aviation hazard. There are several mitigating measures that may be employed.

(2) Resident Canada geese population control should be exercised not only on IMCOM Army Airfield property, but also in the surrounding community wherever potentially hazardous concentrations are noted. Egg oiling or addling, depredation hunts and goose roundups during flightless seasons should be employed as applicable. By far the most effective technique is to round up birds during the summer breeding season when adult birds are flightless for several weeks. Birds are corralled into pens through gentle harassment and encouragement on the water or on grassy areas. Birds are then humanely euthanized and handled in accordance with state and federal regulations. Generally birds are donated to homeless shelters or food banks so that meat does not go to waste. Depredation permits are required and public awareness is key. Place signs around public areas to prohibit feeding of waterfowl and to educate people on the flight safety and public health risks posed by these waterfowl.

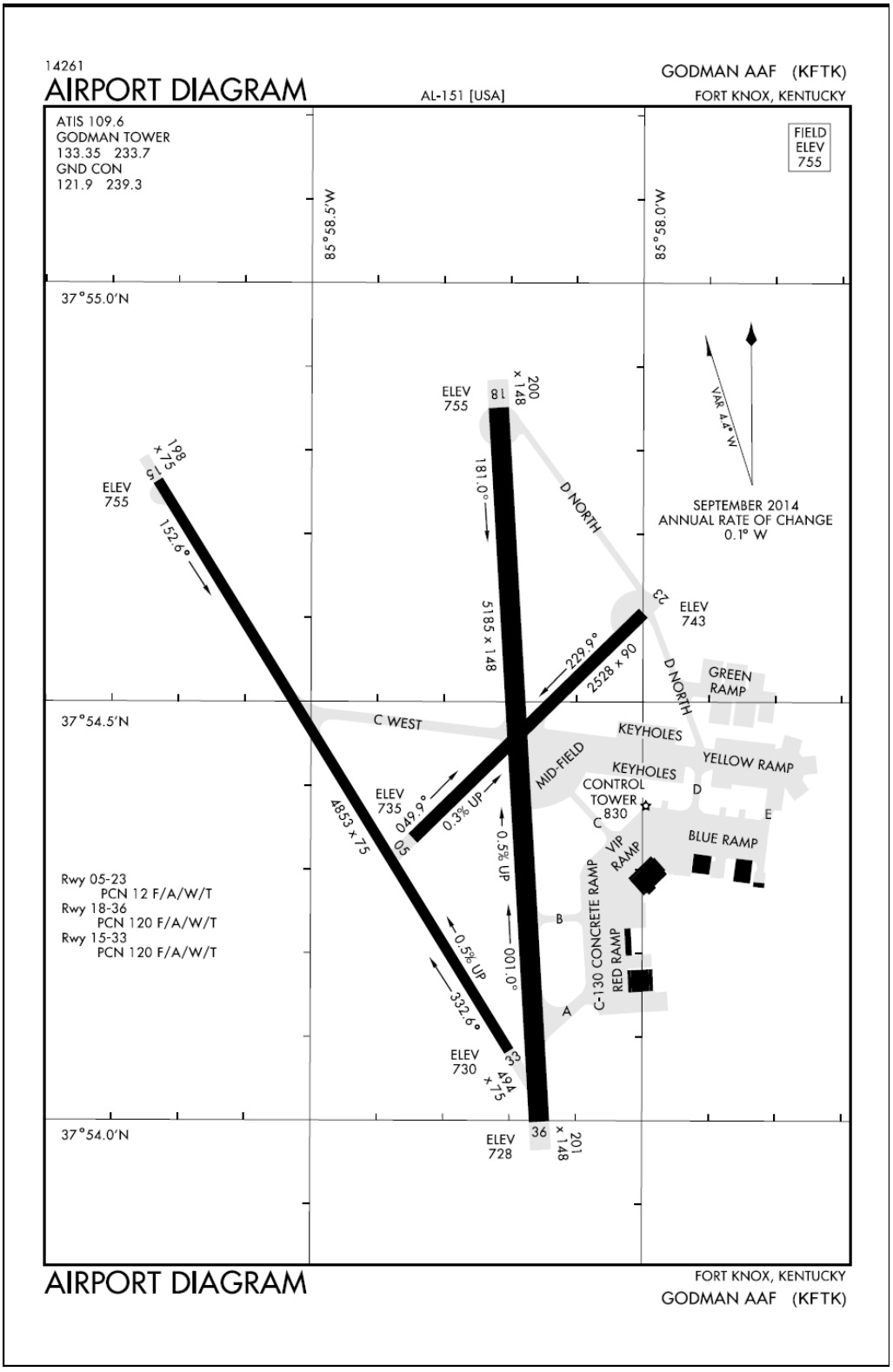
f. Depredation and controlled hunting.

(1) In addition to the geese detailed above, removal of nuisance birds and other wildlife may be conducted with appropriate federal and state permits by federal, state or contracted personnel. Trapping, poisoning and shooting of individual or flocks of birds, such as starlings, blackbirds and gulls or other wildlife, such as foxes, deer or rodents, may be required on a periodic basis. Depredation is a last resort measure that may reinforce other habitat management or active control efforts and is recommended when a severe hazard persists for several days. Such an effort should be carefully controlled and conducted in full compliance with conditions of state and federal permits. Dead birds should not be placed near the operating surfaces as they may attract scavengers and increase the hazard.

(2) Use of depredation permits as a supplement to the installation's annual hunting programs is an excellent means of keeping deer and other wildlife populations below carrying capacity so that they are less prone to disperse to areas including the airfield. These programs should continue in the future. One area to monitor however, is to ensure gut piles or animal remains do not attract vultures, hawks, eagles and other scavengers that may cause hazards to aircraft operations. Removal of entire carcasses or burial of remains may be necessary as conditions for hunting access to the installation if it is determined that exposed remains are attracting hazardous birds or other wildlife. Carcasses and offal left in the field could significantly and adversely affect hazardous bird concentrations. Scavengers such as turkey vultures, bald eagles and other raptors, as well as other species, will exist in higher than normal numbers if provided supplemental food sources. In addition to causing hazardous concentrations, such practices can lead to long-term increases in local scavenging bird populations and further exacerbate the potential hazards. Not only is there an immediate food source available, but freezing temperatures and snow cover during and following hunting seasons can allow these food sources to persist well into the following spring. Although the

terrain may make removal of whole carcasses or offal difficult, every effort should be made to remove these animals from the field following hunts and depredation efforts should it be determined that scavenging birds present a WASH concern. Alternatively, burial of carcasses and offal may be considered. Preferably, this material should be covered by at least 18 inches of soil to prevent attracting scavenging vultures and other species. As the post requires hunters to check in and sign waiver forms to hunt on the property and also check out with any animals harvested, monitoring of compliance should be relatively easy to enforce should it be determined necessary.

Appendix D. Godman AAF (KFTK)



Appendix E. Local Wildlife Species

GENERAL. The following is a summary of wildlife commonly found within the airfield environment. Associated with each is a brief description of how they can be controlled or avoided. Each control measure will require action by one or more tasked organizations as described in Section 2. It is very important to know which wildlife species or airfield attractants are present before control techniques can be effectively applied. As such, all WDDT personnel should be trained in wildlife identification. Depredation (lethal harassment) of migratory birds (as defined by the Migratory Bird Treaty Act) requires a permit from the Regional US Fish & Wildlife Service Regional Bird Permit Office.

a. BIRDS

(1). Gulls:

These birds represent the most significant hazard to aircraft at airports worldwide. Due to their omnivorous feeding habits and preference for flat, open areas to rest, they are commonly found on airfields/heliports. Gulls are most active just after sunrise and before sunset as they move to and from feeding areas. Maintenance of grass height between 6 and 12 inches is critical in reducing gull numbers. Even with this in effect, gulls may inhabit the airfield, particularly during inclement weather. Persistent harassment using pyrotechnics and bioacoustics is necessary to discourage these birds. Other techniques such as gas cannons, model gulls, radio-controlled model aircraft and even falconry should be considered if available and cost-effective.

(2). Horned Larks:

Horned larks are attracted by bare spots such as runway sides, where they eat weed seeds and insects. These birds are very difficult to control. The best defense against these birds is a thick, uniform grass with no bare spots. Consider coating bare spots, particularly along runways, with oil-based or asphalt cover. Pyrotechnics can be used, but these birds will tend to fly only short distances and settle down. Persistence is the key to success.

(3). Wild Turkey:

Wild turkeys are most effectively controlled through habitat management including proper grass-height, elimination of roosting and food sources, and reduction of habitat diversity. Do not allow grass to exceed 18 inches and eliminate all weeds and brush patches on the fields, particularly if the plants are seed producing. Pyrotechnics, gas cannons, live ammunition or periodic hunts can effectively disperse these birds. Depredation of turkeys requires special permits from the state environmental conservation agency.

(4). Raptors (Hawks, Owls, Falcons, Eagles, Vultures):

These birds can be particularly hazardous to aircraft because of their size and widespread distribution over bases and low-level areas. Raptors (particularly vultures) use thermals to their advantage to search for prey. These birds become active during mid-morning and remain aloft until late afternoon. Removal of dead animals and removal of dead trees and other perching sites on the airfield can control these birds. Pyrotechnics may be used to frighten raptors from the airfield.

