FINAL
INVASIVE PLANT SURVEY REPORT AND MANAGEMENT PLAN FOR 25 NEW JERSEY ARMY NATIONAL GUARD INSTALLATIONS

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NEW JERSEY DEPARTMENT OF MILITARY AND VETERANS AFFAIRS
NEW JERSEY ARMY NATIONAL GUARD
OFFICE ENVIRONMENTAL COMPLIANCE
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FINAL
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LIST OF ACRONYMS

AASF	Army Aviation Support Facility
APHIS	Animal and Plant Health Inspection Service
CFR	Code of Federal Regulations
CSMS	Combined Support Maintenance Shop
DoD	Department of Defense
DMAVA	Department of Military and Veterans Affairs
EPR	Environmental Programs
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GIS	Geographic Information System
HQ	Headquarters
INRMP	Integrated Natural Resources Management Plans
IPM	Integrated Pest Management
NGTC	National Guard Training Center
NJARNG	New Jersey Army National Guard
NJDEP	New Jersey Department of Environmental Protection
OMS	Organizational Maintenance Shop
OSHA	Occupational Safety and Health Act
RTS-M	Regional Training Site-Maintenance
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USFWS	United States Fish and Wildlife Service
UTES	Unit Training Equipment Site

SECTION 1

INTRODUCTION

1.1 INTRODUCTION

This document presents the findings of invasive plant species surveys conducted at 25 New Jersey Army National Guard (NJARNG) installations throughout the state. Collectively these installations encompass approximately 765 acres of land used for various military operations. The New Jersey Department of Military and Veterans Affairs (DMAVA) and NJARNG are responsible for stewardship of these lands. Information obtained from the surveys has been used to develop an integrated management plan for control of invasive plant species found on the installations and to help prevent introduction of new species in accordance with Department of Defense (DoD) and Army regulations.

Invasive plants are one of the most serious and fastest growing environmental problems in the United States. Infestations have caused significant and sometimes irreversible ecological damage and cost millions of dollars in economic losses (NJDEP, 2004). Executive Order 113112 – *Invasive Species* defines an invasive species as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Invasive plants are also often referred to as non-indigenous, exotic, alien, nuisance, or noxious. The term invasive will be used in this document to refer to both alien (non-native) and native plants whose introduction does or is likely to cause harm economically, environmentally, or to human health.

Approximately 1,300 non-native, invasive plant species (62 percent of the state's total vascular flora) have been documented in New Jersey (NJDEP, 2004). These plants have been identified as a moderate level risk to ecological and socioeconomic resources within the state (NJDEP, 2004). In addition, native plants, such as the common reed (*Phragmites australis*) and poison ivy (*Toxicodendron radicans*), which are sometimes considered to be invasive contribute to impacts on state natural and economic resources. These plant species are

successful competitors and can become undesirable in the natural landscape resulting in a need to control the presence and spread of their populations.

Although the common reed is often found on invasive species lists, the plant is a native species in North America and has been present for over 3,500 years. Recent research had indicated that a non-native aggressive strain of the common reed has been introduced to North America in the early 20th century and that this particular strain is present in New Jersey along with native strains of the species (Saltonstal, 2002). Research is also being conducted to determine if there are morphological differences between the native and non-native strains which can be used for field identifications. Genetic and morphological research is preliminary and more study needs to occur before final determinations can be made regarding the geographical origins and distribution of *Phragmites australis* (NJDEP, 2004). The New Jersey Department of Environmental Protection (NJDEP) therefore continues to refer to this species as a native species within the state.

Invasive plants can drastically alter ecosystems that have evolved over thousands of years. These plants can displace or hybridize with native species; they can also change the structure of the plant community, the competitive regimes, or the function of the ecosystem they invade. Invasive plants displace native species (Callaway and Aschehoug, 2000; Morse et al., 1995) and alter native species proportions (Callaway and Aschehoug, 2000; Gould and Gorchov, 2000), nutrients (Evans et al., 2001; Mack et al., 2001; Scott et al., 2001), fire patterns, geomorphology, hydrology, and biogeochemistry (Scott et al., 2001). In the United States, invasive plant infestations are second only to land use changes as the cause of habitat loss and subsequent species endangerment (Levine et al., 2003). The Ecological Society of America has noted that invasive species, both plants and animals, have contributed to the decline of 42 percent of U.S. threatened and endangered species (ESA, 1998).

Invasive plant species typically have one or more of the following characteristics that enable them to displace native plant species and sometimes entire plant communities:

- Effective reproduction and dispersal mechanisms;
- A competitive ability superior to that of native plants in the original or modified system;
- Few or no herbivores or pathogens, especially in herbivore-controlled communities;

- The ability to occupy a "vacant niche"; and
- The ability to alter a site by significantly changing resource availability or disturbance regimes or both (Gordon, 1998).

In addition to harming the environment, the U.S. economy faces billions of dollars worth of damage from invasive plants and animals. According to the National Invasive Species Council, invasive species account for about $137 billion every year in economic costs (Pimentel et al., 2000). These escalating losses occur in agriculture, forestry, and several other segments of the U.S. economy.

Military installations face an increasing threat from the introduction and expansion of invasive plants, which have the potential to adversely impact military readiness by affecting the health and safety of personnel; damaging structures, materials, or property; and degrading training lands. In addition, invasive plants damage native habitats, can increase erosion on sites, and can create fire hazards by increasing fuel loads which further threaten the health and safety of military personnel and equipment. Consequently, invasive plant management is an important component of the military's overall land management program to sustain the mission.

1.2 OBJECTIVES

The objectives of this project included:

- Identifying ecological communities, invasive plants, and their relative abundance at 25 NJARNG installations;
- Preparing Geographic Information System (GIS) mapping of the ecological communities and the current distributions of invasive plants within these communities;
- Establishing a baseline for future monitoring and evaluation of invasive plant management and control measures; and
- Developing an invasive plant management plan.

Based on evaluation of the background and field data collected at the installations, an invasive plant management plan was developed. This management plan is a framework

through which invasive plant management is defined and accomplished on the 25 NJARNG installations. The objectives of the plan are to:

- Identify means to prevent the establishment of invasive plants;
- Control or eradicate invasive plants, both non-native and native, that are established; and
- Restore areas with native species.

The elements of the plan include identifying invasive plants and the ecological communities infested; establishing priorities for invasive plant management; identifying the appropriate controls using an integrated pest management (IPM) approach; and developing a monitoring protocol to assess effectiveness of control measures. An IPM approach is most effective as it avoids total reliance on chemical pesticides and employs multiple management practices to reduce or eliminate invasive plants with minimum risk to the environment. This approach coordinates knowledge of pest biology, the environment, and available technology. The invasive plant management plan takes a programmatic approach in that it provides a general characterization of the elements of the program that are applicable to the 25 NJARNG installations. In addition, the plan provides site-specific procedures for controlling invasive plants at individual installations, where necessary.

1.3 INVASIVE PLANT REGULATORY REQUIREMENTS

Management of invasive plants on NJARNG installations requires compliance with applicable U.S. statutes, Executive Orders, DoD and Army regulations, U.S. environmental, safety, occupational health, and pest management policies, and State of New Jersey pesticide regulations. The purpose of this section is to discuss regulatory considerations that guide or constrain invasive plant management activities at the installations.

1.3.1 Executive Order 13112

Section 2 of Executive Order 13112 - *Invasive Species*, signed February 1999, directs federal agencies to identify actions that may affect the status of invasive species and take action to (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor

invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

1.3.2 Plant Protection Act of 2000

The Plant Protection Act became law in June 2000 as part of the Agricultural Risk Protection Act. The Plant Protection Act consolidates all or part of 10 existing U.S. Department of Agriculture plant health laws into one comprehensive law, including the authority to regulate plants, plant products, certain biological control organisms, noxious weeds, and plant pests. The Plant Quarantine Act, the Federal Pest Act, and the Federal Noxious Weed Act are among the 10 statutes that the new act replaces. The Plant Protection Act is necessary because of the major impact plant pests could have or currently have on the agriculture, environment, economy, and commerce of the United States.

The Plant Protection Act gives the Secretary of Agriculture (and through delegated authority, the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture) the ability to prohibit or restrict the importation, exportation, and interstate movement of plants, plant products, certain biological control organisms, noxious weeds, and plant pests. As authorized under this act, the Secretary of Agriculture has identified those plant species or plant products which are considered to be noxious weeds as defined in section 403 of the Act. This list of noxious weeds is available at the APHIS internet site (www.aphis.gov/ppq/weeds/noxiousweedlist.txt). The act also authorizes APHIS to regulate "any enemy, antagonist, or competitor used to control a plant pest or noxious weed."

1.3.3 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the regulations established by the U.S. Environmental Protection Agency (40 CFR 116-117, 165, 170-172) serve as primary guidance governing pesticide registration, pesticide use, the training and certification of pesticide applicators, and the criminal and civil penalties associated with misuse of pesticides. Herbicides are a class of pesticides that could be used on installations to

chemically treat invasive plants. FIFRA also gives the U.S. Environmental Protection Agency review authority for biological control agents when they are used to control invasive pests.

1.3.4 Endangered Species Act

Section 7 of the Endangered Species Act requires all federal agencies to ensure that any action authorized, funded, or carried out by the agency will not jeopardize the continued existence of any endangered or threatened species or adversely modify any critical habitat of these species (16 USC 1536[a][2]). Each federal agency must consult with the U.S. Fish and Wildlife Service (USFWS) for any action that may affect a listed species.

1.3.5 Army Regulation 200-5, Pest Management

The Army Pest Management Program implements DoD policies to protect health, property, and natural resources from damage by insects, weeds, and other species in ways that promote training and readiness with minimum risks to the environment. In addition, the regulation promulgates policies, responsibilities, and procedures to implement the Army Pest Management Program. The Army pest management policy is committed to integrated pest management at its facilities and installations as the best approach to control pests, reduce pesticide resistance, and meet mandates for Federal agencies to reduce environmental risks from hazardous chemicals. This regulation supplements Federal, State, and local laws and requirements described in AR 200–1 for the Army Environmental Program.

1.3.6 Army Regulation 200-1, Environmental Protection and Enhancement

This regulation requires preservation, protection and restoration of the environment. In addition, AR 200-1 regulates certain pesticides as hazardous materials and hazardous wastes, and establishes guidelines for program administration.

1.3.7 Army Regulation 200-3, Natural Resources - Land, Forest and Wildlife Management

This regulation requires ecosystem management to conserve natural resources, protect endangered species, and preserve biological diversity in pest management plans, pesticide management plans, and Integrated Natural Resources Management Plans (INRMPs).

1.3.8 Occupation Safety and Health Act

The Occupational Safety and Health Act (OSHA) requires proper protection of personnel working with or around chemicals.

1.3.9 Memorandum of Understanding

A Memorandum of Understanding between U.S. Environmental Protection Agency (USEPA) and DoD, 20 March 1996, requires DoD to use IPM to control pests and meet pesticide reduction goals.

1.3.10 New Jersey Pesticide Control Regulations

NJARNG installations are required to comply with the New Jersey Pesticide Control Regulations (New Jersey Administrative Code Title 7 Chapter 30 subchapters 1-12) when using, transporting, or storing herbicides. These regulations govern the manufacturing, labeling, registration, and classification of pesticides; the registration of pesticide dealers and pesticide dealer businesses; the registration of applicators of pesticides; and the distribution, use, application, storage, handling, transportation, and disposal of pesticides in the State of New Jersey.

1.4 DOCUMENT ORGANIZATION

This report and management plan has been organized as follows:

- Section 1 presents the introduction, background, and objectives of the project;
- Section 2 describes the methodology;
- Section 3 provides the survey results, maps, and a discussion of the results for each installation;
- Section 4 details the invasive plant management plan, which provides a description of the control methods, site-specific management practices, description of the monitoring program, implementation schedule, and staffing and funding requirements;
- Section 5 includes references;

SECTION 2

METHODS

2.1 BACKGROUND INFORMATION ACQUISITION

A list of invasive plants that may be present at the NJARNG installations (Table 2.1) was compiled using *An Overview of Nonindigenous Plant Species in New Jersey*, which was written by the NJDEP and can be found at the following website: http://www.nj.gov/dep/parksandforests/natural/heritage/InvasiveReport.pdf (NJDEP, 2004). Additional native plants, reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), and poison ivy (*Toxicodendron radicans*), were included in the surveys and management plan based on discussions with NJARNG staff.

Ecological community information was obtained from two sources. *A Preliminary Natural Community Classification for New Jersey* (Breden, 1989) was used to identify and describe the ecological communities at each installation. The location of the ecological communities at each installation was initially identified from the use of 1:12,000 scale color aerial photographs.

2.2 FIELD SURVEYS

2.2.1 Facilities Surveyed

Invasive plant surveys were conducted at 25 NJARNG facilities in the fall of 2004. Table 2.2 lists all of the NJARNG facilities included in the invasive plant surveys, the counties in which they are located, the acreages of the facility properties, and the dates when the field surveys were conducted.

TABLE 2.1

LIST OF NEW JERSEY INVASIVE PLANTS

Common Name	Scientific Name
Norway maple	*Acer platanoides*
Tree-of-heaven	*Ailanthus altissima*
Garlic mustard	*Alliaria petiolata*
Porcelain berry	*Ampelopsis brevipedunculata*
Japanese barberry	*Berberis thunbergii*
Japanese sedge	*Carex kobomugi*
Asian bittersweet	*Celastrus orbiculatus*
Spotted knapweed	*Centaurea biebersteinii*
Canadian thistle	*Cirsium arvense*
Wild teasel	*Dipsacus fullonum*
Cut-leaf teasel	*Dipsacus laciniatus*
Autumn olive	*Elaeagnus umbellate*
Winged spindletree	*Euonymus alata*
Chinese bush-clover	*Lespedeza cuneata*
Japanese honeysuckle	*Lonicera japonica*
Morrow's bush honeysuckle	*Lonicera morrowii*
Twinsisters, Tartarian honeysuckle	*Lonicera tartarica*
Purple loosestrife	*Lythrum salicaria*
Yellow sweetclover	*Melilotus officinalis*
Japanese stiltgrass	*Microstegium vimineum*
Eurasian water-milfoil	*Myriophyllum spicatum*
Japanese knotweed	*Polygonum cuspidatum*
Mile-a-minute	*Polygonum perfoliatum*
Curly leaf pondweed	*Potamogeton crispus*
Lesser celandine	*Ranunculus ficaria*
Common buckthorn	*Rhamnus cathartica*
Black locust	*Robinia pseudoacacia*
Multiflora rose	*Rosa multiflora*
Wineberry	*Rubus phoenicolasius*

TABLE 2.2

SUMMARY OF INVASIVE PLANT SURVEYS
CONDUCTED AT NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	County	Acreage	Field Survey Date(s)
Bordentown Armory/OMS	Burlington	4.22	September 15, 2004
Bordentown CSMS (Route 130)	Mercer	14.9	September 15, 2004
Cape May Court House Armory	Cape May	22.17	September 22, 2004
Cherry Hill Armory/OMS	Camden	11.3	September 16, 2004
Dover Armory	Morris	16.17	September 1, 2004
Flemington	Hunterdon	13	August 30, 2004
Fort Dix HQ, OMS, and RTS-M	Burlington	44.3	September 16, 2004
Fort Dix UTES	Ocean	27.67	September 16, 2004
Franklin Armory	Sussex	10.85	September 1, 2004
Hackettstown Armory	Warren	15.9	September 3, 2004
Hammonton Armory	Atlantic	9.21	September 21, 2004
Lawrenceville Complex	Mercer	78.14	September 14-15, 2004
Morristown Armory	Morris	41.7	September 1, 2004
Newton Armory	Sussex	5.97	September 2, 2004
Picatinny Arsenal (AASF)	Morris	28.48	September 2, 2004
Princeton Warehouse	Mercer	8.21	September 14, 2004
Sea Girt NGTC	Monmouth	171	August 20, 2004
Somerset Armory/OMS	Somerset	18.06	September 13, 2004
Toms River Armory/OMS	Ocean	30.21	September 21, 2004
Tuckerton Armory	Ocean	16	September 21, 2004
Vineland Armory/OMS	Cumberland	46	September 22, 2004
Washington Armory	Warren	34.67	September 14, 2004
Westfield Armory/OMS	Union	12.05	August 31, 2004
West Orange Armory	Essex	65	August 31, 2004
West Trenton AASF/OMS	Mercer	20.48	September 15, 2004

2.2.2 Vegetative Community Survey

Field surveys of the facilities included site inspections to identify and map the vegetative communities and land cover types present within the installation boundary. The vegetative communities were named according to the classification system found in *A Preliminary Natural Community Classification for New Jersey* (Breden, 1989). General community boundaries were initially identified using aerial photography. These boundaries were verified in the field via meandering transects and a flora inventory was completed for each vegetation community type. Both dominant and common species observed in the canopy, shrub, and herbaceous layers of each community were recorded on the datasheet. Representative photographs of each vegetative community were taken.

2.2.3 Invasive Plant Survey

While surveying vegetative communities, invasive plants were also being recorded. Once an invasive plant was observed, it was recorded on the datasheet and the vegetative community in which it was found was also noted. Polygons were drawn on the aerial photo and numbered to identify the location of each area of invasion. The invasive plants observed in each polygon were recorded. After an entire vegetative community was surveyed, the percentage cover for each invasive plant was estimated. Using the aerial photograph and visual approximation, the invasive species were ranked according to their percentage cover within a vegetative community. A ranking of high indicates that the invasive plant's estimated cover was 30 percent or greater within the vegetative community. A ranking of medium represents 10 to 30 percent cover and low represents less than 10 percent cover. Representative photos of each infested area were taken.