(5). Waterfowl (ducks, geese, swans):

Resident waterfowl nesting in the area during the summer tend to be attracted to ponds, lakes, and the like. A depredation permit can be obtained to oil eggs if this becomes necessary to limit nesting success. Low flying helicopters in the training area are at greater risk striking waterfowl than aircraft at AAFs. Migrating waterfowl during spring and fall can potentially be dangerous to flight safety due to the large numbers of birds traveling between their breeding and wintering grounds. Migrating birds are most active from sunset through midnight, with numbers decreasing in the early morning hours. Avoidance of flying during the evening hours is generally safest. If migrating waterfowl land at the airfield, pyrotechnics, gas cannons, and effigies are all excellent control techniques.

(6). Sandpipers/Shorebirds:

The most significant hazard from these birds occurs when large numbers flock in tight groups, particularly during migration. To control these birds, proper grass height management should be observed. Water in puddles should be eliminated and ditch banks steepened to limit access to these birds. Other species such as killdeer are quite adept at avoiding aircraft. Pyrotechnics and bioacoustics can be used for all species and some respond well to falconry.

(7). Owls:

Most owls are nocturnal and attracted to rodents as a food source. Rodent control through habitat manipulation may be necessary on the airfield to control owls. Limit the number of perch sites by removing perch sites such as unnecessary fence posts and dead trees. Avoid over-flying landfills at night to reduce hazards from owls.

(8). Nighthawks, Whippoorwills:

These birds are nocturnal and particularly active at sunset and moonlit nights. Little can be done to limit their number other than insect control. Avoiding night flights is also not feasible however, these birds tend to pose little risk to aircraft.

(9). Woodpeckers:

Woodpecker strikes should be extremely rare. These birds are common in forested areas, but generally remain below canopy level. On the airfield, elimination of trees should eliminate strikes with these birds.

(10). Flycatchers:

These birds are present on airfields/heliports to feed on insects. Strikes are infrequent, but should not be overlooked. Control is best accomplished by limiting the abundance of insects and removal of perch sites such as fence posts, tree limbs, bushes, high spots on the field, etc.

(11). Swallows and Swifts:

These birds eat insects in flight and are commonly found above airfields/heliports. Insect control will reduce swallow numbers and discouragement of nesting will further decrease numbers. Remove mud nest from hangars, etc., with a hose as the birds begin nesting and when nesting is complete. Nesting in hangars can be discouraged by harassing the birds as they work on building. If swallows are noted resting on runways or taxiways, use pyrotechnics to disperse them. Nest removal (an action requiring permits) from hangars shall be coordinated with the DPW-environmental (fish and wildlife).

(12). Crows, Ravens, Blackbirds, Grackles, Cowbirds and Starlings:

These birds can be particularly hazardous because they frequently occur in large flocks particularly at sunset as they return to roost sites. These birds are generally attracted to flat, open areas to feed, rest, or stage/pre-roost; they are also attracted to dumpsters and garbage bins. Maintenance of grass height between 6 and 12 inches is the best control method. Remove any known roost sites or thin individual roost trees. Bioacoustics, pyrotechnics, and depredation can be used to frighten and remove these birds. Starlings are not federally protected and may be removed without permits. Permits are required for other species. If these birds occur in hangars, removal or modification of the perches is recommended to eliminate the problem; toxic bird perches could be used in some circumstances. Avoid flying near known roosts, especially at sunrise and sunset and during spring and fall migration.

(13). Meadowlarks:

These birds occur on many airfields/heliports and are attracted to grasslands and low weeds. Eliminate broadleaf weeds and maintain grass height at 6 to 12 inches. Elimination of suitable perching sites, such as fence posts and

brush will also aid in reduction. Pyrotechnics can be used, but meadowlarks usually only fly a short distance before setting down again. Persistence is the key to success.

(14). House Sparrows:

These birds are not commonly struck by aircraft, but are common pests around structures. House sparrows often nest in hangars and dense shrubs and trees. These birds are not protected by law and may be destroyed without a permit. If these birds occur in hangars, removal or modification of the perches or nesting areas is recommended to eliminate the problem. Toxic bird perches may also be used. Frightening techniques are usually ineffective against these birds.

b. Mammals.

While concern is mostly centered on birds, several mammalian species also pose threats to flight operations and should be considered. As for all wildlife, close coordination with the installation's fish and wildlife management program is necessary to reduce hazards.

(1). Deer:

Deer pose the greatest threat to aircraft due to their size and preferred nocturnal activities. Control techniques include modifying and maintaining existing perimeter fences and gates to make them less likely to allow access by deer. This includes continual monitoring of gates any time they must be open for access for any reason. Deer that do enter airfield/heliport perimeters may be driven out using nets as funnels, while personnel and vehicles push the deer out one of the gates. Selective shooting of deer posing a safety threat inside the airfield boundaries shall be used as a last resort and in coordination with the fish and wildlife management program. State permits may be required.

(2). Coyotes and foxes:

These animals are attracted to airfields/heliports by rodents, rabbits and other food sources. Dens may be found in banks, culverts or other suitable areas. Rodent control through habitat modification will reduce the likelihood these animals will enter airfield/heliport areas; pyrotechnics can also be used to frighten these animals. Shooting and trapping of individual animals in specific circumstances can be evaluated on a case-by-case basis. State permits are required. Under no circumstances should coyotes/foxes be allowed on the airfield as a way to keep other rodents/rabbits off the airfield.

(3). Rabbits and rodents:

These animals often attract raptors, coyotes and foxes. Proper grass management will reduce the numbers of these animals on airfields/heliports. State permits are required.

Appendix F. USAF Low-Level Bird Avoidance Model (BAM).

a. The BAM is a predictive model using geographic information system (GIS) technology as a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics, combined with key environmental and man-made geospatial data. The value for each cell (or pixel) of the model is equivalent to the sum of the mean bird mass (in ounces), for all bird species present during a particular daily time period, for one of 26 two-week periods in a year. The BAM is internet accessible at the following web site http://www.usahas.com/bam/

b. The bird species data set was derived from discrete geographic information for observations of 60 key WASH bird species, over a 30-year period. The species data was acquired from several key datasets, including the Audubon Societies' Christmas Bird Count, the US Biologic Survey's Breeding Bird Survey, bird refuge arrival and departure data for the conterminous U.S., and many additional data specific to a particular bird species.

c. The risk levels describe three predicted risk classes — Low, Moderate and Severe, which are based upon the bird mass in ounces per square kilometer. In other words, the risk levels represent the amount of birds (bird mass) in a kilometer squared spatial area. The "Moderate Zone" indicates a risk ratio that is 57-708 times the risk of the "Low Zone", while the "Severe Zone" indicates a risk ratio that is 2,503-38,647 times the risk of the "Low Zone".

d. The model uses the best available data for historical modeling of bird migratory patterns to provide the user with an effective decision making tool. Because birds are dynamic creatures whose migratory behavior is initiated by weather events in any given year, the model cannot be said to predict the exact movement of bird species through space and time beyond the biweekly timeframe. Spatial zones indicating a severe risk according to the model should not be ignored and should be avoided. It is not suggested that pilots fly within the "Severe Zone" unless it is absolutely mission essential.

Appendix G. Active WASH Dispersal/Depredation Methods and Equipment

a. General.

There are a variety of methods for dispersing birds using static, pyrotechnic, bioacoustics and depredation equipment. Any or all of these may be used at IMCOM AAF to control birds. The WDDT should be trained in the use of bird dispersal equipment used at IMCOM Army airfields/heliports annually. Due to the Army not having a list of WASH equipment, use AF Plan (AFPAM) 91-212, Attachment 5, to obtain a list of WASH equipment normally used by DOD.

b. Static deterrent devices:

Static deterrents include, but are not limited to: propane cannons, scarecrows, silhouettes and effigies. They are often very effective in bird deterrence. Static devices are designed to augment the activities of the bird dispersal teams. Static deterrents should not be considered a replacement for dispersal teams. Static devices are very labor intensive and should be moved 50-100 feet from their existing locations at least once daily. This activity will inhibit the decline in their deterrent effect that can occur as wildlife begins to become accustomed to the device.

c. Propane cannons:

These devices produce loud explosions at regular, pre-set intervals. They can be useful in combination with other methods. The WDDT should position and operate propane cannons based on the active runway, bird locations, and air traffic density. Change the locations daily/weekly to avoid habituation by the birds. At a minimum, one cannon each should be placed at the approach end, midfield and departure end.

d. Bioacoustics:

Bioacoustics are audio-taped distress or predator calls of actual birds. Special care must be taken to play the tape in short intervals to prevent habituation by the birds. Play the tape 20-30 seconds, then pause briefly. Repeat as required. Birds should respond by taking flight or becoming alert. These calls are effective for waterfowl, gulls, songbirds and shorebirds. Pyrotechnics should be used in conjunction with bioacoustics to enhance complete dispersal. Bioacoustics should be the first option employed to control airfield/heliport bird habitation.

e. Pyrotechnics:

Pyrotechnics are effective for dispersing most bird species and should also be used for coyotes, deer and other animals. Pyrotechnics are fired from modified pistols and 12 gauge shotguns. Pyrotechnics may include a variety of devices similar to commercial fireworks, including bangers, whistlers and screamers. Screamers and bangers are smaller diameter projectiles which are fired from commercially available .22 caliber starter or blank pistols. These small but very loud firecrackers are shot from the pistol/shotgun into flocks or near individual animals to frighten them away when they are discharged. Judicious and varied use of several different kinds of pyrotechnics is important, to prevent acclimation.

f. Lethal control (depredation):

Occasional depredation of birds reinforces the other methods. Shooting one or two from a flock, then following with a volley of pyrotechnics is generally a very effective strategy for deterrence. Domestic pigeons, European starlings and house sparrows may be removed without permit. All migratory birds (as defined by the Migratory Bird Treaty Act) require a permit prior to removal. DPW-environmental (fish and wildlife) personnel should advise the WDDT before any lethal control methods are conducted. DPW-environmental (fish and wildlife) collect depredated wildlife (whether a permit was required or not) for identification, disposal and reporting requirements.

Appendix H. Passive WASH control methods

a. Managing grass height.

(1). There is no grass height management standard that fits all situations. Different species of grasses, weeds, etc. grow at various rates, produce seeds and fruits as varying heights and attract different species of wildlife. The wildlife hazard assessment will help determine the most appropriate grass height and management scheme.

b. Controlling broad-leafed weeds.

Keep broad-leafed weeds to a minimum on the airfield/heliport. Apply herbicides as necessary for control. Broad-leafed weeds attract a variety of birds and wildlife, may produce seeds or berries, and may limit grass growth. Obtain assistance in herbicide selection for weed control, appropriate grass seed selection, fertilization, and erosion control vegetation from WHWG recommendations, DPW-environmental (fish and wildlife), U.S. Soil Conservation Service or the Agricultural Extension Service.

c. Planting bare or erodible areas.

(1). Eliminate bare areas on the airfield/heliport. Where re-vegetation hasn't worked or can't work, soil cementing may be the answer. Soil cementing is the process of adding materials to the existing soil. Once the soil is hardened, it becomes like concrete; however, water runoff is accelerated.

(2). The following grass mixture/blend is designed for areas that receive little or no supplemental fertilization or irrigation, avoid using invasive species and minimize the use of pesticides. IAW 4715.03, restore and rehabilitate altered or degraded landscapes and associated habitats to promote native ecosystems and land sustainability when such action is practicable and does not conflict with the military mission or capabilities consistent with EO13514. Seed mixtures should not contain millet or any other large seed producing grass.

d. Fertilizing.

Fertilize as needed to stimulate grasses and promote a uniform cover. Irrigation may be required to support turf growth. Rate and frequency of application may vary from that of other semi-improved grass areas and should be based on soil test.

e. Removing habitat diversity/edge effect.

The greatest numbers of species are found where vegetation types change from forests to brush or brush to grass (edge effects). To reduce wildlife problems, keep edge effects to a minimum or as far from the active runway as possible. If an airfield/heliport has clumps of brush and shrubs around the grass, more diverse habitat is available. Remove brush and weeds to maintain the airfield/heliport in the most uniform condition possible. This eliminates the cover many birds and rodents require. Single trees or snags on an airfield/heliport may provide perches for hawks, owls or other bird species. Biodiversity practices should not be implemented on airfields.

f. Leveling of airfield.

Level or fill high or low spots to reduce attractiveness to birds and prevent standing water.

g. Removing animal carcasses from the airfield.

This is to avoid attracting scavengers that may feed on them. Forward all remains from aircraft strikes, depredation activities or found dead to the installation's DPW-environmental fish and wildlife management program for identification and collection.

h. Removing dead vegetation.

As soon as possible, remove dead vegetation such as brush piles, grass clippings, etc., and the cover it affords.

i. Pest control.

Invertebrates and rodents are food sources for many birds. Periodically survey and reduce these pests when required. Pesticides and traps can sometimes reduce pest populations. Only Environmental Protection Agency-registered and command pest management consultant-approved pesticides are authorized and they must be used strictly according to label instructions. Additionally, if the pesticides are purchased with non-governmental funds, they must also be state registered. Inspection and control should begin early in the spring after coordination is made with DPW-environmental (fish and wildlife) and DPW-operations and maintenance (pest control).

j. Maintaining drainage ditches.

Fresh water is one of the most important airfield/heliport wildlife attractants, especially in arid regions and near the seacoast. Standing water creates a source of drinking water and a breeding place for insects, amphibians and other food sources for birds. Regularly inspect ditches to keep them clear. Maintain ditch sides as steeply as possible (minimum slope ratio of five to one) to discourage wading birds and emergent vegetation. Improve drainage as necessary to inhibit even temporary ponds or puddles. When able, cover ditches with netting/plastic fencing. Working in and around wetlands (e.g., ditches and creeks) should be done in coordination with DPW-environmental (wetlands).

k. Eliminate roosting sites.

Control roosts by vegetation management of roost sites where possible. Prune or cut down trees to reduce the number of perches if necessary.

l. Bird-proof buildings and hangars.

Often, bird-proofing of buildings and hangars is required to exclude pigeons, sparrows and swallows. Excluding birds from a structure will often displace them to an adjacent structure. Lethal control of birds in buildings can only be done in accordance with state and federal permits. Denying access by screening windows, closing doors and blocking entry holes is most effective. When necessary, consider:

(1) Toxic perches.

Install where maximum numbers of birds will contact them. Ensure perches are maintained to remain effective.

(2) Pellet guns.

This weapon is a short-term bird eradication solution only. Proper safety equipment and skilled personnel are required.

(3) Netting.

Though expensive, netting provides an excellent long-term defense against birds returning to hangars. Install under superstructure to exclude birds from roosting areas while allowing the doors to be open during hangar operations.

(4) Avitrol.

DPW-operations and maintenance (pest control) should place in or near hangar to remove birds or create a distressed response that scares other birds.

(5) Trapping and removal.

Use a large cage with food and water to trap birds. Release birds away from buildings or depredate if permitted by law. Permits should be coordinated through DPW-environmental (fish and wildlife).

(6) Design features.

If designing a new hangar, consider locating supports on the exterior.

(7) Sharp projections.

Use in limited areas such as ledges and overhangs or small places where birds cannot be allowed.

(8) Perimeter fence and gates.

Maintain perimeter fence and gates around the boundaries of Army Airfields to exclude large mammals (e.g., deer).

Appendix I. WASH Shotgun Log

Shotgun/ CAPA	Date/Time Out	Date/Time In	Number of Rounds Fired	Location(s)	Depredation (Y-N)	DPW En. Notified	Miscellaneous	Shooter's Signature
Example:	3 Mar 00/1000	3 Mar 00/1030	5	see map	N	N/A	Moved flock of crows	Joe White

Form Approved OMB NO. 2120-0018

U.S. Department of Transportation
Federal Aviation Administration

BIRD/OTHER WILDLIFE STRIKE REPORT

1. Name of Operator	2. Aircraft Make/Model	3. Engine Make/Model
4. Aircraft Registration	5. Date of Incident ____/____/____ Month Day Year	6. Local Time of Incident ☐ Dawn ☐ Dusk —— HR —— MIN ☐ Day ☐ Night ☐ AM ☐ PM
7. Airport Name	8. Runway Used	9. Location if En Route *(Nearest Town/Reference & State)*
10. Height *(AGL)*	11. Speed *(IAS)*	

12. Phase of Flight

- ☐ A. Parked
- ☐ B. Taxi
- ☐ C. Take-off Run
- ☐ D. Climb
- ☐ E. En Route
- ☐ F. Descent
- ☐ G. Approach
- ☐ H. Landing Roll

13. Part(s) of Aircraft Struck or Damaged

	Struck	Damaged		Struck	Damaged
A. Radome	☐	☐	H. Propeller	☐	☐
B. Windshield	☐	☐	I. Wing/Rotor	☐	☐
C. Nose	☐	☐	J. Fuselage	☐	☐
D. Engine No. 1	☐	☐	K. Landing Gear	☐	☐
E. Engine No. 2	☐	☐	L. Tail	☐	☐
F. Engine No. 3	☐	☐	M. Lights	☐	☐
G. Engine No. 4	☐	☐	N. Other:	☐	☐

(Specify, if "N. Other" is checked)

14. Effect on Flight

- ☐ None
- ☐ Aborted Take-Off
- ☐ Precautionary Landing
- ☐ Engines Shut Down
- ☐ Other: *(Specify)*

15. Sky Condition

- ☐ No Cloud
- ☐ Some Cloud
- ☐ Overcast

16. Precipitation

- ☐ Fog
- ☐ Rain
- ☐ Snow
- ☐ None

17. Bird/Other Wildlife Species

18. Number or birds seen and/or struck

Number of Birds	Seen	Struck
1	☐	☐
2-10	☐	☐
11-100	☐	☐
more than 100	☐	☐

19. Size of Bird(s)

- ☐ Small
- ☐ Medium
- ☐ Large

20. Pilot Warned of Birds ☐ Yes ☐ No

21. Remarks *(Describe damage, injuries and other pertinent information)*

DAMAGE / COST INFORMATION

22. Aircraft time out of service: _____ hours	23. Estimated cost of repairs or replacement *(U.S. $)*: $	24. Estimated other cost *(U.S. $) (e.g. loss of revenue, fuel, hotels)*: $

Reported by *(Optional)*	Title	Date

Paperwork Reduction Act Statement: The information collected on this form is necessary to allow the Federal Aviation Administration to assess the magnitude and severity of the wildlife-aircraft strike problem in the U.S. The information is used in determining the best management practices for reducing the hazard to aviation safety caused by wildlife-aircraft strikes. We estimate that it will take approximately **5 minutes** to complete the form. If you wish to make any comments concerning the accuracy of this burden estimate and any suggestions for reducing this burden, send those comments to the Federal Aviation Administration, Management Staff, ARP-10, 800 Independence Avenue, SW, Washington, DC 20591. The information collected is voluntary. Please note that an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control number associated with this collection is 2120-0045.