2.3 GEOGRAPHIC INFORMATION SYSTEM DATA

The land cover/ecological community data and invasive plant data were digitized and incorporated into the DMAVA geographic information system using established standards. Federal Geographic Data Committee-compliant metadata were provided with the electronic GIS data deliverable.

2.4 TREATMENT PRIORITIES

This subsection describes how the survey data were evaluated to identify priorities for invasive plant treatments at individual installations and specific infested areas at each installation. The following criteria were considered in establishing the priority for treatment at an installation:

- The degree of infestation. Those installations that have a high degree of infestation were given priority for treatment over less infested installations;
- The significance of natural resources and general environmental setting. Installations with significant natural resources (i.e., known or potential rare species habitat, wetlands, natural communities, etc.) were given higher priority than highly developed installations that generally lack natural communities. In addition, the size of the installation and the extent of surrounding development were considered; and
- The installation's mission and potential impacts to the mission. A higher priority for treatment was given to those installations designated as training centers, OMSs, or CSMSs. These installations receive a relatively higher proportion of federal funding to carry out the mission.

Installations were given a rank of high, medium, or low in terms of the priority of treatment. Those considered to be high had met multiple criteria listed above. For example an installation that supported outdoor training or had an OMS, had a high level of infestation of invasive plants, and had undeveloped or significant natural resources present was considered to be high. Those installations that had small areas of infestation and did not have significant natural resources were given a ranking of medium or low.

Within an installation, each infested site (designated as a polygon on the invasive plant maps) was given a relative priority ranking for treatment based on the following criteria:

- Impact that the invasive species may have on the NJARNG mission or natural resources. Highest priority for treatment was assigned to those infestations that are the fastest growing, most disruptive, and affect the most highly valued areas on the installations.

- Potential for successful treatment. The potential for successful eradication of invasive plants is typically higher for small, recent infestations compared to larger, well-established infestations. Eradication of small, recent infestations can often be accomplished with minimal effort and can help prevent further spread of invasive plants, which reduces the need for more intensive treatments in the future. Larger infestations typically require more initial effort and several re-treatments to achieve success. Therefore, areas that contain highly invasive species that can be eradicated with minimal effort were given highest priority for immediate treatment.

- Appendix A includes species-specific descriptions and control measures for invasive plants identified at the 25 NJARNG installations;
- Appendix B provides a listing of dominant plants identified in various ecological communities at each installation;
- Appendix C includes representative photographs; and
- Appendix D provides site specific treatment methods for invasive plants.

SECTION 3

RESULTS AND DISCUSSION

3.1 INTRODUCTION

This section presents the invasive plant survey results for the 25 NJARNG installations that were surveyed (Table 2.3). The results are presented in tabular and graphic format by facility, in alphabetical order. A discussion of management issues and priorities for each installation is also presented. Table A.1 in Appendix A provides a list of invasive plants identified at the installations and their degree of invasiveness. Appendix A also includes descriptions of each invasive plant species identified. Appendix B provides a list of dominant plants found in each ecological community at the installations. Representative photographs are provided in Appendix C.

3.2 BORDENTOWN ARMORY/OMS

TABLE 3.1
BORDENTOWN ARMORY/OMS

Bordentown Armory/OMS	
Facility Identification Number	34B90
City/Township	Bordentown
County	Burlington
Facility Acreage	4.22

TABLE 3.2
LAND COVER AND ECOLOGICAL COMMUNITIES
AT BORDENTOWN ARMORY/OMS

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.58	13.81
Paved Road/Paved Parking	1.93	45.56
Maintained Grass	0.66	15.52
Mesic Coastal Plain Mixed Oak Forest	1.04	24.57

TABLE 3.3
INVASIVE PLANTS AT BORDENTOWN ARMORY/OMS

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Garlic mustard, Japanese honeysuckle, Poison ivy, Tree-of-heaven, Multiflora rose, Black locust, Common reed, Morrow's bush honeysuckle, Autumn olive	1.04	24.64
2	Japanese honeysuckle, Multiflora rose, Wineberry, Black locust	0.04	0.95

TABLE 3.4

PERCENTAGE COVER OF INVASIVE PLANTS

AT BORDENTOWN ARMORY/OMS

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Mesic Coastal Plain Mixed Oak Forest	Tree-of-heaven	High
	Poison ivy	High
	Multiflora rose	High
	Japanese honeysuckle	High
	Morrow's bush honeysuckle	Medium
	Black locust	Low
	Common reed	Low
	Autumn olive	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES - BORDENTOWN ARMORY/OMS

Overall Facility Priority: Low
Infested Area Priorities: 1, 2
High Priority Species: Garlic mustard, Japanese honeysuckle, tree-of-heaven, common reed, Morrow's bush honeysuckle, and autumn olive

Bordentown Armory/OMS is a small installation with a medium level infestation of invasive plants; some being highly invasive plant species. Highly invasive plants in the Mesic Coastal Plain Mixed Oak Forest could continue to spread through the forested area. Invasive plants present near the fence present more of an aesthetic concern and do not pose a risk of spreading into natural areas and therefore are a lower priority for treatment.

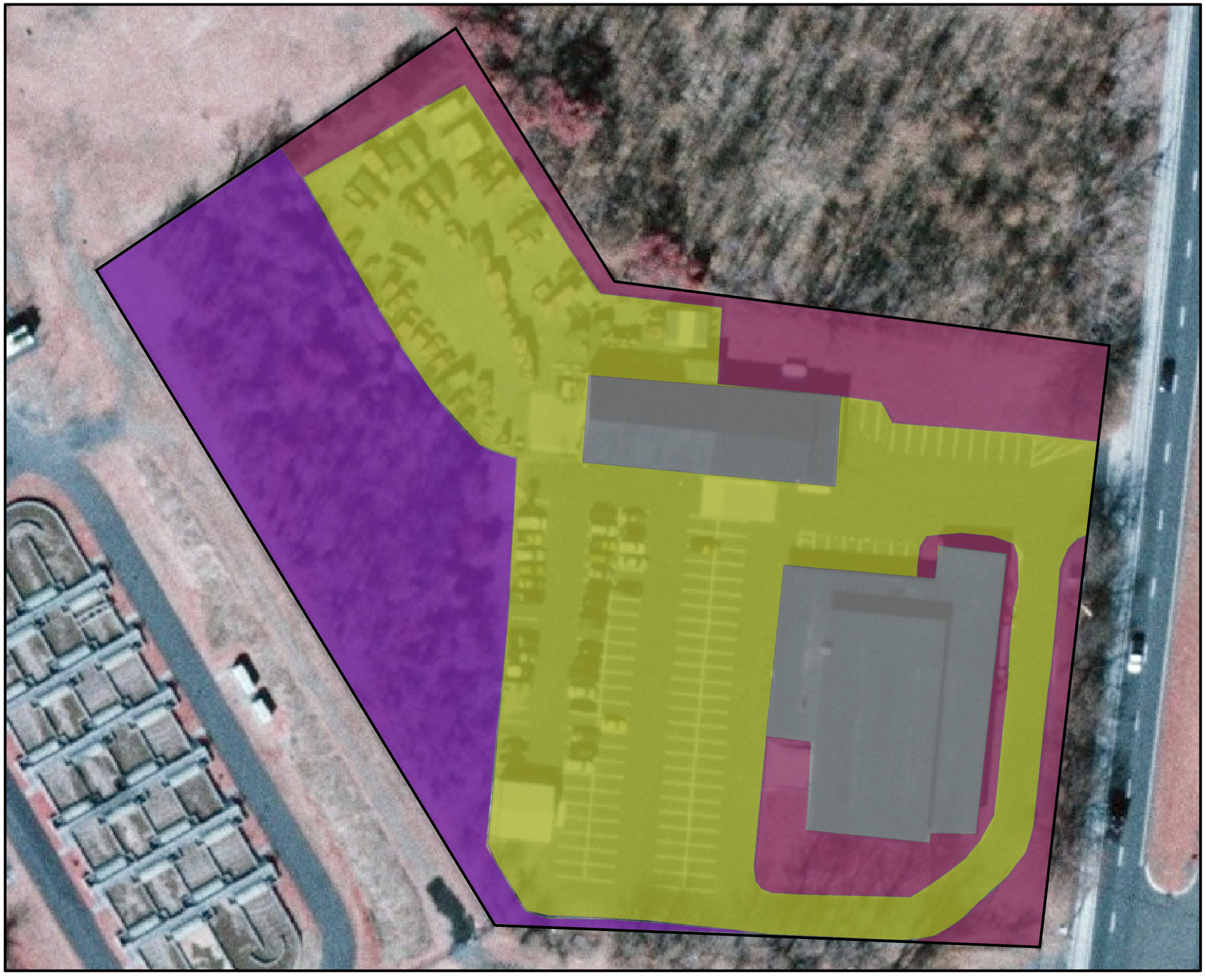

Figure 3-1
Bordentown Armory/OMS
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Maintained Grass
- Mesic Coastal Plain Mixed Oak Forest
- Pavement

0 15 30 60 90 120
Feet

Scale:	1:700
Created By:	Parsons
File:	20050616_Hackettstown_Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-1
Page Number:	3-4

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Figure 3-2
Bordentown Armory/OMS
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2

See Table 3.3 for list of invasive plants within each polygon.

0 15 30 60 90 120
Feet

Scale:	1:700
Created By:	Parsons
File:	20050612_Bordentown_Armory_OMS17_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-2
Page Number:	3-5

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3.3 BORDERTOWN CSMS (ROUTE 130)

TABLE 3.5

BORDENTOWN CSMS (ROUTE 130)

Bordentown CSMS (Route 130)	
Facility Identification Number	34A15
City/Township	Bordentown
County	Mercer
Facility Acreage	14.9

TABLE 3.6

LAND COVER AND ECOLOGICAL COMMUNITIES AT BORDENTOWN CSMS (ROUTE 130)

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.86	5.78
Paved Road/Paved Parking	6.35	42.63
Gravel	0.73	4.90
Maintained Grass	4.24	28.50
Emergent Wet Weather Conveyance	0.05	0.37
Mesic Coastal Plain Mixed Oak Forest	2.65	17.79
Forested Wet Weather Conveyance	0.60	4.03

TABLE 3.7

INVASIVE PLANTS AT BORDENTOWN CSMS (ROUTE 130)

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Multiflora rose, Japanese honeysuckle, Poison ivy, Autumn olive, Morrow's bush honeysuckle, Canadian thistle	0.45	3.02
2	Purple loosestrife, Multiflora rose, Japanese honeysuckle, Autumn olive, Poison ivy	0.05	3.36
3	Tree-of-heaven, Japanese honeysuckle, Autumn olive, Multiflora rose	0.15	1.01
4	Japanese honeysuckle, Multiflora rose, Purple loosestrife, Japanese stiltgrass	2.66	17.85
5	Japanese honeysuckle, Poison ivy, Multiflora rose, Purple loosestrife, Autumn olive	0.27	1.81
6	Japanese honeysuckle, Poison ivy, Purple loosestrife	0.07	0.47
7	Japanese honeysuckle	0.16	1.07
8	Poison ivy, Japanese honeysuckle, Tree-of-heaven	0.54	6.71

TABLE 3.8

PERCENTAGE COVER OF INVASIVE PLANTS AT BORDENTOWN CSMS (ROUTE 130)

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Forested Wet Weather Conveyance	Japanese honeysuckle	High
	Autumn olive	High
	Multiflora rose	High
	Tree-of-heaven	Low
	Morrow's bush honeysuckle	Low
	Canadian thistle	Low
Mesic Coastal Plain Mixed Oak Forest	Japanese honeysuckle	High
	Poison ivy	Medium
	Tree-of-heaven	Low
	Multiflora rose	Low
	Purple loosestrife	Low
	Japanese stiltgrass	Low
Emergent Wet Weather Conveyance	Japanese honeysuckle	High
	Purple loosestrife	Medium
	Autumn olive	Low
	Multiflora rose	Low
	Poison ivy	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES - BORDENTOWN CSMS (ROUTE 130)

Overall Facility Priority: Medium
Infested Area Priorities: 2, 5, 6, 7, 8, 4, 3, and 1
High Priority Species: Purple loosestrife, Japanese honeysuckle, Japanese stiltgrass, and tree-of-heaven

Bordentown CSMS (Route 130) is at a medium level of infestation of invasive plants with some being highly invasive. Highly invasive plants, particularly purple loosestrife, in the wet conveyance areas could spread to natural areas within the

installation or off site and should be a priority for treatment. Smaller infested areas within the Mesic Coastal Plain Mixed Oak Forest should be treated and eradicated to prevent spread throughout the forest. The larger infested area within the forest should then be managed to control and reduce infestation in the natural area. Infestations in paved or gravel areas are of lesser concern as they pose little threat to natural systems.



Figure 3-3
Bordentown CSMS (Route 130)
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Emergent Wet Weather Conveyance
- Forested Wet Weather Conveyance
- Gravel
- Maintained Grass
- Mesic Coastal Plain Mixed Oak Forest
- Pavement

0 37.5 75 150 225 300 Feet

Scale:	1:1,500
Created By:	Parsons
File:	20050616_Bordentown_CSMS_A_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-3
Page Number:	3-10

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Figure 3-4
Bordentown CSMS (Route 130)
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8

See Table 3-7 for list of invasive plants within each polygon

0 35 70 140 210 280
Feet

Scale:	1:1,500
Created By:	Parsons
File:	20050612_Bordentown_CSMS_A_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-4
Page Number:	3-11

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3.4 CAPE MAY COURT HOUSE ARMORY

TABLE 3.9

CAPE MAY COURT HOUSE ARMORY

Cape May Court House Armory	
Facility Identification Number	34A40
City/Township	Cape May Court House
County	Cape May
Facility Acreage	22.17

TABLE 3.10

LAND COVER AND ECOLOGICAL COMMUNITIES AT CAPE MAY COURT HOUSE ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.65	2.92
Paved Road/Paved Parking	3.72	34.18
Maintained Grass	6.69	30.20
Scrub Shrub	1.18	5.33
Brackish Tidal Marsh Complex	6.00	27.08
Coastal Plain Atlantic White Cedar Swamp	3.79	17.12

TABLE 3.11

INVASIVE PLANTS AT CAPE MAY COURT HOUSE ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Common reed, Japanese honeysuckle, Poison ivy, Multiflora rose	1.38	6.22
2	Autumn olive	0.01	0.05
3	Chinese bush-clover	<0.01	0.01
4	Common reed	6.79	30.63
5	Porcelain berry	0.01	0.05
6	Spotted knapweed	0.01	0.05

TABLE 3.12

PERCENTAGE COVER OF INVASIVE PLANTS AT CAPE MAY COURT HOUSE ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Brackish Tidal Marsh Complex	Common reed	High
Scrub Shrub	Common reed	High
	Japanese honeysuckle	High
	Poison ivy	High
	Multiflora rose	Medium
	Autumn olive	Medium
	Chinese bush-clover	Low
Coastal Plain Atlantic White Cedar Swamp	Porcelain berry	Low
Maintained Grass	Spotted knapweed	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – CAPE MAY COURT HOUSE ARMORY

Overall Facility Priority: High
Infested Area Priorities: 5, 2, 3, 6, 4, and 3
High Priority Species: Common reed, Japanese honeysuckle, autumn olive, porcelain berry, and spotted knapweed

Cape May Courthouse Armory has a medium level of infestation on the installation. Wetland areas on the installation are infested with highly invasive species. To effectively use resources, the small area of porcelain berry located within the white cedar swamp should be targeted in order to eradicate or prevent further spread that will degrade this marsh. In addition, the small areas of autumn olive and Chinese bush-clover within the Scrub Shrub community should also be removed before they spread within this community. The larger infested areas within the Brackish Tidal Marsh and the Scrub Shrub communities should be focused on last for management, as they are more difficult to control due to the highly invasive nature of the plants and the size of the infestation. The Brackish Tidal Marsh Complex is almost a monoculture of common reed. The possibility of cooperating with ongoing or planned regional efforts to control common reed in tidal marshes should be explored. The invasive plants present in the Scrub Shrub community should be controlled or removed in order to prevent spread into the Coastal Plain Atlantic White Cedar Swamp.