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APPENDIX I

NATURAL AND CULTURAL RESOURCES

MANAGEMENT PLAN

U.S. Army Privatization of Military Family Housing
Fort Knox, Kentucky

Knox Hills Communities, LLC

Fort Knox, KY

November 2006

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ARPA	Archaeological Resources Protection Act
BMP	Best Management Practices
CFR	Code of Federal Regulations
INRMP	Integrated Natural Resources Management Plan
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
NAGPRA	Native American Graves Protection and Repatriation Act
NRHP	National Register of Historic Places
NRMP	Natural Resource Management Plan
RCI	Residential Communities Initiative
SHPO	State Historic Preservation Office
SOP	Standard operating procedure
SWPPP	Storm Water Pollution Prevention Plan

1.0 INTRODUCTION

1.1 Background

In connection with the implementation of the public-private partnership between Actus Lend Lease, LLC and the U.S. Army, and pursuant to a Community Development Management Plan being developed by the United States of America, acting by and through the US Army with respect to the subject properties, it is anticipated that the U.S. Army will lease the subject properties to a new entity, “Knox Hills Communities, LLC” (Knox Hills) pursuant to a Ground Lease. The residential units and ancillary facilities are located within Fort Knox, Kentucky. As of the effective date of the Ground Lease, Knox Hills will undertake certain activities relating to the design, renovation, construction, operation, management, demolition and maintenance of rental housing developments, including ancillary facilities and associated infrastructure, at the subject properties (collectively "the Project”). These activities will include compliance with applicable federal, state, and local environmental laws and regulations (except to the extent such obligations are retained by the U.S. Army, either by law or pursuant to any operative contract document) and providing for consistency and cooperation, to the extent applicable to Knox Hills’ interest in the residential portions of the sites, in the implementation of environmental management plans otherwise specific to the sites (including non-residential portions of the sites).

1.2 Purpose

This Natural Resource Management Plan (“NRMP”) provides guidance to protect the natural resources at Fort Knox during implementation of the Knox Hills project. The plan provides guidance to help conserve U.S. Army land and natural resources in Kentucky and helps ensure compliance with environmental laws and regulations.

2.0 ENVIRONMENTAL LAND USE CONSIDERATIONS

2.1 Land Use, Aesthetic and Visual Resources

In general, the land use contemplated under the Ground Lease is typical and appropriate to a residential community, including ancillary and recreational uses. Land use shall adhere to optimal land use plans outlined in the Lessee’s Development Plan when siting housing developments. New housing shall be designed in a regionally appropriate architectural style.

In general, land-use planning will include consideration of the impact of housing on sensitive environmental areas. Family housing shall be sited to avoid loss of natural and ecological resources such as wetlands, listed or sensitive/endangered species or their habitat, and wildlife species travel corridors as practical. New construction design will include consideration of existing natural systems of topography, vegetation and drainage. Native vegetation and trees shall be maintained wherever possible. Housing areas shall be landscaped with native vegetation whenever possible.

2.2 Vegetation, Wildlife, and Sensitive Habitats

When possible, large blocks of existing native vegetation will be identified prior to construction, flagged in the field to ensure visibility, and preserved for use as buffers. Known sensitive areas, such as wetlands and streams, will have a construction set-back/buffer zone. Construction plans shall be prepared so as to preserve, where feasible, existing parks, vegetated buffers and blocks of existing vegetation to serve as buffers and to provide wildlife corridors. Lessee shall coordinate with the Department of Public Works before implementing any tree removal actions. When possible, sensitive native plant species will be preserved within the development footprints.

Lessee shall generally employ Best Management Practices (BMPs) specified in site-specific Civil Engineering Construction Drawings to control erosion and protect vegetation and wildlife. BMPs will be described, specified, and implemented in accordance with a Storm Water Pollution Prevention Plan (SWPPP) written in accordance with Kentucky regulations. During construction, disturbed areas shall be limited to the construction footprint, footprint of support structures (e.g., roads, utility lines, amenities) and adjacent construction staging areas, as practical. Natural areas disturbed during construction activities shall be re-vegetated or reseeded with native species as soon as practical. To minimize the amount of vegetation upkeep on the project sites, environmentally and economically beneficial landscaping practices shall be followed, as practical.

2.3 Wetlands

Lessee shall use BMPs and maintain vegetated buffers and silt curtains between construction areas and aquatic bodies to reduce impacts to these habitats. Lessee shall avoid construction activities within 100 feet of known wetlands when possible. BMPs will be employed to reduce the potential for spills and to contain and clean up any spills that cannot be prevented. Siting of family housing will be performed to minimize loss of natural and ecological resources such as wetlands, listed or sensitive species or their habitat, and wildlife species travel corridors as practical. If it is necessary to disturb wetlands, Lessee will conduct a wetland delineation to determine exact wetland boundaries and acreage and implement appropriate mitigation for wetland loss. If necessary following wetland delineation, Lessee will obtain appropriate Section 404 permits from the U.S. Army Corps of Engineers, Louisville District, and Section 401 Water Quality Certification from the Kentucky Division of Water to dredge, and fill wetlands. All work to be completed within the 100 year floodplain of streams that could have an effect on the flood waters may also require a permit from the Floodplain Section of the Kentucky Division of Water.

2.4 Cultural Resources, Archaeological and Historic Preservation

Pursuant to Stipulation II B. 7. of the Programmatic Agreement Among Fort Knox, Kentucky, Kentucky State Historic Preservation Officer And The Advisory Council On Historic Preservation For The Privatization Of Family Housing At Fort Knox, Kentucky dated January 12, 2006, In the event of a discovery of archaeological materials, deposits or features during any activities, the Lessee shall immediately stop work in the vicinity of the discovery and notify

the Fort Knox Cultural Resource manager point of contact. As per this section, the Kentucky SHPO will be notified pursuant to 36 CFR Part 800.13.

In the event that human remains are discovered, work will cease and the proper law enforcement authorities will also be notified.

Upon notification, Fort Knox Cultural Resources manager point of contact and the Lessee Cultural Resources point of contact shall develop a methodology for proceeding within applicable federal and state laws to ensure the protection of the potential resource while making every effort to keep the project on schedule.

In the area identified as the Fort Knox Cantonment Historic District that is under the Lessee's jurisdiction, every effort will be made to retain and protect the cultural landscape within the appropriate framework as set forth in the Secretary of the Interior's Standards for Cultural Landscapes. Where the natural and cultural resources might be in conflict, the Lessee Cultural Resources point of contact and Fort Knox Cultural Resources manager point of contact shall work to resolve the issues in a manner that best protects all resources and in concert with all applicable state and federal laws.

Pursuant to Stipulation III A of the Programmatic Agreement Among Fort Knox, Kentucky, Kentucky State Historic Preservation Officer And The Advisory Council On Historic Preservation For The Privatization Of Family Housing At Fort Knox, Kentucky (PA) dated January 12, 2006, plans for all proposed projects that affect Historic Properties will be submit to the Fort Knox CRM staff point of contact. The CRM point of contact will review the project and plans and respond within 15 working days with a determination that the project is either consistent with agreed historic property management plans and therefore exempt from further review, or, if the project plans affecting the Historic Properties do not conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties, that further review and consultation with the Kentucky SHPO is needed. If further review and consultation with the SHPO is needed, Knox Hills will provide all necessary documentation needed to complete the further consultation using procedures consistent with 36 C.F.R. 800 or with any alternate." Section IV.A 13 of the Programmatic Agreement exempts the removal or remediation of hazardous materials from the Historic Properties from consultations with the CRM or SHPO (to the extent removal or remediation does not alter or detract from the historic qualities of the Unit).

2.5 Rare, Threatened and Endangered Species

Lessee shall consider vegetated areas outside their planned development areas as a buffer between the development and potential species of concern habitat. Natural vegetation shall be left wherever practical adjacent to existing and new construction to buffer housing from the potential species of concern habitat.

If Migratory Bird Treaty Act (MBTA) species are identified roosting in project areas, Lessee shall notify the Army for coordination with the U.S. Fish and Wildlife Service. In addition, any tree of value to wildlife, native trees, and trees that support special species, will be conserved when reasonably practical.

Trees greater than 6 inches in diameter at breast height must only be removed between 15 October and 31 march to avoid potential harm to the endangered Indiana bat. Requirements for clearing of forested areas must be coordinated with Directorate of Public Works, Environmental Management Division well in advance of the clearance of this habitat.

2.6 Urban Forest Trees

A trained arborist shall be consulted to provide appropriate methods for the care, pruning, and removal of trees within the Project. Appropriately trained landscaping personnel shall perform the emergency removal of trees in the event of safety issues or storm damage.

APPENDIX J

Fort Knox ITAM Plan

Table of Contents

1. Executive Summary

1.1 Purpose Statement

The purpose of the Integrated Training Area Management (ITAM) Plan is to identify the scope and requirements of the FORT KNOX ITAM program in support of the FORT KNOX prioritized Senior Commander (SC) training needs." This plan is required by AR350-19, and is used by the FORT KNOX ITAM staff to plan and monitor execution of all ITAM actions. The Plan will demonstrate how all ITAM actions actively support SC training needs. The Plan drives the installation annual requirements submittal, and will be updated annually. An annual report on the execution of this Plan will be prepared to identify specific actions and resource obligations in support of the SC training needs identified within the Plan.

1.2 Program Overview

The Army's ITAM program is a core program of the Sustainable Range Program (SRP) and is responsible for maintaining the outdoor classroom to help the Army to meet its training requirements. ITAM provides the capability to manage training lands by integrating mission requirements with environmental requirements and sound land management practices. ITAM establishes a systematic framework for decision-making and management by integrating elements of operational, environmental, master planning, and other programs that identify and assess land use alternatives. ITAM includes the following components:

Training Requirements Integration (TRI), provides trainers and range managers with technical information to balance training needs with land constraints

Land Rehabilitation and Maintenance (LRAM), improves and enhances training capacity through repair, maintenance, and reconfiguration of training land

Range and Training Land Assessment (RTLA), collects data to determine training land conditions, identifies areas needing repair or reconfiguration, and supports range operations and modernization planning

Sustainable Range Awareness (SRA), educates trainers and range managers on how to reduce impacts on training land

Geographic Information Systems (GIS), provides standard mapping and spatial analysis capabilities for ITAM, range operations, and modernization.

1.3 Scope

The Plan defines SC training needs and covers those actions required to manage and sustain training and testing land that supports training. It does not include planning for management and sustainment of areas not eligible for TATM funding.

1.4 Responsibility

The ITAM Coordinator, with support from installation ITAM personnel, is responsible for developing and maintaining the Fort Knox ITAM Plan. The Plan is updated annually following issuance of the installation Senior Commander Training Guidance, and projects five years forward. It is reviewed and signed annually as a means to indicate approval of the prioritized Senior Commander Training Needs documented herein. The annual review and approval process for the Fort Knox ITAM Plan is as follows: (1) Draft Final ITAM Plan is reviewed by IMCOM G7 and Mission Commands, (2) Based upon feedback the ITAM Plan is revised, (3) Final ITAM Plan is endorsed by the Senior Commander, and (4) Final ITAM Plan is signed and approved by the Garrison Commander (GC) or delegated authority.

2. Installation Mission

2.1 Mission Statement

USACC partners with universities to recruit, educate, develop and inspire, SROTC Cadets in order to commission officers of character for the Total Army; and partners with high schools to conduct JROTC in order to develop citizens of character for a lifetime of commitment and service to our Nation.

2.2 Brief Description of Training Units and Activities

2.2.1 Current

Fort Knox is currently home of the Human Resource Center of Excellence (HRCoE), the U.S. Army Cadet Command (USACC), the U.S. Army Recruiting Command (USAREC), 1st Army Division East, 84th Training Division, 83rd Reserve Readiness Training Center (RRTC), 19th Engineer Battalion and the 1st Theater Support Command.

Other tenants supported are the US Army Medical Activity Fort Knox, the U.S. Bullion Depository, and E CO 4th Tank U.S. Marine Corps Reserve. Units located on Fort Knox are considered "Partners in Excellence" and include active duty Army organizations, Army Reserve, and the National Guard; which all utilize the Fort Knox training facilities. United States Reserve Units include: 7th Brigade, 100th Division (IT), 1st and 2nd Battalions of the 399th Regiment and the Drill Sergeant School, 6th Brigade, 100th Division (IT), 3rd battalion, 337th Regiment, 4th Brigade, and the 1st Battalion, 411th Regiment, 4th Brigade, 85th Division (training Support), 8th Battalion, 229th Aviation Regiment, 244th Aviation Brigade. Fort Knox also provides AR 5-9 support to units in Kentucky, Indiana, and Ohio.

Fort Knox hosts a JSOC RDT&E facility that supports the National Mission Force, but does not possess a joint training requirement. Joint units train at Fort Knox and train mission rehearsals of individuals, units, and staffs using joint doctrine or tactics, techniques, and procedures to prepare joint forces or joint staffs to respond to strategic, operational, or tactical requirements that the Combatant Commanders (CCDRs) consider necessary to execute their assigned or anticipated missions.
As interagency, intergovernmental, and multinational considerations continue to play a key role in joint operations there becomes an increasing need to incorporate JIIM at all levels of mission rehearsals, exercises, and other joint training.

If properly resourced Ft Knox is prepared to support the use of innovative methods that will allow Commander's to integrate training with other agencies.

2.2.2 Future

Fort Knox currently does not possess a joint training requirement. Joint units train at Fort Knox and train mission rehearsals, of individuals, units, and staffs using joint doctrine or tactics, techniques, and procedures to prepare joint forces or joint staffs to respond to strategic, operational, or tactical requirements that the Combatant Commanders (CCDRs) consider necessary to execute their assigned or anticipated missions.

2.3 Installation Setting

2.3.1 Geographic Setting

Located 35 miles from Louisville, Fort Knox encompasses 109,000 acres in three Kentucky counties, the majority of which is designated as Range Training Areas to support a resident population at Fort Knox of over 23,000 Soldiers. At its greatest extent, it is approximately 15 miles from north to south and approximately 14 miles from east to west. The main cantonment area of Fort Knox, where most mission support, logistic, administrative, and community functions are concentrated, is located astride US Highway 31W between Radcliff and Muldraugh.

Godman Army Airfield is a medium airfield that affords limited deployment capabilities. A small railhead is

available and provides minimal deployment ability for wheeled and tracked vehicles. Major interstates and highways are available within 30 minutes of the installation. Deployment via the Ohio River to a major seaport is conceivable with infrastructure improvements and coordination with appropriate agencies.

Fort Knox has a total of 109,000 acres. Approximately 9,000 acres is located within the cantonment area. Of the remaining 100,000 acres, approximately 45,000 acres is maneuver training area, and 55,000 is impact area for live fire training.

2.3.2 Landscape Conditions/Geographic Context

Soil

Fort Knox has highly erodible, poor quality soils which pose a challenge to ensure adequate, serviceable training areas are available to units when required. The result is an adverse effect on training as units are forced to adapt training plans to account for slow-go/no-go terrain resulting primarily from saturated soil conditions.

Water Bodies

Water bodies are a prominent feature within the Fort Knox Training Complex. These water bodies also serve as platforms on which to conduct training and only impact training with respect to mounted and dismounted land maneuvers. These impacts are limited to an inability to traverse these water bodies at will and are considered natural barriers when developing training plans.

Terrain

A considerable portion of the training lands are karst topography. This type of landform does not prohibit any types of training or events, but it does restrict maneuver within the training complex. Sink holes resulting from the erosion of cavernous limestone walls beneath the shallow soil surface create barriers to maneuvering. These areas are clearly marked as off limits and they do not prevent any event or training from being conducted. Sink holes are on average one to two acres in size and therefore are not a physical barrier in traversing a given maneuver space.

Fort Knox is committed to stewardship of the environment for the long term sustainment of the installation. The Army’s strategy for a sustainable installation includes mission, environment and community. Our goals are to sustain resources to support training, testing and other mission requirements; reduce environmental impacts and total ownership costs of systems, material, facilities and operations; enhance operational capability and reduce environmental (and logistical) footprints; and to promote well-being and quality of life for Soldiers, civilians, dependents and neighbors.

3. Analysis of Training Needs

3.1 Summary of ITAM Training Needs

3.2 Training Needs

3.2.1 Goal 1:Support Mounted and Dismounted Training for all Units Utilizing the Fort Knox Training Complex

Ensure 19th EN, ROTC CLC, ROTC CIET, 11th Aviation BDE and external units have safe and accessible maneuver lands with which to conduct mounted, dismounted and aviation maneuvers.

3.2.1.1 Current Conditions

3.2.1.1.1 Landscape Conditions

Mounted and dismounted training is widely varied at Fort Knox and therefore requires a varied approach to maintaining these areas for a desired functional outcome.