Figure 3-5
Cape May Courthouse Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Brackish Tidal Marsh Complex
- Building
- Coastal Plain Atlantic White Cedar Swamp
- Maintained Grass
- Pavement
- Scrub Shrub

0 50 100 200 300 400

Feet

Scale:	1:2,500
Created By:	Parsons
File:	20050616_Cape_May_Armory_OMS4_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-5
Page Number:	3-15

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Figure 3-6
Cape May Courthouse Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6

See Table 3-11 for list of invasive plants within each polygon

0 60 120 240 360 480
Feet

Scale:	1:2,500
Created By:	Parsons
File:	20050612_CapeMay_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-6
Page Number:	3-16

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3.5 CHERRY HILL ARMORY/OMS

TABLE 3.13

CHERRY HILL ARMORY/OMS

Cherry Hill Armory/OMS	
Facility Identification Number	34A45
City/Township	Cherry Hill
County	Camden
Facility Acreage	11.3

TABLE 3.14

LAND COVER AND ECOLOGICAL COMMUNITIES AT CHERRY HILL ARMORY/OMS

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.97	8.61
Paved Road/Paved Parking	3.86	34.18
Maintained Grass	6.42	56.88

TABLE 3.15

INVASIVE PLANTS AT CHERRY HILL ARMORY/OMS

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Japanese stiltgrass, Garlic mustard	6.42	56.81
2	Japanese honeysuckle	<0.01	0.03
3	Poison ivy	0.05	0.44
4	Poison ivy	<0.01	0.03
5	Poison ivy	<0.01	0.03
6	Poison ivy	<0.01	0.02
7	Japanese stiltgrass, Garlic mustard, Poison ivy, Common mugwort	0.13	1.15

TABLE 3.16

PERCENTAGE COVER OF INVASIVE PLANTS AT CHERRY HILL ARMORY/OMS

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Maintained Grass	Japanese stiltgrass	High
	Garlic mustard	High
	Poison ivy	Medium
	Multiflora rose	Low
	Japanese honeysuckle	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – CHERRY HILL ARMORY/OMS

Overall Facility Priority: Low
Infested Area Priorities: 3, 4, 5, 6, 7, 2, and 1
High Priority Species: Common reed, Japanese stiltgrass, garlic mustard, and poison ivy

Cherry Hill Armory/OMS has a relatively high level of infestation; however the area infested is in the Maintained Grass area. The areas of small infestation should be treated first to eradicate the invasive plants. Four small infested areas had poison ivy growing up tree trunks and into the canopy should be treated to protect health and safety of staff at the installation and to protect the trees from damage. The infested areas along the fence surrounding the parking area and a small portion of the maintained lawn with Japanese honeysuckle could be eradicated to prevent further spread into other areas. The largest area of infestation consisting of common reed, Japanese stiltgrass, and garlic mustard exists within the maintained lawn area and should be treated to control and contain further spread of the invasive plants.



Figure 3-7
Cherry Hill Armory/OMS
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Maintained Grass
- Pavement

0 50 100 200 300 400
Feet

Scale:	1:2,362
Created By:	Parsons
File:	20050616_Cherry_Hill_Armory_OMS_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-7
Page Number:	3-20

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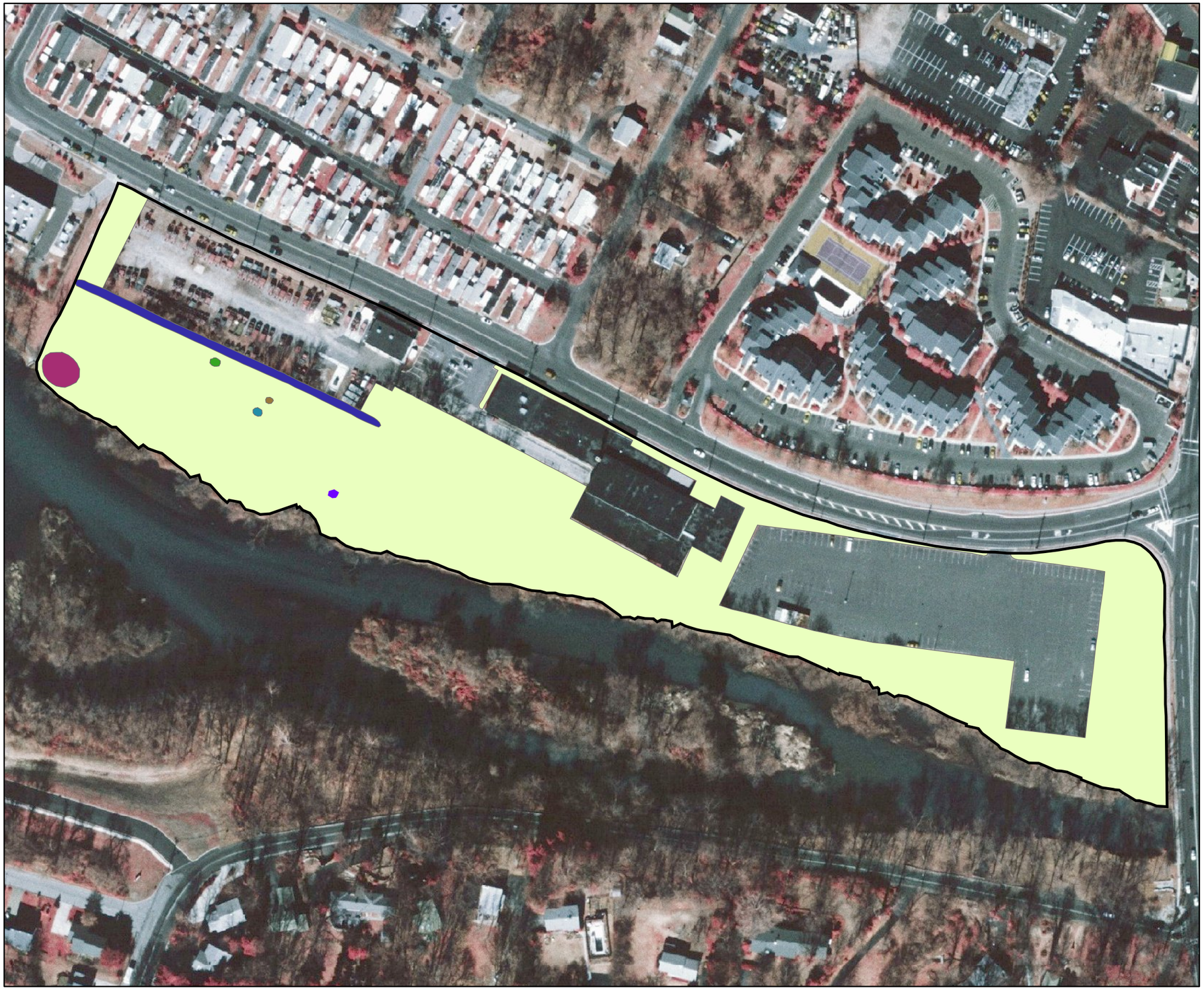

Figure 3-8
Cherry Hill Armory/OMS
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 1
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7

See Table 3-15 for list of invasive plants within each polygon

0 40 80 160 240 320
Feet

Scale:	1:1,800
Created By:	Parsons
File:	20050612_Cherry_Hill_Armory_OMS_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-8
Page Number:	3-21

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3.6 DOVER ARMORY

TABLE 3.17

DOVER ARMORY

Dover Armory	
Facility Identification Number	34A50
City/Township	Dover
County	Morris
Facility Acreage	16.17

TABLE 3.18

LAND COVER AND ECOLOGICAL COMMUNITIES AT DOVER ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.73	4.55
Paved Road/Paved Parking	2.52	15.58
Gravel	0.96	5.96
Maintained Grass	1.94	12.03
Dry-Mesic Inland Mixed Oak Forest	8.75	54.12
Inland Red Maple Swamp	1.15	7.14

TABLE 3.19

INVASIVE PLANTS AT DOVER ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Japanese knotweed, Tree-of-heaven, Japanese stiltgrass	0.04	0.25
2	Japanese stiltgrass, Garlic mustard, Japanese barberry, Winged spindletree	7.49	46.32
3	Reed canarygrass, Japanese knotweed	0.01	0.06
4	Japanese knotweed, Morrow's bush honeysuckle, Porcelain berry, Asian bittersweet, Poison ivy, Garlic mustard, Japanese barberry, Common reed, Multiflora rose, Autumn olive, Black locust, Spotted knapweed, Norway maple, Reed canarygrass	0.42	2.60
5	Japanese knotweed	0.14	0.87
6	Japanese knotweed, Spotted knapweed	0.06	0.37
7	Canadian thistle, Spotted knapweed	0.01	0.06
8	Garlic mustard	0.43	2.66

TABLE 3.20

PERCENTAGE COVER OF INVASIVE PLANTS AT DOVER ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Paved Road/Paved Parking	Japanese knotweed	Medium
	Japanese stiltgrass	Medium
	Spotted knapweed	Medium
	Tree-of-heaven	Low
	Common reed	Low
	Canadian thistle	Low
Dry-Mesic Inland Mixed Oak Forest	Garlic mustard	Medium
	Morrow's bush honeysuckle	Low
	Porcelain berry	Low
	Japanese knotweed	Low
	Asian bittersweet	Low
	Poison ivy	Low
	Common reed	Low
	Japanese barberry	Low
	Multiflora rose	Low
	Autumn olive	Low
	Spotted knapweed	Low
	Black locust	Low
	Japanese stiltgrass	Low
	Winged spindletree	Low
	Norway maple	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – DOVER ARMORY

Overall Facility Priority: High
Infested Area Priorities: 2, 4, 8, 7, 5, 3, 1, and 6
High Priority Species: Japanese knotweed, Japanese stiltgrass, spotted knapweed, porcelain berry, and garlic mustard

The Dover Armory is relatively highly infested with invasive plants that threaten or have the potential to threaten natural areas. It is recommended that the wetland community be prioritized for protection from infestation by invasive plant in the adjacent area due to its value as an important vegetative community. The larger area of infestation should be the highest priority for treatment to protect the wetland especially from invasion of the common reed. Small areas of infestation within the Dry-Mesic Inland Mixed Oak Forest should follow. This area has a high concentration of highly invasive species and is located adjacent to the forest community increasing the potential for spread. Smaller areas of infestation of highly invasive plants should be treated next particularly those that are adjacent to the forested community to prevent spread into the area. Infested areas along fence lines or in the developed areas should be of a lesser priority for treatment.

Figure 3-9
Dover Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry Mesic Inland Mixed Oak Forest
- Gravel
- Inland Red Maple Swamp
- Maintained Grass
- Pavement

0 40 80 160 240 320

Feet

Scale:	1:1,700
Created By:	Parsons
File:	20050616_Dover_Armory_OMS7_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-9
Page Number:	3-26

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Figure 3-10
Dover Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8

See Table 3.19 for list of invasive plants within each polygon

0 35 70 140 210 280 Feet

Scale:	1:1,700
Created By:	Parsons
File:	20050612_Dover_Armory_OMS7_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-10
Page Number:	3-27

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3.7 FLEMINGTON

TABLE 3.21

FLEMINGTON

Flemington	
Facility Identification Number	34A80
City/Township	Flemington
County	Hunterdon
Facility Acreage	13

TABLE 3.22

LAND COVER AND ECOLOGICAL COMMUNITIES AT FLEMINGTON

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.60	4.56
Paved Road/Paved Parking	1.99	15.22
Maintained Grass	1.56	11.95
Dry-Mesic Inland Mixed Oak Forest	8.69	66.54
Marshy Wet Weather Conveyance	0.18	1.41

TABLE 3.23

INVASIVE PLANTS AT FLEMINGTON

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Purple loosestrife	0.06	0.46
2	Purple loosestrife	0.05	0.39
3	Japanese stiltgrass	7.18	55.23
4	Japanese stiltgrass	0.07	0.54
5	Common periwinkle	0.13	1
6	Multiflora rose, Poison ivy	0.13	1
7	Poison ivy	0.15	1.15
8	Wineberry, Multiflora rose	0.52	4
9	Autumn olive	0.22	1.69
10	Morrow's bush honeysuckle	0.10	0.77
11	Spotted knapweed	0.05	0.38

TABLE 3.24

PERCENTAGE COVER OF INVASIVE PLANTS AT FLEMINGTON

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry-Mesic Inland Mixed Oak Forest	Japanese stiltgrass	High
	Multiflora rose	Medium
	Wineberry	Medium
	Morrow's bush honeysuckle	Low
	Autumn olive	Low
	Japanese honeysuckle	Low
	Poison ivy	Low
	Common periwinkle	Low
	Spotted knapweed	Low
Marshy Wet Weather Conveyance	Purple loosestrife	Medium
	Japanese stiltgrass	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – FLEMINGTON

Overall Facility Priority: Medium
Infested Area Priorities: 1, 2, 4, 11, 10, 9, 8, 6, 7, and 3
High Priority Species: Japanese stiltgrass, purple loosestrife, autumn olive, and Morrow's bush honeysuckle

There is a relatively high level of infestation of invasive plants at Flemington. The largest infestation covers the entire Dry-Mesic Inland Mixed Oak Forest Community and is composed of Japanese stiltgrass, which covers much of the forest floor. Because the Japanese stiltgrass is so well established it will be difficult to control or remove and will require a greater amount of resources to do so. Therefore the smaller areas of invasion will be better areas to place the greatest management efforts at Flemington.

Two out of the three Marshy Wet Weather Conveyance areas contained purple loosestrife, which is extremely invasive. These areas are small and the plants could potentially be eradicated. Small areas of infestation containing the highly invasive Japanese stiltgrass, autumn olive and Morrow's bush honeysuckle should be a high priority for treatment to prevent further spread. Other small areas containing less invasive plants, multiflora rose, common periwinkle, and wineberry should be controlled or eradicated to prevent spread throughout the forest; however, these areas are of a lesser priority for treatment.

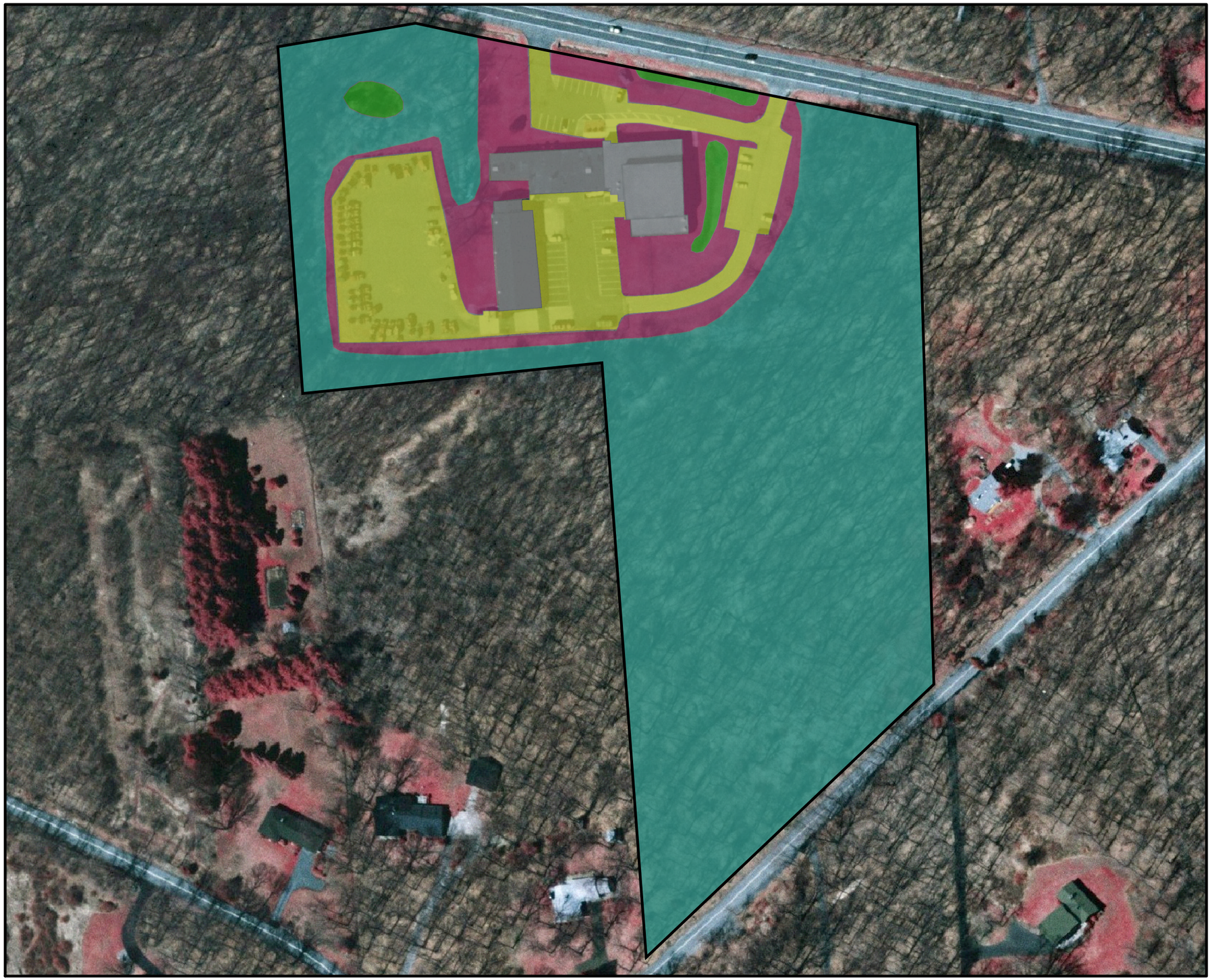

Figure 3-11
Flemington Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry Mesic Inland Mixed Oak Forest
- Maintained Grass
- Marshy Wet Weather Conveyance
- Pavement

0 37.5 75 150 225 300

Feet

Scale:	1:1,600
Created By:	Parsons
File:	20050616_Flemington_Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-11
Page Number:	3-31