Clay soils do not withstand maneuvers well and require constant maintenance to keep vegetation in place and reduce erosion. There are large amounts of training lands in need of repairs and this task has been conducted through large-scale erosion repairs by grading, seeding and mulching eroded areas.

3.2.1.1.2 Management Activities and Constraints

Fort Knox is scheduling repairs to all of its maneuver lands utilizing a multi-year approach. This allows for proportional and cyclical repairs to be made.

Constraints to completing these Activities (projects) are weather, maintaining a staff and the respective equipment and most importantly obtaining the required funding to complete the repairs and maintain a workforce for project execution.

FY 16 funding allowed the 5 major Training Area rehabilitation projects moved to FY 16 to be completed. FT Knox ITAM will fall under the Consolidated TSS Contract for FY 17-18. How support is funded will depend on project completion. Some Activities may require being pushed right to FY 19/20.

3.2.1.2 ITAM Objectives Supporting Goal

3.2.1.2.1 Objective A: Light Maneuver Trail Reinforcement

Annually reinforce/repair 30 KM of fair weather only Maneuver Access Trails (MATS) to support the CG training

requirements for ROTC and to attain all-weather status to support light maneuver in the training areas. This will be accomplished through the use of gravel, grading and rock as a means of reinforcement.

3.2.1.2.2 Objective B: Erosion Control

Control excessive erosion on affected acreage in training areas to promote safe and effective training annually as a recurring requirement. Grading, seeding, mulching and BMP (check dams, rock lined channels, etc.) installation are the primary means of controlling erosion.

3.2.1.2.3 Objective C: Low Water Crossing Sustainment

Annually construct, repair and maintain low water crossings on Maneuver Access Trails and/or other areas within the training areas as determined through unit training scenarios and maneuver patterns. Crossings are constructed primarily with CC70 or CC45 cable concrete or suitable, like material(s).

3.2.2 Goal 2: Support Field Artillery Training

Ensure KYARNG 138th FA, 623rd FA, and external units have safe, accessible, and functional field artillery training sites.

3.2.2.1 Current Conditions

3.2.2.1.1 Landscape Conditions

Field Artillery Operations require maintained and functional firing points and observation points as well as a clear route in/out of these areas. The firing points and observation points are continually in need of maintenance. These areas have vegetation encroachment as well as erosion issues both on-site and along the trails accessing these sites. Erosion will be repaired and vegetation will be cleared to the desired state for line-of-site and tree clearance of rounds.

3.2.2.1.2 Management Activities and Constraints

Repair and maintenance of firing points and observation points, as well as access routes to these sites are not lengthy endeavors and as a result, scheduling these areas for maintenance and repair is not difficult.

Wet weather and range utilization are the primary constraint for completion of this goal. Working in an area while the soils are saturated can result in the area having more damage than it originally had, relegating all work to be done during dry soil conditions.

3.2.2.2 ITAM Objectives Supporting Goal

3.2.2.2.1 Objective A: Firing Point Accessibility

Semiannually maintain accessibility to 27 surveyed and unsurveyed firing points in training areas 2, 3, 5, 6, 14, and 16. This requires vegetation clearing along lesser used trails and access roads along with trail improvements and erosion control.

3.2.2.2.2 Objective B: Firing Point Repair and Stabilization

Semiannually stabilize and repair soil erosion and maneuver damage on all active firing points by grading, seeding and mulching affected areas and providing rock/gravel where needed.

3.2.2.2.3 Objective C: Vegetative Encroachment Control

Semiannually control vegetative encroachment around 27 surveyed and unsurveyed firing points in training areas 2, 3, 5, 6, 14 and 16 by clearing encroaching vegetation with hand tools, saws, batwing mowers and Bobcat w/attachments. This work would be cyclical in nature as the vegetation regenerates.

3.2.2.2.4 Objective D: Observation Point Sustainment

Improve accessibility to and visibility from 8 Observation Points in training areas 2, 3, and 17 semi-annually by improving access trails, working erosion issues and clearing vegetation consisting of 5 acres that impairs visibility of impacting rounds.

3.2.3 Goal 3: Aviation Training Support

Improve Fort Knox's capability to support aviation training for 11th Aviation BDE, 101st aviation units, 1-160th SOAR and other visiting units.

3.2.3.1 Current Conditions

3.2.3.1.1 Landscape Conditions

Fort Knox experiences substantial aviation training and the utilization of aviation oriented training sites and support facilities. Fort Knox requires that landing zones, drop zones, FAARPs and airstrips be repaired and maintained to meet this training need. Vegetative encroachment and erosion issues need to be addressed to realize this goal.

3.2.3.1.2 Management Activities and Constraints

The issues related to this goal are few, although the full impact of this type of training has yet to be realized. Vegetative clearing can be conducted year-round, while erosion issues should only be addressed during favorable weather and preferable during the spring and fall growing periods. The drop zone in Training Area 3 will require continued erosion control work as a result of years of heavy maneuver use and recovery vehicles securing dropped packages. Every attempt is made to avoid use of the drop zone while soils are saturated.

3.2.3.2 ITAM Objectives Supporting Goal

3.2.3.2.1 Objective A: FAARP Sustainment

Annually repair the trail network and excessive vehicle damage/erosion around 11 acres making up Cedar Creek, Yano and Chappel Ridge FAARPs through the use of gravel, seed/mulch and small erosion control structures.

3.2.3.2.2 Objective B: Vegetative Encroachment Control

Semiannually control 11 acres of vegetative encroachment around Cedar Creek, Yano and Otter Creek Airstrips by removing primarily eastern red cedar and other perimeter plants and reestablishing the boundaries of the airstrips.

3.2.3.2.3 Objective C: Drop Zone Sustainment

Repair existing maneuver damage and excessive erosion within the 400 acre Training Area 3 drop zone through the use of grading, disking, seed and mulch.

4. ITAM Management

4.1 Staffing and organization of installation's ITAM Program

4.1.1 Description of MER Staff

Fort Knox's ITAM staff consists of three approved Manpower Estimate Report (MER) positions; ITAM Coordinator (DAC), LRAM Coordinator and a GIS Analyst. Non-MER positions include a Heavy Equipment Operator (HEO) and an LRAM laborer. LRAM, GIS and HEOs positions are filled via a contract.

4.1.2 Organization

The ITAM office falls under Range Branch and the ITAM Coordinator reports directly to the Range Branch Chief. This ensures that ITAM is coordinating all actions and decisions with Range staff and also ensures that all interested parties are involved with ITAM decisions and actions that affect training.

The ITAM Coordinator carries out the TRI and SRA functions while the LRAM Coordinator handles all LRAM activities and non-MER personnel. ITAM is physically located in building 9307.

Attachment A - Organizational Chart

URL: https://srp.army.mil/RCMP/Application/Tools/ViewGetImage.aspx?SectionNo=289884&ViewNo=A

4.2 ITAM Program Management

4.2.1 Travel

All MER ITAM personnel are expected to attend the TSS (or equivalent) Workshop annually. This will require 1 week TDY per Coordinator plus associated registration/course fees. The ITAM Coordinator is also required to attend a one week budgetary training course when scheduled. The LRAM and GIS Coordinators are expected to travel for one UWG meeting each (one week TDY), held external to the TSS workshop. The GIS Coordinator is also to attend the ESRI conference (one week TDY). The LRAM Coordinator is required to attend the International Erosion Control Association (IECA) workshop/ or equivalent training each year. Heavy equipment operators and laborers do not travel for training purposes.

4.2.2 Training

Training is available at the Training Support Systems or equivalent (TSS) workshop for those in attendance. The ITAM Coordinator and LRAM Coordinator will (time providing) attend the International Erosion Control Association's (IECA) annual workshop or its equivalent where one can take all-day courses. The LRAM Coordinator usually will have time for some training in the erosion control field somewhere closer to Fort Knox. The ITAM and LRAM Coordinators also attend certification courses for the Commonwealth of Kentucky to retain certification in writing Stormwater Pollution Prevention Plans (SWPPP's) and in Kentucky Erosion Prevention and Sediment Control (KEPSC). KEPSC training provides certification to inspect SWPP's and job sites.

The GIS Coordinator attends the TSS or equivalent workshop and generally two ESRI sponsored training functions. ITAM staff may also spend time on user working groups, obtaining valuable information/training. Non MER staff receives training in-house and do not travel to obtain training.

4.2.3 Reporting

A Monthly Status Report (MSR) is provided by the contractor to the COR on or before the 15th of each month by the Lead Contractor. All ITAM contract personnel contribute to the MSR. The LRAM Coordinator provides information for inclusion in the MSR to the GIS Coordinator NLT the 10th of each month.

Installation Status Report (ISR) 903 and Common Levels of Support (CLS) 304 are reported by the ITAM Coordinator on a quarterly basis. The ISR and CLS reporting dates vary by year; however, 1st quarter is reported in January, 2nd quarter is reported in April, 3rd quarter is reported in July, and 4th quarter is reported in October.

The ITAM Plan is updated annually in the spring in association with the Range Complex Master Plan (RCMP) update. The ITAM Plan updates are reviewed by IMCOM G7 and Mission Commands then endorsed by the SC and signed/approved by the GC or delegated authority. All ITAM Coordination personnel are involved in the ITAM Plan update.

The ITAM Annual Report is produced through the automated ITAM workplan. The ITAM Coordinator, with ITAM personnel support/input, provides some information in addition to the automated product for clarification. The ITAM Annual Report is produced no later mid-November. It is provided to the Range Officer, DPTMS, COR, and contract Technical Point of Contact
(TPOC).

4.2.4 Budgeting

The ITAM Coordinator is responsible for building ITAM Workplan activities. LRAM and GIS activities are discussed with the respective Coordinators prior to development in RCMP-ITAM Workplan by the ITAM Coordinator. All activities for the next fiscal year are reviewed and discussed with the Range Officer prior to final submission on or around 31 December annually.
ITAM Workplan activities for the current fiscal year are entered throughout the fiscal year by the ITAM Coordinator as needed to support prioritized Senior Commander training needs. The validated activities are used to develop the program spend plan (i.e., 1-N list). The spend plan is used to determine when funding is passed down to the installation for expenditure.

4.3 ITAM Functions

4.3.1 TRI

The primary focus of TRI is to ensure sustained accessibility to adequate training lands to support training to standards under realistic natural conditions, and to provide military trainers and land managers with the necessary technical and analytical information to integrate doctrinally based training and testing with land constraints.

4.3.1.1 ITAM Scheduling and Coordination

A Range staff meeting is held every Thursday at 0730 hours in order for all to view and discuss the current firing/training schedule. Activities and times for scheduling maintenance are discussed and conflicts worked out. This meeting serves as the primary means of scheduling and coordinating ITAM work. On-site meeting are coordinated whenever the situation dictates that personnel meet to discuss a particular aspect of an event or project. Personnel from all interested entities will participate in these on-site meetings.

4.3.1.2 Integration

The ITAM Coordinator is informed of Unit training requirements by reviewing the Senior Commander's Training Guidance, Installation Campaign Plan, Range Development Plan, Installation Master Plan and Range Facilities Management Support System (RFMSS) data for high use training areas, and discussions with the Range Officer. Information gathered from all of the sources mentioned above support development of the prioritized ITAM Senior Commander training needs and associated activities provided in the ITAM Workplan.

The ITAM Coordinator reviews the following installation documents, on an as needed basis, to ensure that training area management is not impacted/restricted by any plans and to ensure the incorporation of ITAM activities, as appropriate:

Integrated Natural Resources Management Plan (INRMP), Integrated Cultural Resources Management Plan (ICRMP), Integrated Pest Management Plans (IPMP), Forest Management Plan, Annual Prescribed Burning Plan, and NEPA documentation.

All ITAM land disturbing project activities meet NEPA requirements through integration into the installation INRMP. To meet NEPA requirements, ITAM land disturbing activities are associated with one of the following: (1) a pre-existing environmental assessment (EA) or environmental impact statement (EIS), (2) Army Categorical Exclusion (CATEX), or (3) a CATEX and Record of Environmental Consideration (REC), before they can be carried out.

4.3.1.3 Range Operations Support

The ITAM Coordinator supports Range Operations via participation in de-confliction meetings, project planning meetings, and Range Complex Master Plan review. The ITAM Coordinator also serves as liaison between Range and environmental staff. This helps to minimize multiple efforts with regard to environmental guidance/compliance in working through projects.

4.3.1.4 Range Modernization Support

The ITAM Coordinator participates in all Range Modernization meetings (e.g., charrettes). The ITAM Coordinator provides location recommendations and SRP GIS data layers representing location recommendations and alternatives based upon environmental and training considerations.

4.3.2 RTLA

The focus of RTLA is to provide information in support of land management decision processes for sustained mission use. This includes assessing impacts of mission activities; evaluating the capability of training lands and recommending options that enhance accessibility and capacity; providing land use, condition, and capability information; and monitoring land rehabilitation effectiveness.

4.3.2.1 RTLA Management and Oversight Responsibilities

Fort Knox does not request funding for nor execute any RTLA activities.

4.3.2.2 Project Execution

4.3.2.2.1 Field Crews

N/A

4.3.2.2.2 Vehicles

N/A

4.3.2.2.3 Supplies

N/A

4.3.3 LRAM

The primary focus of LRAM is to repair, rehabilitate, and reconfigure training lands to eliminate Soldier safety hazards and sustain Army training and testing lands to support realistic training conditions and maintain training to standard.

4.3.3.1 LRAM Management and Oversight Responsibilities

The ITAM Coordinator, with assistance from the LRAM Coordinator, prioritize LRAM projects based upon the following factors: (1) prioritized Senior Commander training needs, (2) project site/training land conditions, and (3) training schedule. The LRAM Coordinator sees each LRAM project through the LRAM project process (i.e., planning, design, execution, and effectiveness/completion monitoring). The LRAM Coordinator briefs the recommended project prioritization to the ITAM Coordinator; the ITAM Coordinator may choose to alter the recommended prioritization list.

4.3.3.2 Project Planning

Following project site identification, LRAM personnel obtain information regarding the site physical conditions to assist the ITAM Coordinator in project prioritization, developing project objectives, determining the appropriate best management practice (BMP)/design to rehabilitate the site and determining the effectiveness of the rehabilitation measure. Scheduling and time of year are also factored into the planning phase of a project.

4.3.3.3 Project Design

Project design is heavily dependent on the scope of a project. Small, maintenance type projects that merely require some light grading, seeding and mulching will not have a design drawn up. These smaller projects will only have a materials list generated to assist with budgeting.

Larger projects will have a design created by the LRAM Coordinator with occasional assistance from the ITAM Coordinator. Items such as materials, equipment, proposed BMP’s and man-hours will go into the design. The final design is approved by the ITAM Coordinator and then briefed to the Range Branch Chief for final approval.

4.3.3.4 Project Execution

Prior to initiating the execution of a project, all appropriate NEPA documentation must be completed. Generally, a Record of Environmental Consideration (REC) is all that is required. Should any 401/404 permits be required for wetland and river work, those are applied for 6-9 months in advance. If a SWPPP is required, it would be drafted and approved prior to execution.

Once the LRAM Coordinator has gotten approvals for project execution, they ensure that all required materials are available and that scheduling has been verified to not interfere with the project. Projects are always scheduled around training and every effort is made to avoid conflicts with training.

Range and all land users are informed of the project being executed to ensure that personnel understand that the area is now off- limits.

4.3.3.4.1 Labor

The in-house work crew consists of the LRAM Coordinator and 2 HEOs. The ITAM Coordinator assists in project work when time allows. The LRAM Coordinator and two HEOs are full-time equivalent employees

working off of a contract.

4.3.3.4.2 Equipment

Lease or purchase of LRAM equipment is determined by frequency of use, rental costs, and average maintenance costs. Equipment is purchased if it is determined by the ITAM Coordinator and the Range Branch Chief that purchase will be more cost effective over the long-term for the Fort Knox ITAM Program and funding can be approved.

All equipment purchases are first entered into the ITAM Workplan and validated for purchase. Once validated and funded, Fort Knox Contracting office obtains the required bids and secures that particular piece of equipment.

Following purchase of heavy equipment the ITAM Coordinator submits documents to the Installation Property Book Officer (PBO) to document the equipment on the Range Control installation property hand receipt. Once the equipment is documented on the Range Control hand Receipt, the heavy equipment is maintained through DPW/LRC Maintenance.

All fuel for government owned equipment is provided by (LRC) Department of Logistics (DOL) via fuel tanks on select ranges.

4.3.3.4.3 Supplies

Supplies acquisition is based on prior use as determined by the LRAM Coordinator's records. A supply list is drawn up prior to each year's ITAM Workplan entries and entered into the Workplan for funding. These supplies generally consist of equipment tie-downs, zip ties, fuel cans, cleaning supplies, hand tools, and all other consumables. Once the items have been approved and funded, Range Branch Logistics personnel acquire the materials for the ITAM program.

4.3.3.4.4 Materials

Under the consolidated ITAM contract, it is the responsibility of the contractor to order all bulk materials to support Activity completion. The amount and type of bulk materials purchased will correspond to validated Workplan Activities, bulk material project entry description, available funds, and updated anticipated need. For purchases through DOC, the ITAM Coordinator will submit data to the RM POC to populate the purchase request form for the installation RM to complete the purchase.

All bulk materials (rock, topsoil, seed, fertilizers, chemicals) are stored at strategic locations for anticipated use on projects within a practical transport distance.

4.3.4 SRP GIS

The primary focus of SRP GIS is to create, analyze, manage, and distribute authoritative standardized spatial information, products, and services for the execution of training strategies and missions on U.S. Army ranges and training lands.

4.3.4.1 SRP GIS Management and Oversight Responsibilities

The SRP GIS Coordinator provides programmatic support for all areas of SRP. Responsibilities include, but are not limited to, geospatial data development, overall programmatic training support, TSS Workshop support, reporting requirements, SRP GIS UWG membership/feedback, and programmatic functional recommendations development.