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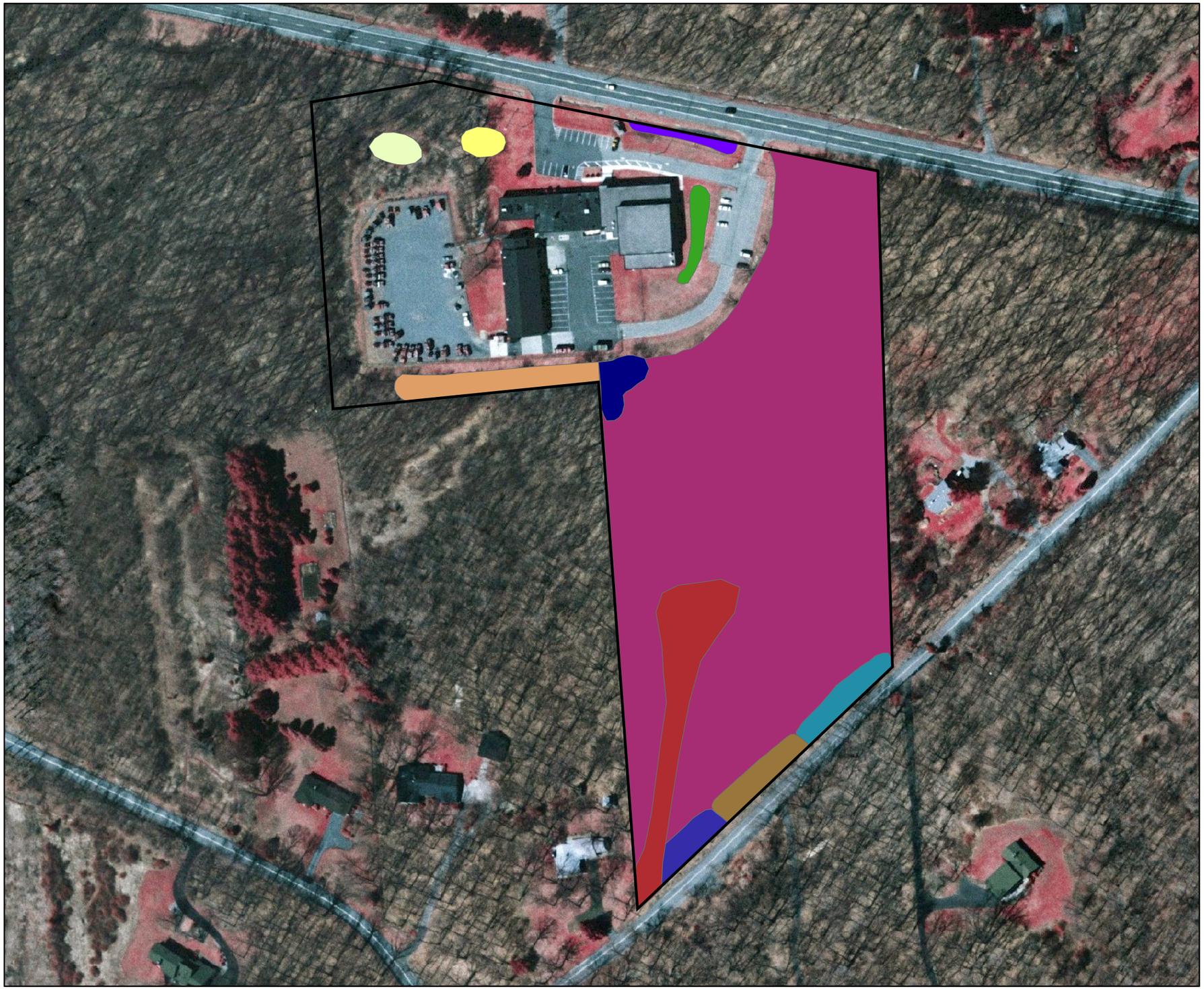

Figure 3-12
Flemington Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11

See Table 3.23 for list of invasive plants within each polygon

0 40 80 160 240 320
Feet

Scale:	1:1,800
Created By:	Parsons
File:	20050612_Flemington_Armory_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-12
Page Number:	3-32

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3.8 FORT DIX HQ, OMS, AND RTS-M

TABLE 3.25

FORT DIX HQ, OMS, AND RTS-M

Fort Dix HQ, OMS, and RTS-M	
Facility Identification Number	34C55
City/Township	Fort Dix
County	Burlington
Facility Acreage	44.3

TABLE 3.26

LAND COVER AND ECOLOGICAL COMMUNITIES AT

FORT DIX HQ, OMS, AND RTS-M

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	5.15	11.67
Paved Road/Paved Parking	16.07	36.40
Maintained Grass	14.39	32.61
Virginia Pine-Oak Forest	5.64	12.78
Open Field	0.77	1.74
Inland Red Maple Swamp	0.31	0.71
Inland Graminoid Marsh	1.81	4.09

TABLE 3.27

INVASIVE PLANTS AT FORT DIX HQ, OMS, AND RTS-M

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Garlic mustard, Poison ivy, Black locust, Chinese bush-clover, Multiflora rose	0.33	0.74
2	Chinese bush-clover, Black locust, Spotted knapweed, Crown vetch	0.35	0.79
3	Japanese honeysuckle, Chinese bush-clover, Garlic mustard, Multiflora rose, Wineberry, Black locust, Japanese stiltgrass	5.46	12.33
4	Multiflora rose, Poison ivy	0.31	0.70
5	Poison ivy, Japanese honeysuckle, Multiflora rose	0.52	1.17
6	Spotted knapweed	0.46	1.04
7	Common mugwort, Multiflora rose	0.28	0.63
8	Black locust, Spotted knapweed, Crown vetch	0.42	0.95
9	Common reed	0.08	0.18
10	Spotted knapweed, Poison ivy	0.07	0.16
11	Multiflora rose	0.05	0.11
12	Japanese honeysuckle, Multiflora rose	0.06	0.14
13	Poison ivy, Japanese honeysuckle, Multiflora rose	0.02	0.05
14	Chinese bush-clover, Black locust, Spotted knapweed, Common mugwort, Common reed	1.67	3.77
15	Poison ivy	0.02	0.05

TABLE 3.28

PERCENTAGE COVER OF INVASIVE PLANTS AT

FORT DIX, HQ, OMS, AND RTS-M

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Open Field	Chinese bush-clover	High
	Black locust	Medium
	Spotted knapweed	Low
Inland Graminoid Marsh	Chinese bush-clover	High
	Black locust	Medium
	Multiflora rose	Low
	Spotted knapweed	Low
	Common mugwort	Low
	Common reed	Low
Virginia Pine-Oak Forest	Garlic mustard	Medium
	Poison ivy	Low
	Black locust	Low
	Chinese bush-clover	Low
	Multiflora rose	Low
	Common reed	Low
	Wineberry	Low
	Japanese stiltgrass	Low
	Japanese honeysuckle	Low
Maintained Grass	Spotted knapweed	Low
	Poison ivy	Low
	Multiflora rose	Low
	Japanese honeysuckle	Low
	Poison ivy	Low
Inland Red Maple Swamp	Multiflora rose	Low
	Poison ivy	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – FORT DIX, HQ, OMS, AND RTS-M

Overall Facility Priority: High
Infested Area Priorities: 14, 4, 9, 3, 7, 8, 1, 6, 13, 11, 12, 2, 5
High Priority Species: Japanese honeysuckle, garlic mustard, Japanese stiltgrass, common reed, and spotted knapweed

The Fort Dix HQ, OMS, and RTS-M have a medium level of infestation that threatens natural resources at the installation. The Inland Graminoid Marsh and the Inland Red Maple Swamp communities at Fort Dix should be prioritized for invasive plant removal due to their value as important vegetative communities. The Inland Graminoid Marsh and Inland Red Maple Swamp communities offer important ecological services such flood abatement and improved water quality. In addition, these areas provide important habitat for wildlife. It is recommended that the next priority be the smaller polygons of invasive plants within the Virginia Pine Oak Forest, with the third priority being the largest polygon that includes the forest itself. Invasive plants within the Maintained Grass areas and along fence lines are a lower priority due to their low percent cover and the potential for spread from the maintained area is low.



Figure 3-13
Fort Dix HQ, OMS, RTS-M
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Inland Graminoid Marsh
- Inland Red Maple Swamp
- Maintained Grass
- Open Field
- Pavement
- Virginia Pine-Oak Forest

0 50 100 200 300 400
Feet

Scale:	1:2,500
Created By:	Parsons
File:	20050615_Fort_Dix_HQ_OMS_RTSM_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-13
Page Number:	3-37

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Figure 3-14
Fort Dix HQ, OMS, RTS-M
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11
- Polygon 12
- Polygon 13
- Polygon 14
- Polygon 15

See Table 3.27 for list of invasive plants within each polygon

0 65 130 260 390 520
Feet

Scale:	1:3,000
Created By:	Parsons
File:	20050612_Fort_Dix_TS_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-14
Page Number:	3-38

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3.9 FORT DIX UTES

TABLE 3.29

FORT DIX UTES

Fort Dix UTES	
Facility Identification Number	34C55
City/Township	Fort Dix
County	Ocean
Facility Acreage	27.67

TABLE 3.30

LAND COVER AND ECOLOGICAL COMMUNITIES AT FORT DIX UTES

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.49	43.82
Paved Road/Paved Parking	6.72	24.33
Maintained Grass	0.35	1.27
Bare Ground	12.11	43.82
Dry Pine-Oak Forest	7.97	28.82

TABLE 3.31

INVASIVE PLANTS AT FORT DIX UTES

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Chinese bush-clover	0.05	0.18
2	Spotted knapweed	0.01	0.04

TABLE 3.32

PERCENTAGE COVER OF INVASIVE PLANTS AT FORT DIX UTES

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry Pine-Oak Forest	Chinese bush-clover	Low
	Spotted knapweed	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – FORT DIX UTES

Overall Facility Priority: Low
Infested Area Priorities: 2, 1
High Priority Species: Spotted knapweed

The Fort Dix UTES has a relatively large undeveloped area within the installation that provides habitat for the state listed northern pine snake (*Pituophis melanoleucus*). There is a low level of infestation of invasive plants at this site. Two areas of infestation were identified that were small in size and located close to each other in the Dry Pine-Oak Forest across from the facility building. Both infestations could be easily removed with priority given to the area of spotted knapweed as it is considered a highly invasive species, compared to the Chinese bush clover, which is less invasive.

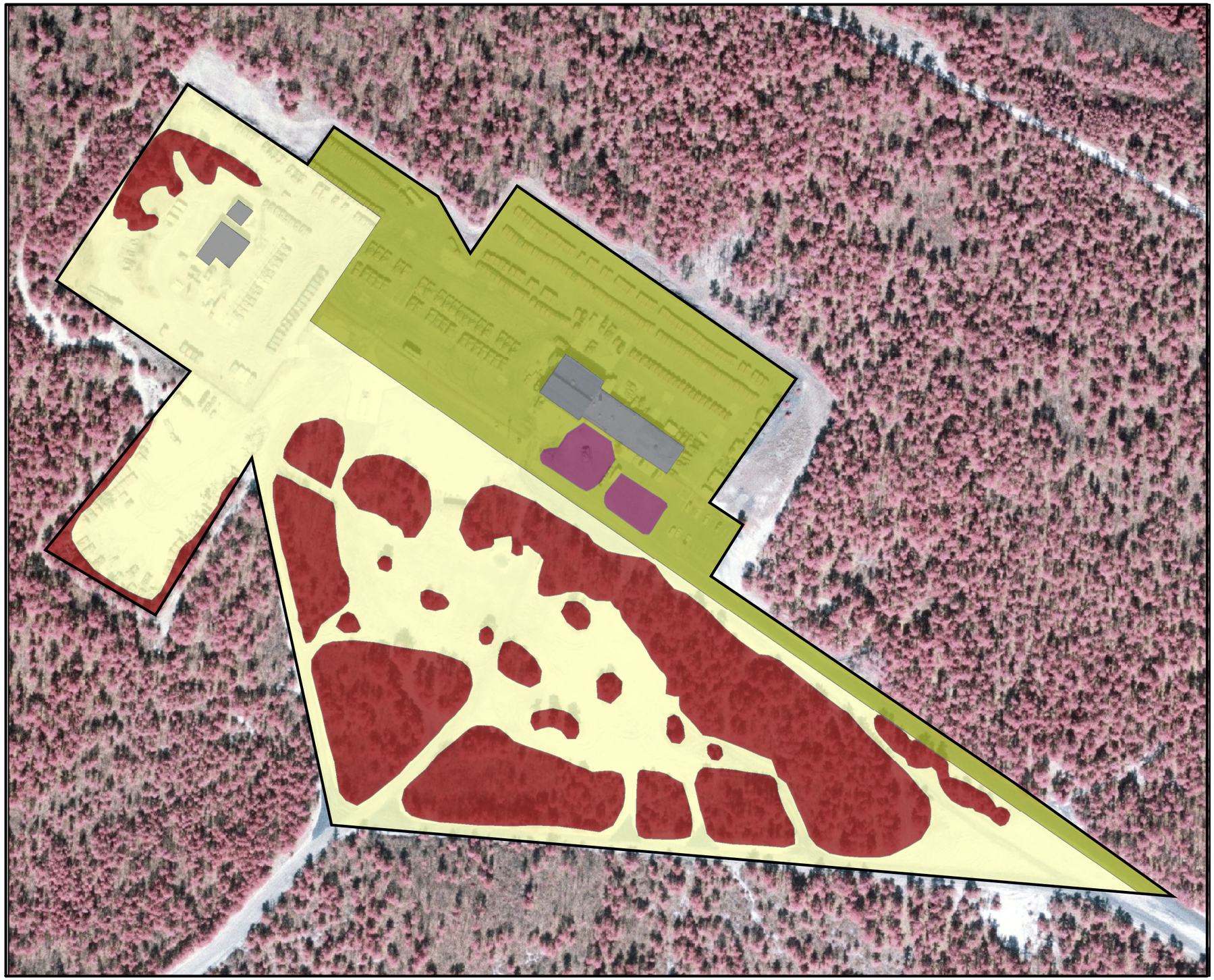

Figure 3-15
Fort Dix UTES
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Bare Ground
- Building
- Dry Pine Oak Forest
- Maintained Grass
- Pavement

0 55 110 220 330 440
Feet

Scale:	1:2,100
Created By:	Parsons
File:	20050616_Fort_Dix_UTES_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-15
Page Number:	3-41

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Figure 3-16
Fort Dix UTES
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2

See Table 3.31 for list of invasive plants within each polygon

0 50 100 200 300 400
Feet

Scale:	1:2,100
Created By:	Parsons
File:	20050612_Fort_Dix_UTES_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-16
Page Number:	3-42

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3.10 FRANKLIN ARMORY

TABLE 3.33

FRANKLIN ARMORY

Franklin Armory	
Facility Identification Number	34A85
City/Township	Franklin
County	Sussex
Facility Acreage	10.85

TABLE 3.34

LAND COVER AND ECOLOGICAL COMMUNITIES AT FRANKLIN ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.63	5.84
Paved Road/Paved Parking	2.22	20.43
Maintained Grass	1.52	14.00
Dry-Mesic Inland Mixed Oak Forest	4.16	38.39
Open Field	0.55	5.06
Riparian Forested	0.37	3.42
Inland Graminoid Marsh	0.55	5.09
Floodplain Forest	0.84	7.78

TABLE 3.35

INVASIVE PLANTS AT FRANKLIN ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Multiflora rose	<0.01	0.01
2	Multiflora rose	<0.01	0.02
3	Spotted knapweed, Porcelain berry, Multiflora rose, Purple loosestrife, Canadian thistle, Asian bittersweet, Common reed	0.44	4.06
4	Morrow's bush honeysuckle, Multiflora rose, Poison ivy, Japanese barberry, Asian bittersweet, Spotted knapweed, Purple loosestrife, Norway maple	0.34	3.13
5	Spotted knapweed, Porcelain berry, Multiflora rose, Purple loosestrife, Canadian thistle, Asian bittersweet, Common reed	0.17	1.57
6	Asian bittersweet, Multiflora rose	0.01	0.05
7	Purple loosestrife, Autumn olive, Multiflora rose, Japanese barberry	0.5	4.61
8	Multiflora rose, Poison ivy, Garlic mustard	0.08	0.74
9	Japanese barberry, Garlic mustard, Multiflora rose, Japanese stiltgrass, Poison ivy, Morrow's bush honeysuckle, Tree-of-heaven, Asian bittersweet, Winged spindletree	5.08	46.82
10	Japanese stiltgrass, Japanese barberry, Multiflora rose, Winged spindletree	0.88	8.11

TABLE 3.36

PERCENTAGE COVER OF INVASIVE PLANTS

AT FRANKLIN ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Riparian Forested	Multiflora rose	High
	Asian bittersweet	Medium
	Morrow's bush honeysuckle	Medium
	Japanese barberry	Medium
	Spotted knapweed	Low
	Poison ivy	Low
	Norway maple	Low
	Purple loosestrife	Low
Dry-Mesic Inland Mixed Oak Forest	Multiflora rose	High
	Japanese barberry	High
	Japanese stiltgrass	Medium
	Morrow's bush honeysuckle	Medium
	Garlic mustard	Low
	Poison ivy	Low
	Tree-of-heaven	Low
	Asian bittersweet	Low
	Winged spindletree	Low
Floodplain Forest	Japanese barberry	High
	Multiflora rose	Medium
	Japanese stiltgrass	Medium
	Winged spindletree	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – FRANKLIN ARMORY

Overall Facility Priority: High
Infested Area Priorities: 5, 3, 7, 4, 10, 9, 1, 2, 6, and 8
High Priority Species: Purple loosestrife, Japanese barberry, Japanese stiltgrass, Morrow's bush honeysuckle, spotted knapweed, Asian bittersweet, and tree-of-heaven

The Franklin Armory has a high level of infestation of highly invasive plants that threaten natural areas on the installation. Several of the polygons contained purple loosestrife, which is highly invasive and can spread rapidly through waterways within and outside of the facility. Purple loosestrife was found at low percentage cover levels in several of these communities. Due to its highly invasive nature it could rapidly become much thicker and could out-compete many of the native plants present in these communities. It is recommended that this invasive plant be prioritized for treatment.

In general the wetland communities should be prioritized for treatment due to their value as important vegetative communities. These areas provide quality habitat for wildlife and the potential to support rare species. The state threatened wood turtle (*Glyptemys insculpta*) has been observed at the facility and the federally threatened and state endangered bog turtle (*Clemmys muhlenbergii*) has been observed on property adjacent to this facility. For these reasons prioritizing the removal of highly invasive plants from these wetland communities is recommended. Smaller areas of infestation that are adjacent to developed areas that contain less invasive species should be treated when resources are available as the threat of spread into natural areas is much less.



Figure 3-17
Franklin Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry Mesic Inland Mixed Oak Forest
- Floodplain Forest
- Inland Graminoid Marsh
- Maintained Grass
- Open Field
- Pavement
- Riparian Forested

0 25 50 100 150 200
Feet

Scale:	1:1,100
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File:	20050615_Franklin_Armory_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-17
Page Number:	3-47

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Figure 3-18
Franklin Armory Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10

See Table 3.35 for list of invasive plants within each polygon

0 25 50 100 150 200 Feet

Scale:	1:1,200
Created By:	Parsons
File:	20050612_Franklin_Armory_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-18
Page Number:	3-48

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3.11 HACKETTSTOWN ARMORY

TABLE 3.37

HACKETTSTOWN ARMORY

Hackettstown Armory	
Facility Identification Number	34A95
City/Township	Hackettstown
County	Warren
Facility Acreage	15.9

TABLE 3.38

LAND COVER AND ECOLOGICAL COMMUNITIES

AT HACKETTSTOWN ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.63	3.93
Paved Road/Paved Parking	1.26	7.89
Maintained Grass	0.93	5.85
Planted White Pine Forest	3.39	21.30
Dry-Mesic Inland Mixed Oak Forest	9.39	59.06
Inland Red Maple Swamp	0.24	1.49
Inland Graminoid Marsh	0.06	0.35

TABLE 3.39

INVASIVE PLANTS AT HACKETTSTOWN ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Morrow's bush honeysuckle, Poison ivy, Garlic mustard, Japanese honeysuckle, Asian bittersweet, Multiflora rose, Autumn olive, Porcelain berry, Norway maple, Japanese stiltgrass	9.61	36.53
2	Japanese barberry, Garlic mustard, Poison ivy, Asian bittersweet, Multiflora rose, Japanese stiltgrass	2.26	14.21
3	Japanese stiltgrass	0.05	0.31
4	Crown vetch, Canadian thistle, Garlic mustard	0.22	1.38
5	Japanese barberry, Garlic mustard, Poison ivy, Asian bittersweet, Multiflora rose, Japanese stiltgrass	1.12	7.04
6	Asian bittersweet, Japanese stiltgrass, Multiflora rose, Morrow's bush honeysuckle, Japanese honeysuckle, Tree-of-heaven, Norway maple	0.23	1.45
7	Common reed, Multiflora rose	0.16	1.00
8	Spotted knapweed	0.24	1.51
9	Japanese barberry	0.03	0.19
10	Wineberry	0.03	0.19
11	Porcelain berry	0.01	0.06

TABLE 3.40

PERCENTAGE COVER OF INVASIVE PLANTS

AT HACKETTSTOWN ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry-Mesic Inland Mixed Oak Forest	Japanese barberry	High
	Japanese stiltgrass	High
	Multiflora rose	High
	Japanese honeysuckle	High
	Morrow's bush honeysuckle	High
	Garlic mustard	High
	Porcelain berry	Medium
	Poison ivy	Medium
	Asian bittersweet	Medium
	Tree-of-heaven	Low
	Autumn olive	Low
	Norway maple	Low
	Common reed	Low
	Spotted knapweed	Low
	Wineberry	Low
Planted White Pine Forest	Japanese barberry	High
	Asian bittersweet	High
	Garlic mustard	High
	Japanese stiltgrass	Medium
	Poison ivy	Medium
	Multiflora rose	Medium
Inland Graminoid Marsh	Japanese stiltgrass	Medium
Maintained Grass	Crown vetch	High
	Garlic mustard	Low
	Canadian thistle	Low
	Porcelain berry	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – HACKETTSTOWN ARMORY

Overall Facility Priority: Medium
Infested Area Priorities: 9, 7, 3, 8, 6, 5, 2, 1, 10, 11, and 4
High Priority Species: Morrow's bush honeysuckle, garlic mustard, Japanese honeysuckle, Asian bittersweet, autumn olive, porcelain berry, Norway maple, and Japanese stiltgrass, and Japanese barberry

The Hackettstown Armory has a high infestation of invasive plants that threaten natural areas on the installation. The Inland Graminoid Marsh community is infested with Japanese stiltgrass and should be a high priority for treatment as wetlands provide quality habitat and important ecological functions. The next priority areas for control or eradication of invasive plants should be those areas containing highly invasive plants located in smaller polygons within the Dry-Mesic Inland Mixed Oak Forest and Planted White Pine Forest communities. Focusing treatment on the smaller areas requires fewer resources, there's a greater chance at succeeding in controlling or eradicating the invasive species, and this will prevent the spread of invasive plants throughout the forested areas. Treatment of the entire Dry-Mesic Inland Mixed Oak Forest should occur next with highly invasive species being more critical to contain than moderate or low level invasive species. Infested areas within the Maintained Grass area should be treated as a last priority.



Figure 3-19
Hackettstown Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry-Mesic Inland Mixed Oak Forest
- Inland Graminoid Marsh
- Inland Red Maple Swamp
- Maintained Grass
- Pavement
- Planted White Pine Forest

0 50 100 200 300 400

Feet

Scale:	1:2,000
Created By:	Parsons
File:	20050616_Hackettstown_Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-19
Page Number:	3-53

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Figure 3-20
Hackettstown Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11

See Table 3.39 for list of invasive plants within each polygon

0 50 100 200 300 400 Feet

Scale:	1:2,000
Created By:	Parsons
File:	20050612_Hackettstown_Armory_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-20
Page Number:	3-54

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3.12 HAMMONTON ARMORY

TABLE 3.41

HAMMONTON ARMORY

Hammonton Armory	
Facility Identification Number	34B00
City/Township	Hammonton
County	Atlantic
Facility Acreage	9.21

TABLE 3.42

LAND COVER AND ECOLOGICAL COMMUNITIES

AT HAMMONTON ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.34	3.69
Paved Road/Paved Parking	1.55	16.87
Maintained Grass	2.06	22.43
Mesic Coastal Plain Mixed Oak Forest	3.11	33.82
Coastal Plain Atlantic White Cedar Swamp	2.10	22.83

TABLE 3.43

INVASIVE PLANTS AT HAMMONTON ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Tree-of-heaven	0.02	0.22
2	Japanese honeysuckle, Garlic mustard, Tree-of-heaven, Japanese knotweed, Autumn olive, Common reed	0.92	9.99
3	Tree-of-heaven	0.06	0.65
4	Japanese barberry	0	0
5	Tree-of-heaven	0.26	2.82
6	Porcelain berry, Japanese honeysuckle, Yellow sweetclover	0.02	0.22

TABLE 3.44

PERCENTAGE COVER OF INVASIVE PLANTS AT HAMMONTON ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Mesic Coastal Plain Mixed Oak Forest	Garlic mustard	High
	Japanese honeysuckle	High
	Tree-of-heaven	Medium
	Japanese knotweed	Medium
	Autumn olive	Low
	Common reed	Low
	Japanese barberry	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – HAMMONTON ARMORY

Overall Facility Priority: Low
Infested Area Priorities: 1, 4, 3, 5, 2, and 6
High Priority Species: Common reed, tree-of-heaven, Japanese barberry, Japanese honeysuckle, porcelain berry, and autumn olive

The Hammonton Armory has a relatively low level of infestation; however, some areas of infestation consist of some highly invasive species. Of particular concern is the presence of the highly invasive common reed so close to the Coastal Plain Atlantic White Cedar Swamp. This area should be treated first to prevent spread into the wetland area. Treating this small area will also prevent the spread of other highly invasive species into the forested community by early treatment and eradication of the invasive plants. Smaller areas infested with highly invasive species such as tree-of-heaven, porcelain berry, and Japanese honeysuckle should be treated next to prevent spread into the forest communities at this facility. The larger area of Japanese barberry should be treated after the smaller areas. The invasive plants along the fence should remain mostly confined to the fence area and should be a last priority for treatment.



Figure 3-21
Hammonton Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Coastal Plain Atlantic White Cedar Swamp
- Maintained Grass
- Mesic Coastal Plain Mixed Oak Forest
- Pavement

0 30 60 120 180 240

Feet

Scale:	1:1,250
Created By:	Parsons
File:	20050616_Hammonton_Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-21
Page Number:	3-58

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Figure 3-22

Hammonton Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6

See Table 3.43 for list of invasive plants within each polygon

0 35 70 140 210 280
Feet

Scale:	1:1,500
Created By:	Parsons
File:	20050612_Hammonton_Armory_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-22
Page Number:	3-59

PARSONS

3.13 LAWRENCEVILLE COMPLEX

TABLE 3.45

LAWRENCEVILLE COMPLEX

Lawrenceville Complex	
Facility Identification Number	34B15
City/Township	Lawrenceville
County	Mercer
Facility Acreage	78.14

TABLE 3.46

LAND COVER AND ECOLOGICAL COMMUNITIES

AT LAWRENCEVILLE COMPLEX

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	6.13	7.84
Paved Road/Paved Parking	16.96	21.71
Maintained Grass	27.25	34.90
Dry-Mesic Inland Mixed Oak Forest	27.44	35.14
Marshy Wet Weather Conveyance	0.32	0.41

TABLE 3.47

INVASIVE PLANTS AT LAWRENCEVILLE COMPLEX

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Common mugwort, Multiflora rose, Tree-of-heaven, Black locust, Winged spindletree	0.71	0.91
2	Pachysandra	0.10	0.13
3	Pachysandra	0.13	0.17
4	Pachysandra	0.08	0.10
5	Winged spindletree, Asian bittersweet, Poison ivy, Japanese honeysuckle, Porcelain berry, Garlic mustard, Japanese stiltgrass, Multiflora rose	1.73	2.21
6	Poison ivy	0.10	0.13
7	Asian bittersweet, Multiflora rose, Japanese stiltgrass, Garlic mustard, Japanese honeysuckle	0.71	0.91
8	Japanese stiltgrass, Winged spindletree, Multiflora rose, Garlic mustard, Poison ivy, Japanese honeysuckle	7.82	10.00
9	Garlic mustard	0.09	0.12
10	Norway maple	0.27	0.35
11	English ivy	0.03	0.04
12	Garlic mustard, Multiflora rose, Black locust, Japanese honeysuckle, Poison ivy, Porcelain berry, Asian bittersweet, Canadian thistle	0.32	0.41
13	Japanese honeysuckle, Asian bittersweet, Porcelain berry, Common mugwort	0.23	0.29

TABLE 3.48

PERCENTAGE COVER OF INVASIVE PLANTS AT LAWRENCEVILLE COMPLEX

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Marshy Wet Weather Conveyance	Japanese honeysuckle	High
	Garlic mustard	High
	Multiflora rose	High
	Poison ivy	High
	Porcelain berry	High
	Black locust	Medium
	Asian bittersweet	Medium
	Canadian thistle	Low
Dry-Mesic Inland Mixed Oak Forest	Japanese honeysuckle	Medium
	Multiflora rose	Medium
	Asian bittersweet	Medium
	Winged spindletree	Medium
	Norway maple	Low
	Poison ivy	Low
	Common mugwort	Low
	Pachysandra	Low
	Garlic mustard	Low
	Japanese stiltgrass	Low
	Black locust	Low
	Tree-of-heaven	Low
	Japanese knotweed	Low
	English ivy	Low
	Norway maple	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – LAWRENCEVILLE COMPLEX

Overall Facility Priority: Medium
Infested Area Priorities: 9, 10, 7, 5, 1, 8, 13, 12, 6, 11, 2, 3, and 4
High Priority Species: Japanese stiltgrass, garlic mustard, porcelain berry, Japanese honeysuckle, Asian bittersweet, tree-of-heaven, Japanese knotweed, and Norway maple

The Lawrenceville Complex has a low level of infestation of invasive plants however it has a relatively large undeveloped area that could be degraded if invasive plants spread on the installation. Small areas of infestation containing highly invasive species at a high concentration should be a priority for treatment to prevent further spread into the Dry-Mesic Inland Mixed Oak Forest community. This should be followed by treatment of the largest infested area that contains several highly invasive plants that will be difficult to eradicate including Japanese stiltgrass, garlic mustard, and Japanese honeysuckle, but could be reduced to a maintenance level of control. The Marshy Wet Weather Conveyance and the infested area near the parking lot is of lower priority for treatment because they are small in size and surrounded by Maintained Grass area making the potential for spread to forested areas lower and it is a lower quality habitat. The small areas infested with pachysandra and English ivy, which are typically low spreading invasive plants, should be treated when resources are available as they pose little threat to the natural areas on site.

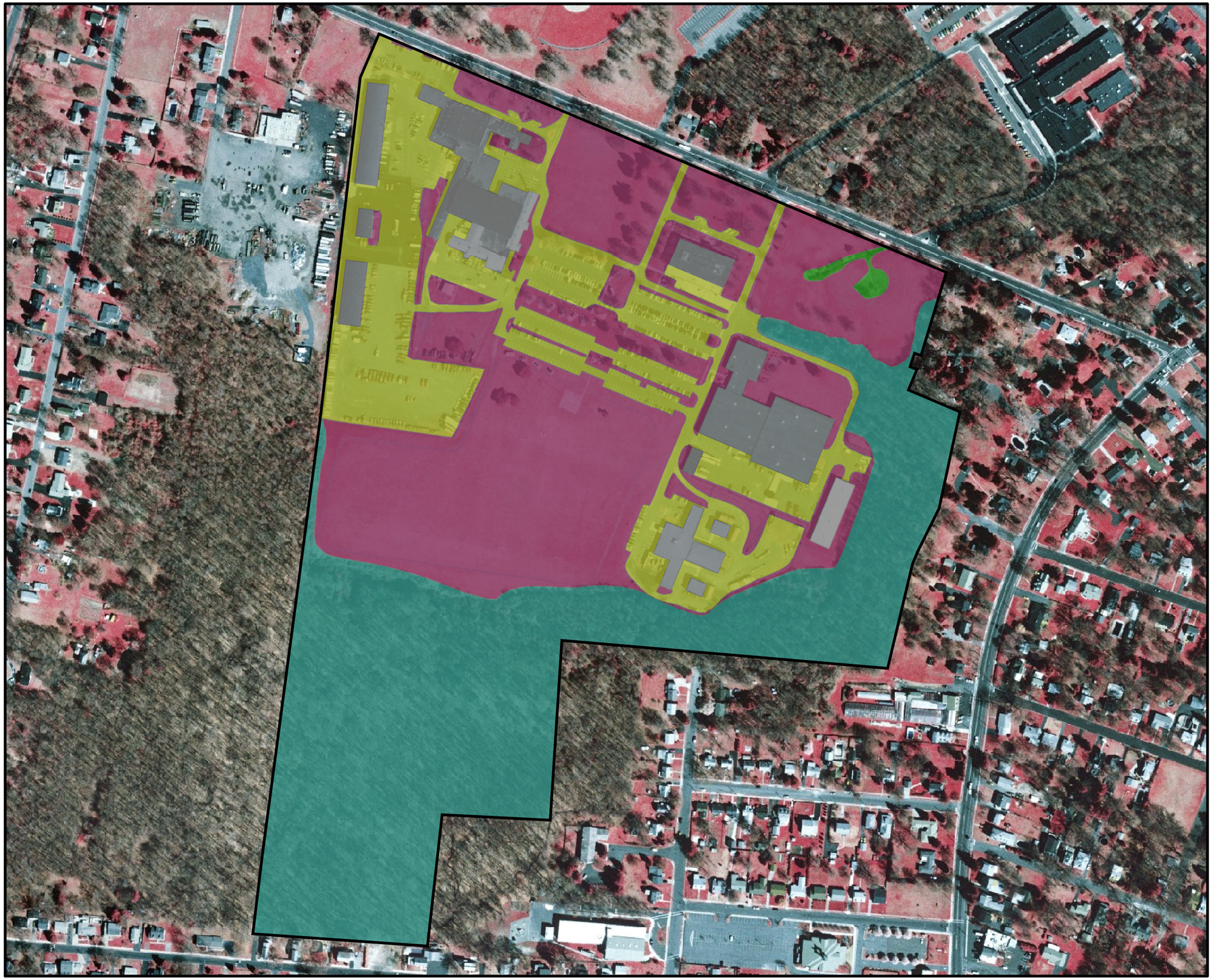

Figure 3-23
Lawrenceville
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry Mesic Inland Mixed Oak Forest
- Maintained Grass
- Marshy Wet Weather Conveyance
- Pavement

0 87.5 175 350 525 700
Feet

Scale:	1:3,700
Created By:	Parsons
File:	20050616_Lawrenceville_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-23
Page Number:	3-64