GIS Activities Include:

- GIS Analysis/Support

- GIS Program Administration

- GIS Support for Range Modernization

- GIS Development of Training Support Products

- GIS Data Development and Sustainment
-

4.3.4.1.1 ITAM

The SRP GIS Coordinator supports the ITAM Program components by developing and maintaining required geospatial data as well as the generation of map products. Remote sensing and geospatial analyses are performed as needed/requested. In addition, technical expertise is provided for data acquisition, project planning and computer hardware and software requirements.

4.3.4.1.2 Range Operations

The SRP GIS staff supports Range Operations by the following actions: (1) design, update, and maintain surface danger zones when requested, (2) provide Soldiers with required data and map products to support their training mission, (3) provides support to the Range Officer for any and all projects requiring geospatial data, analyses and map products, (4) develop and maintain an accurate and current Military Installation Map (MIM), (4) develop and maintain the 34 required and 5 optional SRP GIS data layers to QAP standards, (5) support the development of the installation RCMP via map contributions, (6) support the collection and development of data for the Centralized Geospatial Data Collection Effort (CGDCE) and the Encroachment Condition Module (ECM), and (7) assist with the development/maintenance of RFMSS graphic fire desk including upload of current geospatial data layers.

4.3.4.1.3 Range Modernization

The SRP GIS Coordinator supports Range Modernization requirements by assisting the Range Officer with siting new ranges or modifying existing ones for new or multiple uses. Typically, maps of the area with the new range footprint, existing ranges, environmental and endangered species data and surface danger zones are created for the Range Officer's review. Changes are made to the range design (ie fewer lanes, etc) and/or range orientation as necessary by the Range Officer to avoid any potential environmental or safety conflicts. Range designs and Surface Danger Zones are all created using the SRP Range Manager's Toolkit (RMTK). All data is submitted to the Range Planning Charrette team GIS liaison and any others deemed necessary by the Range Officer and maps are produced as needed.

4.3.4.2 Program Execution

4.3.4.2.1 Products

The 1:50,000 MIM is produced for free by the National Geospatial-Intelligence Agency (NGA). Specialty products are developed on an as needed basis. Examples of specialty products are: project site maps to support the NEPA process, and range planning maps to support charrettes.

4.3.4.2.2 Supplies

GIS supplies consist primarily of removable media, papers, inks, toners and print-heads. Consumption of these supplies is fairly consistent, allowing one entry to be made in the Workplan for approval and funding of the GIS yearly supplies.

4.3.4.2.3 Imagery Acquisition

There is no set schedule for the acquisition of imagery for the installation. The purchase of imagery is more dependent on funding and ITAM has yet to pay for any imagery for Fort Knox. When imagery is purchased, it is generally cost-shared between Range and DPW. To date, imagery has been acquired in intervals that meet the

needs of the installation.

4.3.5 SRA

The primary focus of SRA is to provide a proactive means to develop and distribute education materials to users of range and training land assets to reduce the potential for inflicting avoidable impacts on range and training land assets.

4.4 Programmatic Needs

4.4.1 ITAM Program Operation

Provide an operational program that ensures all ITAM components are planned, budgeted, staffed, equipped, trained, executed, and reported.

4.4.1.1 ITAM Program Administration

Manage the ITAM program and its components through the development and maintenance of an annual Plan and Workplan in coordination with the RCMP, administration of schedules, preparing required reports, acquiring office and computer supplies, and conducting required travel and training.

4.4.2 Training Requirements Integration (TRI)

Provide an integrated decision support capability.

4.4.2.1 TRI Operation

Actively participate in range and land management planning and execution; ensure mission needs are considered in environmental and facilities planning, and environmental constraints are considered in mission planning.

4.4.2.2 Sustainable Range Awareness (SRA) Operation

Create and distribute educational information to enhance awareness of environmental and cultural resource issues that affect training activities.

4.4.3 Land Rehabilitation and Maintenance (LRAM)

Provide an operational SRP GIS capability that addresses priority Training Needs and information requirements.

4.4.3.1 LRAM Operation

Manage SRP GIS by contributing to the development and maintenance of an annual Plan and Workplan, administration of schedules, preparing required reports, acquiring office and computer supplies, coordinating information technology support, and conducting required travel and training.

4.4.4 Range and Training Land Assessment (RTLA)

Provide an operational RTLA capability that addresses priority Training Needs and information requirements.

4.4.4.1 RTLA Operation

Provide RTLA staff oversight, training, equipment, and project scheduling.

4.4.4.2 RTLA Decision Support to SRP

Procure and analyze data collected and data from external sources and other Garrison offices to support SRP planning and operation.

4.4.5 SRP Geographic Information System (SRP GIS)

Provide an operational SRP GIS capability that addresses priority Training Needs and information requirements.

4.4.5.1 SRP GIS Operation

4.4.5.2
Provide SRP GIS staff oversight, training, equipment, and project scheduling.

4.4.5.3 SRP GIS Decision Support to SRP

Procure and analyze data, and provide geospatial mapping to support SRP planning and operation.

4.4.5.4 SRP GIS Support to Range Operations

Provide geospatial data, mapping, and analysis in support of Range Operations and Scheduling.

4.4.5.5 SRP GIS Support to Range Modernization

Provide geospatial data, mapping, and analysis in support of Range Development and Modernization.

4.4.5.6 SRP GIS Training Support

Provide geospatial data, mapping, and analysis in support of unit training.

5. Appendices

5.1 Contact List

Program	Title	POCs	Directorate	Telephone #	Office
ITAM	ITAM Coordinator	Patrick Jordan	DPTMS	502.624.3594	ITAM
ITAM	LRAM Coordinator	Denis Walls	DPTMS	502.624.3793	ITAM
ITAM	GIS Analyst	Muskaan Khurana	DPTMS	502.624.8763	Range
Range	Range Branch Chief	Rodney Manson	DPTMS	502.624.1447	Range
Range	Range Operations Officer	Stuart Holder	DPTMS	502.624.1447	Range
DPTMS	DPTMS Director	Kenneth Boeglen	DPTMS	502.624.2246	DPTMS
DPW	EMD, Chief	Daniel Musel	DPW	502.624.3629	EMD

5.2 Glossary/Acronyms

Acronym	Meaning of Acronym
DPTMS	Directorate of Plans, Training, Mobilization and Security
DPW	Directorate of Public Works
GC	Garrison Commander
GIS	Geographic Information Systems
ITAM	Integrated Training Area Management
LRAM	Land Rehabilitation and Maintenance
NEPA	National Environmental Policy Act
NRB	Natural Resources Branch
POC	Point of Contact
RTLA	Range and Training Land Assessment
SC	Senior Commander
SRA	Sustainable Range Awareness
SRP	Sustainable Range Program

5.3 Annual Updates to the Plan (Archive)

The plan is scheduled to be updated cyclically with the RCMP updates.

5.4 Equipment

See attachments.

Attachment A - GIS Software

URL:

https://srp.army.mil/RCMP/Application/Tools/ViewGetImage.aspx?SectionNo=289939&ViewNo=A Attachment B - TRI Equipment

URL:

https://srp.army.mil/RCMP/Application/Tools/ViewGetImage.aspx?SectionNo=289939&ViewNo=B Attachment C - ITAM Equipment List

2015

URL:

https://srp.army.mil/RCMP/Application/Tools/ViewGetImage.aspx?SectionNo=289939&ViewNo=C Attachment D - ITAM GIS

Equipment

URL:

https://srp.army.mil/RCMP/Application/Tools/ViewGetImage.aspx?SectionNo=289939&ViewNo=D Attachment E - ITAM LRAM GFE

URL: https://srp.army.mil/RCMP/Application/Tools/ViewGetImage.aspx?SectionNo=289939&ViewNo=E

5.5 LRAM Project Planning

Following project site identification, LRAM personnel obtain information regarding the site physical conditions to assist the ITAM Coordinator in project prioritization, developing project objectives, determining the appropriate best management practice (BMP)/design to rehabilitate the site and determining the effectiveness of the rehabilitation measure. Scheduling and time of year are also factored into the planning phase of a project.

5.6 LRAM BMPs

Commonly used installation specific BMP's:

- Straw mulch to protect newly seeded soils
- Cable concrete for maneuver trail reinforcement and low water crossings
- Straw mats for steeply sloped areas
- Rock/gravel for trail reinforcement
- Soil temporary check dams
- Rip Rap check dams
- Silt fencing

5.7 RTLA Assessments

Fort Knox does not request funding for nor execute any RTLA activities.

5.8 Annual Workplan

Annual Workplan is generated through the ITAM Workplan as an embedded component of the RCMP. The Workplan is generated annually by the ITAM Coordinator and will generally cover one fiscal year, although activities within the plan may be valid for multiple years.

5.9 Annual Report

Current year execution report for ITAM Plan; this includes linkages from workplan execution activity.

5.10 ITAM Plan Development and Approval Documentation

The ITAM plan has been reviewed and approved by the Garrison Commander

Attachment A - ITAM Plan Signature Page

URL: https://srp.army.mil/RCMP/Application/Tools/ViewGetImage.aspx?SectionNo=289936&ViewNo=A