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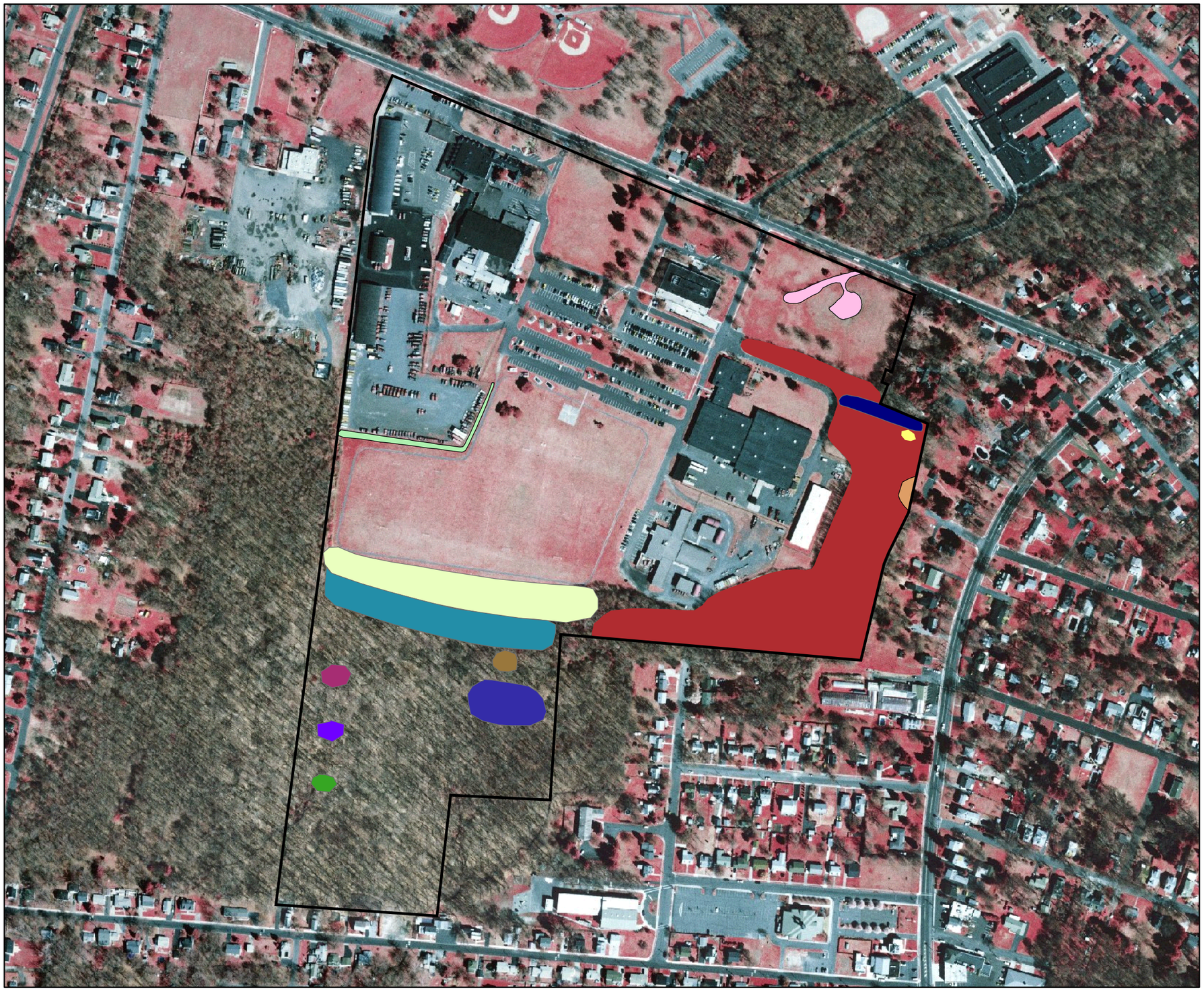

Figure 3-24
Lawrenceville Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11
- Polygon 12
- Polygon 13

See Table 3.47 for list of invasive plants within each polygon

0 110 220 440 660 880
Feet

Scale:	1:4,000
Created By:	Parsons
File:	20050612_Lawrenceville_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-24
Page Number:	3-65

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3.14 MORRISTOWN ARMORY

TABLE 3.49

MORRISTOWN ARMORY

Morristown Armory	
Facility Identification Number	34B40
City/Township	Morristown
County	Morris
Facility Acreage	41.7

TABLE 3.50

LAND COVER AND ECOLOGICAL COMMUNITIES AT MORRISTOWN ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	1.10	2.63
Paved Road/Paved Parking	3.77	9.04
Gravel	5.80	13.91
Maintained Grass	1.53	3.68
Dry-Mesic Inland Mixed Oak Forest	25.48	61.14
Open Field	3.11	7.46
Inland Graminoid Marsh	0.82	1.97

TABLE 3.51

INVASIVE PLANTS AT MORRISTOWN ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Wineberry, Japanese barberry, Black locust	0.59	1.41
2	Poison ivy, Japanese barberry, Wineberry, Multiflora rose, Black locust	0.20	0.48
3	Porcelain berry, Japanese stiltgrass, Japanese barberry, Multiflora rose, Garlic mustard	7.67	18.39
4	Porcelain berry, Multiflora rose, Japanese stiltgrass, Wineberry	0.30	0.72
5	Common mugwort	0.22	2.40
6	Black locust	0.24	2.40
7	Canadian thistle, Japanese stiltgrass, Tree-of-heaven	0.07	0.17
8	Japanese stiltgrass, Tree-of-heaven, Porcelain berry	0.23	0.55
9	Japanese stiltgrass, Poison ivy	0.23	0.55
10	Japanese stiltgrass, Tree-of-heaven, Asian bittersweet, Poison ivy, Japanese knotweed, Japanese honeysuckle	0.32	0.77
11	Black locust, Japanese barberry	0.82	1.97
12	Japanese barberry, Japanese stiltgrass, Norway maple, Garlic mustard	8.49	20.36
13	Pachysandra	1.00	2.40
14	Multiflora rose, Japanese barberry, Japanese stiltgrass	0.29	0.70
15	Japanese barberry, Canadian thistle, Japanese stiltgrass, Autumn olive	0.14	0.34
16	Multiflora rose	0.14	0.34
17	Tree-of-heaven	0.14	0.34
18	Japanese stiltgrass, Japanese barberry, Multiflora rose, Porcelain berry	6.27	15.04
19	Garlic mustard, Wineberry, Norway maple	0.03	0.07
20	Japanese stiltgrass	0.12	0.29
21	Norway maple	0.09	0.22

TABLE 3.52

PERCENTAGE COVER OF INVASIVE PLANTS AT MORRISTOWN ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry-Mesic Inland Mixed Oak Forest	Garlic mustard	High
	Multiflora rose	High
	Japanese stiltgrass	High
	Porcelain berry	Medium
	Japanese barberry	Medium
	Norway maple	Medium
	Pachysandra	Medium
	Tree-of-heaven	Low
	Black locust	Low
	Wineberry	Low
	Poison ivy	Low
Maintained Grass	Japanese stiltgrass	High
	Japanese knotweed	High
	Porcelain berry	Medium
	Poison ivy	Medium
	Asian bittersweet	Medium
	Tree-of-heaven	Low
	Canada thistle	Low
	Japanese honeysuckle	Low
Open Field	Multiflora rose	Medium
	Japanese barberry	Low
	Japanese stiltgrass	Low
	Canadian thistle	Low
	Autumn olive	Low
	Common mugwort	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – MORRISTOWN ARMORY

Overall Facility Priority: Low
Infested Area Priorities: 19, 20, 11, 1, 4, 15, 14, 17, 16, 21, 5, 6, 13, 3, 18, 12, 2, 7, 8, 9, and 10
High Priority Species: Japanese stiltgrass, garlic mustard, Japanese honeysuckle, Norway maple, tree-of-heaven, and Japanese knotweed

The Morristown Armory has a high level of infestation of invasive plants and natural areas are infested with highly invasive and disruptive species. The three largest infested areas covered much of the Dry-Mesic Inland Mixed Oak Forest community and contained several highly invasive plants. Being large areas, controlling or removing the invasive plants will require a considerable amount of resources. However, controlling the invasive plants present in the smaller infested areas within the forest will require less effort. Many of these smaller infested areas contain similar highly invasive plants that could rapidly spread throughout the forest if not controlled or removed and should be the highest priority for treatment. The Open Field community contained only two small infested areas that contained highly invasive plant species. Control or removal of the invasive plants present in the Open Field community should prevent or reduce their spread into the forest community that is adjacent. Maintained Grass or developed areas provide poor quality habitat for wildlife and have low ecological value. Small infestations of low level invasive species such as black locust and pachysandra do not threaten natural areas because of their low rate of spread. Removal of invasive plants from Maintained Grass areas and those species that are not highly invasive is less critical.



Figure 3-25
Morristown Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry-Mesic Inland Mixed Oak Forest
- Gravel
- Inland Graminoid Marsh
- Maintained Grass
- Open Field
- Pavement

0 62.5 125 250 375 500

Feet

Scale:	1:2,700
Created By:	Parsons
File:	20050616_Morristown_Armory_OMS_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-25
Page Number:	3-70

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Figure 3-26
Morristown Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11
- Polygon 12
- Polygon 13
- Polygon 14
- Polygon 15
- Polygon 16
- Polygon 17
- Polygon 18
- Polygon 19
- Polygon 20
- Polygon 21

See Table 3.51 for list of invasive plants within each polygon

0 62.5 125 250 375 500 Feet

Scale:	1:2,700
Created By:	Parsons
File:	20050612_Morristown_Armory_OMS_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-26
Page Number:	3-71

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3.15 NEWTON ARMORY

TABLE 3.53

NEWTON ARMORY

Newton Armory	
Facility Identification Number	34B90
City/Township	Newton
County	Sussex
Facility Acreage	5.97

TABLE 3.54

LAND COVER AND ECOLOGICAL COMMUNITIES AT NEWTON ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.45	7.54
Paved Road/Paved Parking	0.81	13.50
Gravel	0.16	2.68
Maintained Grass	1.75	29.26
Scrub Shrub	1.45	24.21
Inland Graminoid Marsh	1.36	22.78

TABLE 3.55

INVASIVE PLANTS AT NEWTON ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Purple loosestrife, Reed canarygrass, Teasel, Japanese stiltgrass, Canadian thistle, Multiflora rose, Autumn olive, Poison ivy	1.37	22.95
2	Poison ivy, Autumn olive, Multiflora rose, Morrow's bush honeysuckle, Asian bittersweet, Canadian thistle	0.06	1.00
3	Teasel	0.01	0.10
4	Multiflora rose, Teasel, Poison ivy, Canadian thistle, Asian bittersweet, Spotted knapweed, Autumn olive	0.07	1.17
5	Multiflora rose, Teasel, Poison ivy, Canadian thistle, Asian bittersweet, Spotted knapweed, Autumn olive	0.94	15.75
6	Morrow's bush honeysuckle, Autumn olive, Multiflora rose, Asian bittersweet	0.48	8.04
7	Morrow's bush honeysuckle, Autumn olive, Multiflora rose, Spotted knapweed, Garlic mustard	0.04	0.67

TABLE 3.56

PERCENTAGE COVER OF INVASIVE PLANTS AT NEWTON ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Scrub Shrub	Asian bittersweet	High
	Japanese honeysuckle	High
	Multiflora rose	High
	Autumn olive	High
	Poison ivy	Low
	Teasel	Low
	Canadian thistle	Low
	Spotted knapweed	Low
	Garlic mustard	Low
Inland Graminoid Marsh	Teasel	High
	Purple loosestrife	High
	Reed canarygrass	High
	Canadian thistle	Medium
	Autumn olive	Low
	Japanese stiltgrass	Low
	Multiflora rose	Low
	Poison ivy	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – NEWTON ARMORY

Overall Facility Priority: Medium
Infested Area Priorities: 1, 6, 5, 2, 4, 3, and 7
High Priority Species: Purple loosestrife, Japanese honeysuckle, reed canary grass, Asian bittersweet, and Canadian thistle

The Newton Armory is a small installation however nearly 50% of the facility is infested with invasive plants including the wetland area. The wetland habitat has highly invasive species present including purple loosestrife, reed canarygrass, Japanese stiltgrass, and autumn olive. This community should be prioritized for the invasive plant removal efforts. Purple loosestrife is of particular concern due to its highly invasive nature and its ability to disperse seeds through water both within and outside of the facility boundaries. Reducing the number of invasive plants present in this community will greatly improve the quality of this marsh. The second priority for invasive plant treatment should be the removal and control of invasive plants in the areas bordering the marsh. Without the control or removal of surrounding invasive plants these plants will continue to spread into the marsh. Maintained Grass areas, due to their developed nature, have a lower priority for treatment. Maintained Grass areas offer poor wildlife habitat and have low ecological value relative to a forest or wetland community.



Figure 3-27
Newton Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Gravel
- Inland Graminoid Marsh
- Maintained Grass
- Pavement
- Scrub Shrub

0 25 50 100 150 200
Feet

Scale:	1:1,000
Created By:	Parsons
File:	20050616_Newton_Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-27
Page Number:	3-76

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Figure 3-28
Newton Armory Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7

See Table 3.55 for list of invasive plants within each polygon

0 25 50 100 150 200 Feet

Scale:	1:1,000
Created By:	Parsons
File:	20050612_Newton_Armory_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-28
Page Number:	3-77

PARSONS

3.16 PICATINNY ARSENAL

TABLE 3.57

PICATINNY ARSENAL

Picatinny Arsenal	
Facility Identification Number	34A55
City/Township	Picatinny Arsenal
County	Morris
Facility Acreage	28.48

TABLE 3.58

LAND COVER AND ECOLOGICAL COMMUNITIES

AT PICATINNY ARSENAL

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.44	1.54
Paved Road/Paved Parking	9.05	31.79
Maintained Grass	7.31	25.67
Dry-Mesic Inland Mixed Oak Forest	2.55	8.94
Scrub Shrub	9.09	31.94

TABLE 3.59

INVASIVE PLANTS AT PICATINNY ARSENAL

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Autumn olive, Multiflora rose, Poison ivy, Spotted knapweed, Reed canarygrass	7.14	2.51
2	Japanese knotweed	0.05	0.18
3	Autumn olive	0.27	0.95
4	Spotted knapweed	0.01	0.04
5	Poison ivy	0.02	0.07
6	Canadian thistle	0.02	0.07
7	Japanese knotweed, Asian bittersweet, Multiflora rose, Japanese barberry, Japanese stiltgrass	0.07	0.25
8	Autumn olive	0.05	0.18
9	Spotted knapweed, Autumn olive, Japanese knotweed, Multiflora rose, Common reed, Poison ivy	1.40	4.92
10	Canadian thistle, Asian bittersweet	0.09	0.32
11	Poison ivy, Asian bittersweet, Multiflora rose	0.10	0.35

TABLE 3.60

PERCENTAGE COVER OF INVASIVE PLANTS AT PICATINNY ARSENAL

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Scrub Shrub	Autumn olive	High
	Spotted knapweed	Medium
	Multiflora rose	Medium
	Japanese knotweed	Medium
	Poison ivy	Low
	Common reed	Low
	Asian bittersweet	Low
	Canadian thistle	Low
Maintained Grass	Spotted knapweed	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – PICATINNY ARSENAL

Overall Facility Priority: Low
Infested Area Priorities: 2, 10, 11, 9, 1, 5, 6, 7, 8, 4, 3, and 5
High Priority Species: Japanese knotweed, autumn olive, and spotted knapweed

The Picatinny Arsenal has a medium level of infestation of invasive plants. The Scrub Shrub community is quite dense and much of it consists of autumn olive, which is present at high levels of percentage cover. The remaining areas are much smaller in size. These areas will require less effort to control or remove the invasive plants present; however, they are also relatively contained along fences or in mowed areas. The Scrub Shrub community provides better wildlife habitat and is a vegetative community that could support a greater diversity of plants than mowed areas. It is therefore recommended that the greatest efforts be focused on removing and controlling invasive plants from the Scrub Shrub community.



Figure 3-29
Picatinny Arsenal
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Buildings
- Dry Mesic Inland Mixed Oak Forest
- Maintained Grass
- Pavement
- Scrub Shrub

0 50 100 200 300 400
Feet

Scale:	1:2,100
Created By:	Parsons
File:	20050615_Picatinny_Arsenal_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-29
Page Number:	3-81

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Figure 3-30
Picatinny Arsenal
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11

See Table 3.59 for list of invasive plants within each polygon

0 45 90 180 270 360
Feet

Scale:	1:2,100
Created By:	Parsons
File:	20050612_Dover_Picatinny_Arsenal_OMS_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-30
Page Number:	3-82

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3.17 PRINCETON WAREHOUSE

TABLE 3.61

PRINCETON WAREHOUSE

Princeton Warehouse	
Facility Identification Number	TG
City/Township	Princeton
County	Mercer
Facility Acreage	8.21

TABLE 3.62

LAND COVER AND ECOLOGICAL COMMUNITIES

AT PRINCETON WAREHOUSE

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.18	2.18
Paved Road/Paved Parking	0.80	9.70
Maintained Grass	1.15	13.99
Dry Oak-Pine Forest	1.46	17.76
Dry-Mesic Inland Mixed Oak Forest	4.61	56.20

TABLE 3.63

INVASIVE PLANTS AT PRINCETON WAREHOUSE

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Multiflora rose, Wineberry, Japanese stiltgrass, Japanese honeysuckle, Garlic mustard, Autumn olive, Japanese barberry, Porcelain berry, Common buckthorn, Poison ivy, Asian bittersweet	4.6	56.03
2	Japanese stiltgrass	0.21	2.56
3	Poison ivy, Wineberry, Japanese honeysuckle, Multiflora rose, Garlic mustard, Japanese stiltgrass	1.45	17.66
4	Canadian thistle, Morrow's bush honeysuckle, Multiflora rose, Wineberry, Japanese honeysuckle, Tree-of-heaven	0.09	1.10

TABLE 3.64

PERCENTAGE COVER OF INVASIVE PLANTS

AT PRINCETON WAREHOUSE

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry-Mesic Inland Mixed Oak Forest	Poison ivy	High
	Multiflora rose	High
	Japanese honeysuckle	Medium
	Japanese stiltgrass	Medium
	Garlic mustard	Medium
	Autumn olive	Medium
	Common buckthorn	Medium
	Wineberry	Medium
	Japanese barberry	Low
	Porcelain berry	Low
	Asian bittersweet	Low
Dry Oak-Pine Forest	Multiflora rose	High
	Poison ivy	High
	Japanese honeysuckle	Medium
	Wineberry	Medium
	Garlic mustard	Low
	Japanese stiltgrass	Low
	Canadian thistle	Low
	Morrow's bush honeysuckle	Low
	Tree-of-heaven	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – PRINCETON WAREHOUSE

Overall Facility Priority: Low
Infested Area Priorities: 4, 2, 3, and 1
High Priority Species: Japanese stiltgrass, garlic mustard, Japanese honeysuckle, Morrow's bush honeysuckle, tree-of-heaven, Japanese barberry, and autumn olive

The Princeton Warehouse is a small installation with a high level of infestation of invasive plants. Highly invasive plant species at this site are degrading habitat within the forest communities. It is recommended that the smaller areas of infestation be treated first to eradicate or control the highly invasive plants and prevent their spread further into the forested community. The larger areas of infestation will require more resources to treat and control and therefore should be a lower priority. Removing the invasive plants from this community will require considerable resources, while removing the small area of concentrated Japanese stiltgrass within this community will require a less intensive effort. This will reduce the spread of this plant within this forest community.



Figure 3-31
Princeton Warehouse
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry Oak-Pine Forest
- Dry-Mesic Inland Mixed Oak Forest
- Maintained Grass
- Pavement

0 25 50 100 150 200
Feet

Scale:	1:1,000
Created By:	Parsons
File:	20050616_Princeton_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-31
Page Number:	3-87

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Figure 3-32
Princeton Warehouse
Invasive Plant

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4

See Table 3.63 for list of invasive plants within each polygon

0 200 400 Feet

Scale:	1:1,000
Created By:	Parsons
File:	20050612_Princeton_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-32
Page Number:	3-88

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3.18 SEA GIRT NGTC

TABLE 3.65

SEA GIRT NGTC

Sea Girt National Guard Training Center	
Facility Identification Number	34B90
City/Township	Sea Girt
County	Monmouth
Facility Acreage	171

TABLE 3.66

LAND COVER AND ECOLOGICAL COMMUNITIES AT SEA GIRT NGTC

Land Cover and Ecological Communities	Acres	Percent of Installation
Coastal Dune Grass Community	1.5	0.9
Coastal Dune Shrubland	3.2	1.8
Deciduous Scrub/Shrub Wetland	0.7	0.4
Hedgerow	2.2	1.3
Managed Scrub Wetland	1.4	0.8
Intertidal Unconsolidated Shore	12.1	7.1
Successional Dune	3.3	1.9
Salt Marsh	0.1	0.05
Maintained Grass	110.8	64.8
Pavement	22.5	13.2
Bare Ground	6.7	3.9

TABLE 3.67

INVASIVE PLANTS AT SEA GIRT NGTC

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Common reed	1.02	0.60
2	English plantain	0.01	0.01
3	Japanese honeysuckle	0.11	0.06
4	Japanese knotweed	0.12	0.07
5	Norway maple	0.06	0.04
6	Asian bittersweet	0.04	0.02
7	Purple loosestrife	0.01	0.01
8	Poison ivy	3.4	1.99

TABLE 3.68

PERCENTAGE COVER OF INVASIVE PLANTS AT SEA GIRT NGTC

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Coastal Dune Grass Community	Poison ivy	High
	English plantain	Low
Coastal Dune Shrubland	Poison ivy	Medium
	Japanese knotweed	Low
Deciduous Scrub/Shrub Wetland	Common reed	High
Hedgerow	Japanese honeysuckle	Low
Successional Dune	Poison ivy	High
	Common reed	Medium
Maintained Grass	Norway maple	Low
	Asian bittersweet	Low
	Common reed	Low
Bare ground	Common reed	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – SEA GIRT NGTC

Overall Facility Priority: High
Infested Area Priorities: 1, 7, 8, 4, 6, 3, 5, and 2
High Priority Species: Common reed, purple loosestrife, Japanese knotweed, Asian bittersweet, and Norway maple

Sea Girt NGTC has a low level of invasive plant infestation. This installation however provides for on-site outdoor field training and important natural areas, which are infested or threatened by invasive plants. Two areas are of highest priority for treatment on the installation, the Managed Shrub Wetland area in the southeastern portion of the installation and the small arms range berms and adjacent back dune areas along the eastern boundary. These areas are valuable in providing or protecting habitat of rare species such as the federally listed sea beach amaranth (*Amaranthus pumilus*) and piping plover (*Charadius melodus*).

Treatment of common reed and the small infestation of purple loosestrife near or in the wetland will improve wetland habitat and function. The treatment of invasive plants in the area around the small arms ranges and the back dune area will reduce impacts to the mission and proximity to rare species habitat. Invasive plants in this area include Japanese knotweed and common reed. Poison ivy is also prolific in this area. While poison ivy is a native plant, it can display invasive characteristics and its toxin causes an irritating skin reaction on many people. While poison ivy is a nuisance to people, it also has ecological value. Besides providing habitat and food for wildlife, the dense root system of poison ivy also helps to control dune erosion at Sea Girt NGTC. For this reason, control of poison ivy will be limited to areas on and around the small arms range berms and the lower back dunes but maintained on the upper back dunes to retain its wildlife and erosion control benefits. After removal of invasive plants in the dunes area, restoration of native plant species will be conducted in accordance with guidance provided through consultation with the U. S. Fish and Wildlife Service and New Jersey Endangered and Nongame Species Program. Possible coastal species for dune planting include American beachgrass (*Ammophila breviligulata*), coastal panicgrass (*Panicum lanuginosum*), bayberry (*Myrica pennsylvanica*), beach plum (*Prunus maritima*), and shore juniper (*Juniperus conferta*). Shrub species are most appropriate for the back dune areas.

Other infestations of common reed on the installation are less of a priority for treatment. Common reed found along the drainage area along the southeast portion of the property will not be conducted as a part of this plan but rather will be eradicated during efforts to clear the ditch. Similarly, common reed associated with the wetland that runs along the southern boundary of the property will be eradicated when the wooden bulkhead in the area is repaired.

The smaller infestations of highly invasive species such as Japanese honeysuckle, Asian bittersweet, and Norway maple should take place when resources are available as they are found along roadways and in maintained areas of the installation.



Figure 3-33
Sea Girt NGTC
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Bare Ground
- Building
- Coastal Dune Grass
- Coastal Dune Shrubland
- Deciduous Scrub/Shrub Wetland
- Hedgerow
- Intertidal Unconsolidated Shore
- Maintained Grass
- Managed Shrub Wetland
- Pavement
- Salt Marsh
- Successional Dune
- Lake

0 120 240 480 720 960
Feet

Scale:	1:5,700
Created By:	Parsons
File:	20050615_Sea_Girt_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-33
Page Number:	3-93

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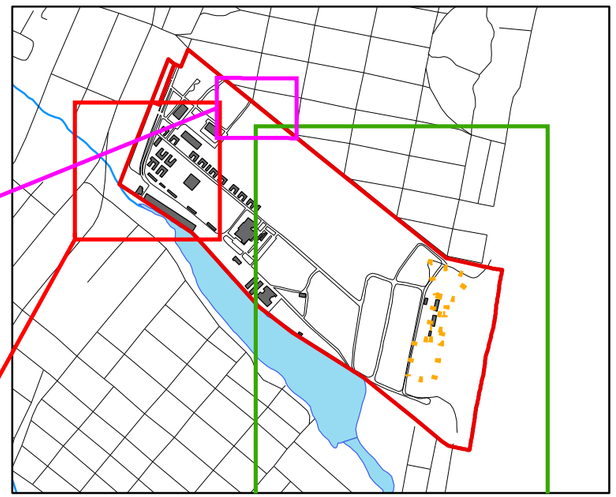

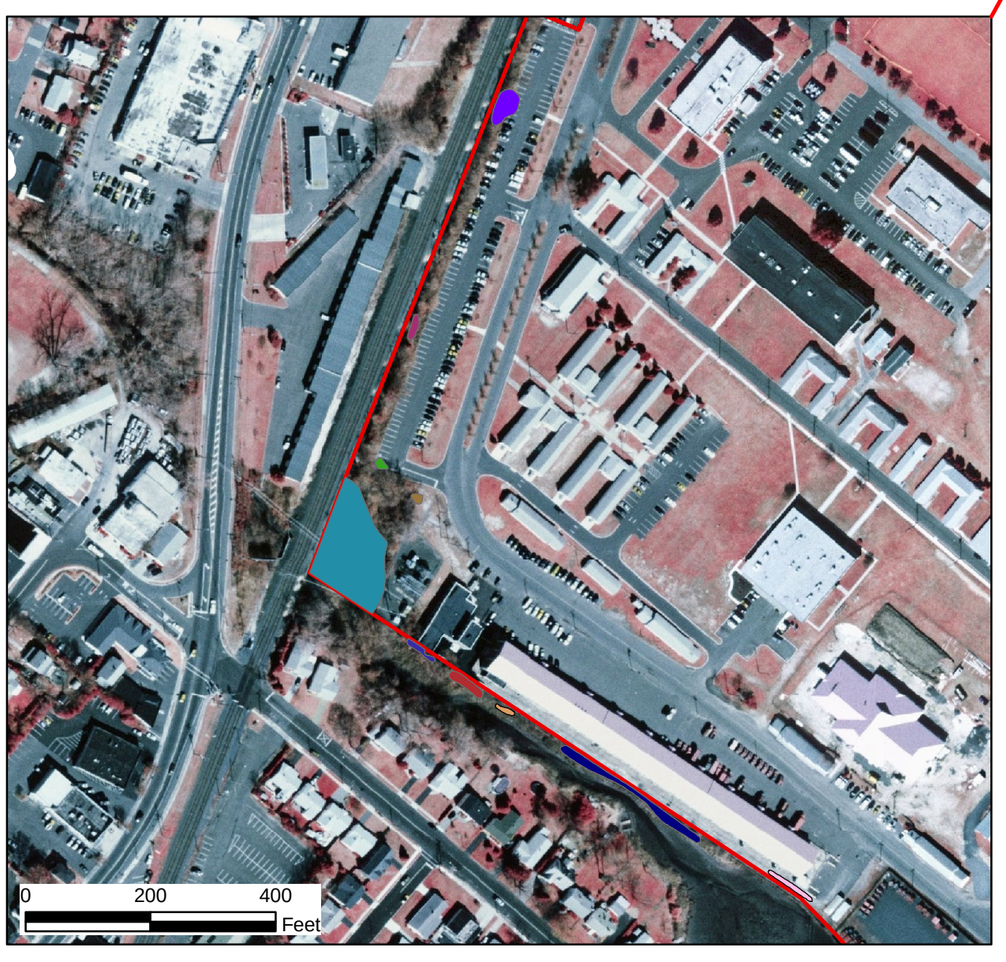



Figure 3-34
Sea Girt NGTC Invasive Plants

New Jersey Army National Guard

Legend

- Sea Girt Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11
- Polygon 12
- Polygon 13
- Polygon 14
- Polygon 15
- Polygon 16
- Polygon 17
- Polygon 18
- Polygon 19
- Polygon 20
- Polygon 21

See Table 3.67 for list of invasive plants within each polygon

Scale:	1:2,902
Created By:	Parsons
File:	Sea_Girt_INRMP_Invasive_20040930.mxd
Date:	12/5/05
Figure Number:	3-34
Page Number:	3-94

PARSONS

3.19 SOMERSET ARMORY

TABLE 3.69

SOMERSET ARMORY

Somerset Armory	
Facility Identification Number	34B98
City/Township	Somerset
County	Somerset
Facility Acreage	18.06

TABLE 3.70

LAND COVER AND ECOLOGICAL COMMUNITIES

AT SOMERSET ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.87	4.79
Paved Road/Paved Parking	4.86	26.91
Maintained Grass	5.04	27.93
Dry-Mesic Inland Mixed Oak Forest	7.27	40.26

TABLE 3.71

INVASIVE PLANTS AT SOMERSET ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Black locust, Poison ivy	0	0
2	Black locust	0.10	0.55
3	Black locust, Japanese honeysuckle, Multiflora rose, Poison ivy	0	0
4	Garlic mustard, Multiflora rose, Poison ivy, Japanese honeysuckle	1.84	10.19
5	Tree-of-heaven, Garlic mustard, Multiflora rose, Poison ivy, Black locust	1.35	7.48
6	Poison ivy, Multiflora rose, Japanese honeysuckle	2.55	14.12

TABLE 3.72

PERCENTAGE COVER OF INVASIVE PLANTS AT SOMERSET ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry-Mesic Inland Mixed Oak Forest	Multiflora rose	High
	Garlic mustard	High
	Poison ivy	Medium
	Japanese honeysuckle	Medium
	Black locust	Low
	Tree-of-heaven	Low
Maintained Grass	Spotted knapweed	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – SOMERSET ARMORY

Overall Facility Priority: Medium
Infested Area Priorities: 3, 5, 4, 6, 1, and 2
High Priority Species: Japanese honeysuckle, garlic mustard, and tree-of heaven

The Somerset Armory has a medium level of infestation of invasive plants. Efforts should focus on the removal of invasive plants observed within the forested community by treating the smaller areas of infestation first because those have a higher likelihood of being controlled or eradicated most successfully and this will prevent spread into the forested area. Then areas of larger infestation with highly invasive plants present in the forested area should be treated. Removal or control of these and other invasive plants within the forest community will protect the existing forest diversity. Those smaller areas with species that are less aggressive such as black locust should be of lowest priority for treatment.



Figure 3-35
Somerset Armory OMS
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry Mesic Inland Mixed Oak Forest
- Maintained Grass
- Pavement

0 37.5 75 150 225 300

Feet

Scale:	1:1,600
Created By:	Parsons
File:	20050616_Somerset_ Armory_OMS_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-35
Page Number:	3-98

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Figure 3-36
Somerset Armory OMS
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6

See Table 3.71 for list of invasive plants within each polygon

0 45 90 180 270 360
Feet

Scale:	1:1,900
Created By:	Parsons
File:	20050612_Somerset_Armory_OMS_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-36
Page Number:	3-99

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3.20 TOMS RIVER ARMORY/OMS

TABLE 3.73

TOMS RIVER ARMORY/OMS

Toms River Armory/OMS	
Facility Identification Number	34C10
City/Township	Toms River
County	Ocean
Facility Acreage	30.21

TABLE 3.74

LAND COVER AND ECOLOGICAL COMMUNITIES

AT TOMS RIVER ARMORY/OMS

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.77	2.55
Paved Road/Paved Parking	2.10	6.94
Maintained Grass	1.20	3.98
Bare Ground	1.95	6.44
Dry Oak-Pine Forest	14.42	47.74
Scrub Shrub	0.95	3.13
Open Field	2.07	6.85
Coastal Plain Atlantic White Cedar Swamp	0.15	0.51
Red Maple Swamp	5.92	19.59
Successional Marsh	0.68	2.25

TABLE 3.75

INVASIVE PLANTS AT TOMS RIVER ARMORY/OMS

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Common reed	0.01	0.03
2	Common reed	0.01	0.03
3	Canadian thistle	0.01	0.03
4	Spotted knapweed	0.09	0.30
5	Spotted knapweed	1.92	6.36

TABLE 3.76

PERCENTAGE COVER OF INVASIVE PLANTS

AT TOMS RIVER ARMORY/OMS

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Open Field	Spotted knapweed	Medium
	Canadian thistle	Low
Coastal Plain Atlantic White Cedar Swamp	Common reed	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – TOMS RIVER ARMORY/OMS

Overall Facility Priority: High
Infested Area Priorities: 1, 2, 3, 4, and 5
High Priority Species: Common reed, Canadian thistle, and spotted knapweed

The Toms River Armory/OMS has a low level of infestation of invasive plants; however some higher quality natural areas are threatened by potential invasion of highly invasive plant species and prevention of spread to the relatively large undeveloped area at the installation should be a priority. Three small infested areas were found in and next to the Coastal Plain Atlantic White Cedar Swamp, two are composed of common reed and one is composed of Canadian thistle. These areas should be of highest priority for treatment to reduce spread into this valued community and control or eradication should be successful as the areas are small. The infestations of spotted knapweed should be controlled next as it is a highly invasive species and can spread into forested areas on the installation and adjacent areas.

Figure 3-37
Toms River Armory/OMS
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Bare Ground
- Building
- Coastal Plain Atlantic White Cedar Swamp
- Dry Oak-Pine Forest
- Maintained Grass
- Open Field
- Pavement
- Red Maple Swamp
- Scrub Shrub
- Successional Marsh

0 60 120 240 360 480

Feet

Scale:	1:2,400
Created By:	Parsons
File:	20050616_Toms_River_ Armory_OMS24_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-37
Page Number:	3-103

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Figure 3-38
Toms River Armory/OMS
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5

See Table 3.75 for list of invasive plants within each polygon

0 55 110 220 330 440
Feet

Scale:	1:2,500
Created By:	Parsons
File:	20050612_Toms_River_Armory_OMS24_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-38
Page Number:	3-104

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3.21 TUCKERTON ARMORY

TABLE 3.77

TUCKERTON ARMORY

Tuckerton Armory	
Facility Identification Number	34C20
City/Township	Tuckerton
County	Ocean
Facility Acreage	16

TABLE 3.78

LAND COVER AND ECOLOGICAL COMMUNITIES AT TUCKERTON ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.31	1.94
Paved Road/Paved Parking	1.01	6.31
Maintained Grass	0.92	5.72
Bare Ground	0.50	3.13
Dry Oak-Pine Forest	6.17	38.38
Dry Pine-Oak Forest	6.83	42.50
Open Field	0.33	2.03

TABLE 3.79

INVASIVE PLANTS AT TUCKERTON ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Tree-of-heaven, Garlic mustard, Japanese stiltgrass, Poison ivy, Porcelain berry, Common periwinkle	0.11	0.69
2	Porcelain berry	0.02	0.13

TABLE 3.80

PERCENTAGE COVER OF INVASIVE PLANTS AT TUCKERTON ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry Pine-Oak Forest	Garlic mustard	Medium
	Japanese stiltgrass	Medium
	Tree-of-heaven	Medium
	Poison ivy	Low
	Porcelain berry	Low
	Common periwinkle	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – TUCKERTON ARMORY

Overall Facility Priority: Low
Infested Area Priorities: 2, 1
High Priority Species: Tree-of-heaven, garlic mustard, and Japanese stiltgrass, and porcelain berry

The Tuckerton Armory has a very low level of infestation of invasive plants and should be easy to treat. The small infested area of porcelain berry will also be easily removed considering its small size and should be the first priority for treatment. Eradicating this infestation before it becomes more established will prevent rapid expansion into the rest of the forest. The infested area located along the northern property boundary should be treated after the smaller area because of its larger size.

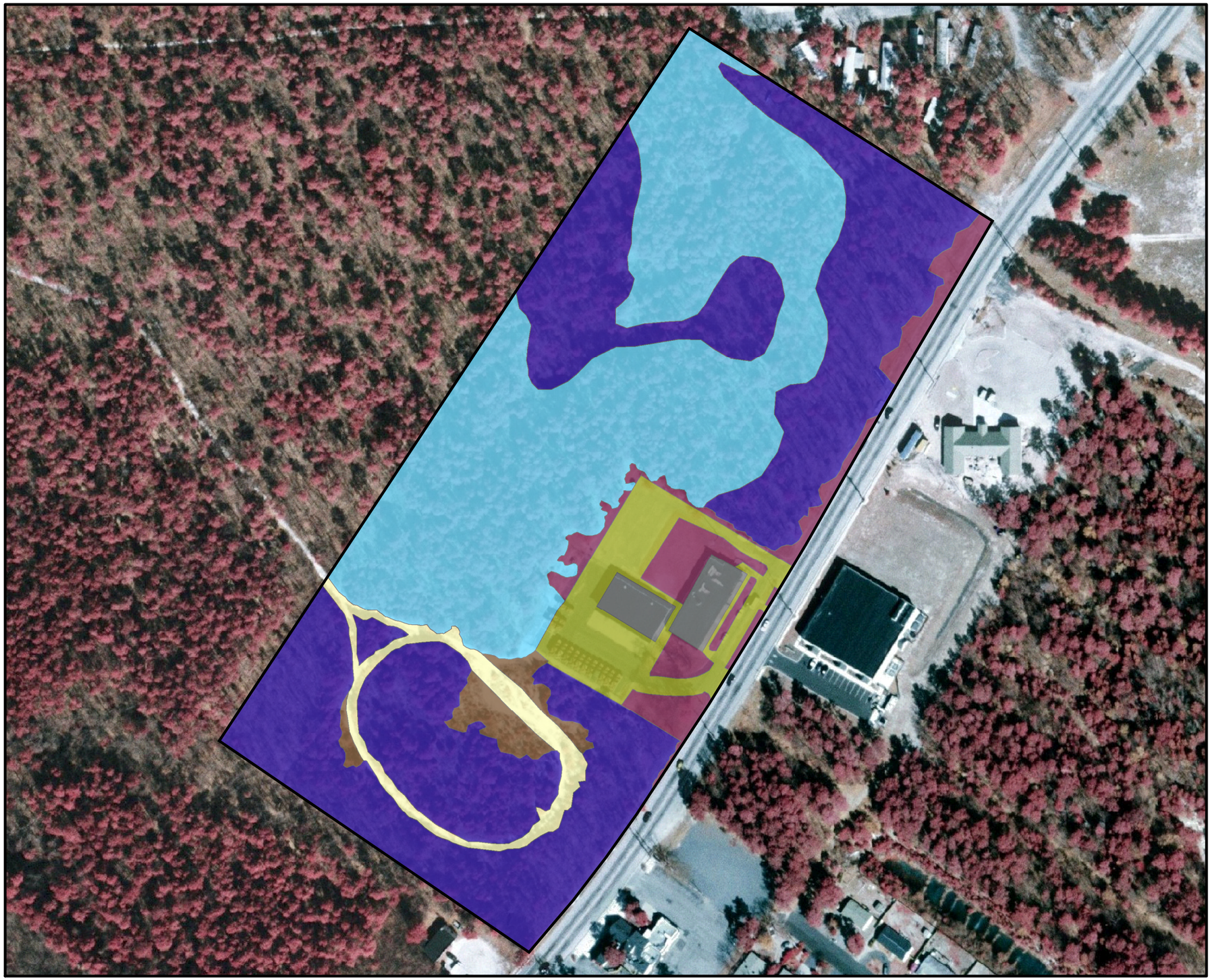

Figure 3-39
Tuckerton Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Bare Ground
- Building
- Dry Pine-Oak Forest
- Dry Oak-Pine Forest
- Maintained Grass
- Open Field
- Pavement

0 40 80 160 240 320
Feet

Scale:	1:1,800
Created By:	Parsons
File:	20050616_Tuckerton_ Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-39
Page Number:	3-108

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Figure 3-40
Tuckerton Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2

See Table 3.79 for list of invasive plants within each polygon

0 200 400
Feet

Scale:	1:2,000
Created By:	Parsons
File:	20050612_Tuckerton_Armory_OMS24_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-40
Page Number:	3-109

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3.22 VINELAND ARMORY/OMS

TABLE 3.81

VINELAND ARMORY/OMS

Vineland Armory/OMS	
Facility Identification Number	34C25
City/Township	Vineland
County	Cumberland
Facility Acreage	46

TABLE 3.82

LAND COVER AND ECOLOGICAL COMMUNITIES

AT VINELAND ARMORY/OMS

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	0.62	1.34
Paved Road/Paved Parking	2.20	4.76
Maintained Grass	4.73	10.24
Bare Ground	6.92	14.99
Mesic Coastal Plain Mixed Oak Forest	4.44	9.62
Dry Oak-Pine Forest	8.44	18.30
Dry Pine-Oak Forest	10.54	22.83
Dry Pine-Oak Successional Forest	4.18	9.06
Forested Depressional Wetland	0.05	0.12

TABLE 3.83

INVASIVE PLANTS AT VINELAND ARMORY/OMS

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Poison ivy	4.10	8.91
2	Tree-of-heaven, Japanese honeysuckle, Multiflora rose	0.11	0.24
3	Porcelain berry	0.08	0.17
4	Japanese honeysuckle	0.05	0.11
5	Spotted knapweed	0.07	0.15
6	Japanese honeysuckle, Multiflora rose	0.02	0.04
7	Japanese honeysuckle, Multiflora rose	0.07	0.15
8	Japanese honeysuckle, Multiflora rose	0.06	0.13
9	Porcelain berry	0	0
10	Japanese honeysuckle, Black locust, Spotted knapweed, Morrow's bush honeysuckle, Autumn olive, Tree-of-heaven	1.63	3.54
11	Canadian thistle, Japanese honeysuckle, Multiflora rose, Black locust	0.50	1.09
12	Multiflora rose, Spotted knapweed, Chinese bush-clover	0.04	0.09

TABLE 3.84

PERCENTAGE COVER OF INVASIVE PLANTS

AT VINELAND ARMORY/OMS

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry Pine-Oak Successional Forest	Japanese honeysuckle	High
	Black locust	Medium
	Spotted knapweed	Medium
	Morrow's bush honeysuckle	Low
	Canadian thistle	Low
	Autumn olive	Low
	Tree-of-heaven	Low
Dry Pine-Oak Forest	Japanese honeysuckle	Medium
	Multiflora rose	Low
	Porcelain berry	Low
Bare Ground	Chinese bush-clover	Medium
	Spotted knapweed	Low
	Multiflora rose	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – VINELAND ARMORY/OMS

Overall Facility Priority: Medium
Infested Area Priorities: 1, 9, 12, 6, 5, 3, 4, 7, 8, 2, 11, and 10
High Priority Species: Poison ivy, porcelain berry, Japanese honeysuckle, spotted knapweed, and Morrow's bush honeysuckle, Canadian thistle, and autumn olive

The Vineland Armory/OMS has a low level of infestation of invasive plants. This facility offers on-site outdoor field training operations that may be affected by the presence of some invasive species and therefore it is a higher priority for treatment. If any training activities occur in the forested area in the northeast portion of the facility, the poison ivy within this area should be a high priority for treatment to protect NJARNG personnel. If training activities do not occur here, then the area containing poison ivy should be addressed last if resources allow. The smaller areas infested with highly invasive plant species within the forested community should be treated next to prevent the further spread of these species into the forest community. This should be followed by treatment of the two larger infested areas within the forested community to reduce the infestation in these areas to a maintainable level and prevent further spread.

Figure 3-41
Vineland Armory/OMS
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Bare Ground
- Building
- Dry Pine Oak Forest
- Fry Oak-Pine Forest
- Fry Oak-Pine Successional Forest
- Forested Depressional Wetland
- Maintained Grass
- Mesic Coastal Plain Mixed Oak Forest
- Pavement

0 62.5 125 250 375 500
Feet

Scale:	1:2,200
Created By:	Parsons
File:	20050616_Vineland_ Armory_OMS23_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-41
Page Number:	3-114

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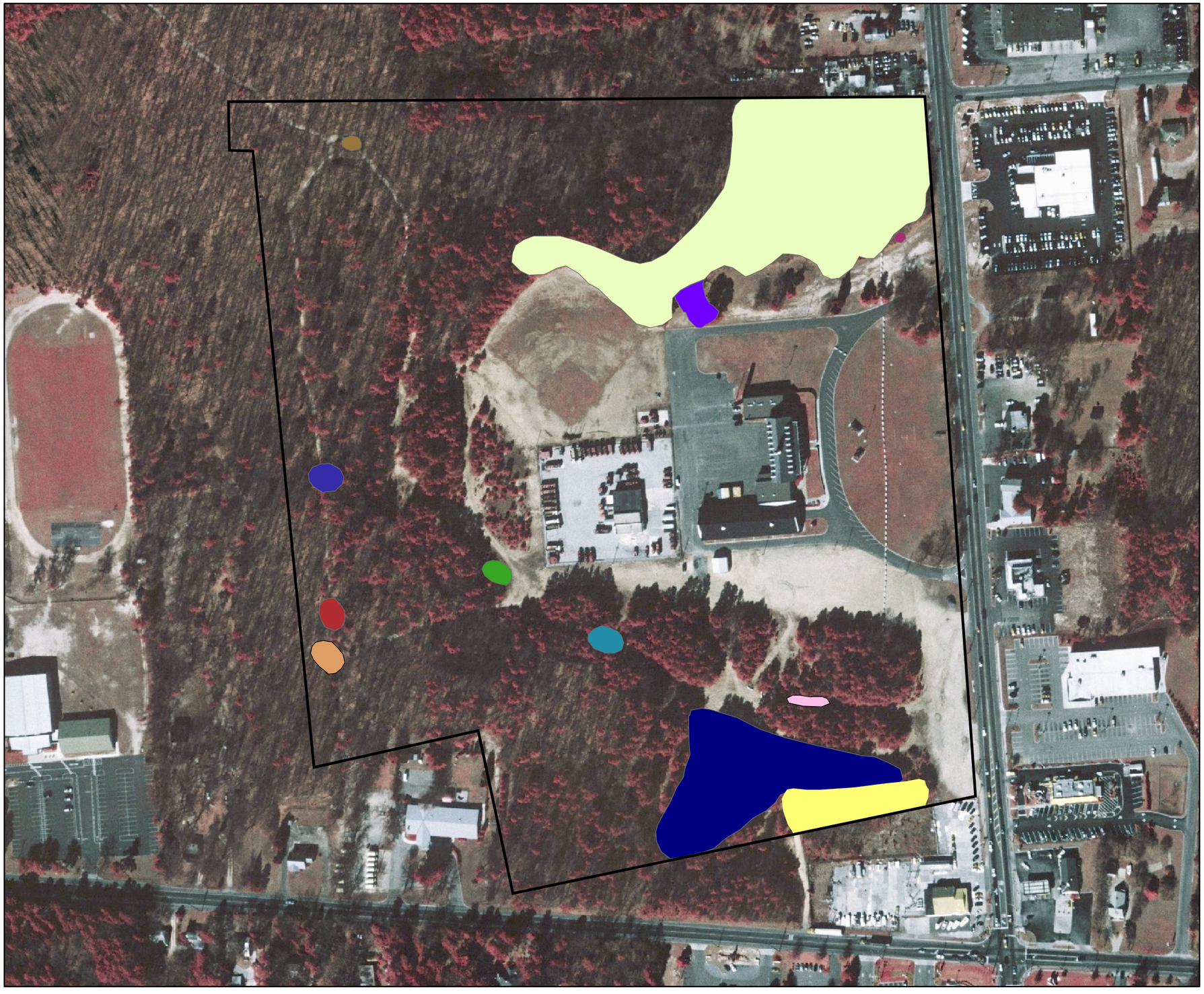

Figure 3-42
Vineland Armory/OMS
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11
- Polygon 12

See Table 3.83 for list of invasive plants within each polygon

0 62.5 125 250 375 500 Feet

Scale:	1:2,500
Created By:	Parsons
File:	20050612_Vineland_Armory_OMS23_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-42
Page Number:	3-115

PARSONS

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3.23 WASHINGTON ARMORY

TABLE 3.85

WASHINGTON ARMORY

Washington Armory	
Facility Identification Number	34C30
City/Township	Port Murray
County	Warren
Facility Acreage	34.67

TABLE 3.86

LAND COVER AND ECOLOGICAL COMMUNITIES

AT WASHINGTON ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	1.06	3.05
Paved Road/Paved Parking	2.60	7.52
Gravel	1.27	3.67
Maintained Grass	9.00	25.97
Dry-Mesic Inland Mixed Oak Forest	2.61	7.53
Scrub Shrub	8.87	25.60
Open Field	9.17	26.46

TABLE 3.87

INVASIVE PLANTS AT WASHINGTON ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Multiflora rose	0.10	0.29
2	Spotted knapweed	9.24	26.65
3	Garlic mustard	0.09	0.26
4	Poison ivy, Japanese barberry	0.21	0.61
5	Asian bittersweet	0.08	0.23
6	Autumn olive, Spotted knapweed, Multiflora rose	1.02	2.94
7	Porcelain berry, Japanese stiltgrass	0.50	1.44
8	Mile-a-minute	0.03	0.09
9	Autumn olive	0.03	0.09
10	Black locust	0.27	0.78
11	Asian bittersweet	0.06	0.17
12	Poison ivy, Asian bittersweet, Multiflora rose, Japanese honeysuckle	0.54	1.56

TABLE 3.88

PERCENTAGE COVER OF INVASIVE PLANTS AT WASHINGTON ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Maintained Grass	Spotted knapweed	High
Scrub Shrub	Poison ivy	High
	Autumn olive	High
	Multiflora rose	High
	Spotted knapweed	High
	Morrow's bush honeysuckle	Medium
	Mile-a-minute	Low
	Japanese barberry	Low
Open Field	Spotted knapweed	High
	Multiflora rose	Medium
	Poison ivy	Medium
	Garlic mustard	Medium
	Autumn olive	Low
	Winged spindletree	Low
	Japanese honeysuckle	Low
	Norway maple	Low
Dry-Mesic Inland Mixed Oak Forest	Multiflora rose	Medium
	Garlic mustard	Medium
	Japanese stiltgrass	Low
	Black locust	Low
	Porcelain berry	Low
	Poison ivy	Low
	Japanese barberry	Low
	Asian bittersweet	Low
	Tree-of-heaven	Low
	Autumn olive	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – WASHINGTON ARMORY

Overall Facility Priority: Low
Infested Area Priorities: 8, 9, 11, 5, 3, 7, 6, 2, 10, 1, and 12
High Priority Species: Spotted knapweed, Asian bittersweet, garlic mustard, porcelain berry, Japanese barberry, mile-a-minute, and Japanese honeysuckle

There is a medium level of invasive plant infestation at the Washington Armory. The largest area of infestation at this facility covers the entire Open Field community and is composed of a near monoculture of spotted knapweed. Smaller areas of infestation contained highly invasive plants that were scattered across the property. These smaller areas of infestation should be a high priority for treatment to allow for eradication of the invasive plants and prevent further spread on the installation. Those areas with poison ivy present near developed areas where NJARNG staff may come in contact with it should also be a high priority for treatment. Although poison ivy is a native species, due to its negative impact on the NJARNG training mission it is being considered an invasive plant for this survey. As time and resources permit the remaining poison ivy could be treated as a lower priority for control and eradication.

Those smaller areas containing highly invasive plants should be treated as a higher priority and then the large infestations of spotted knapweed should be treated since they are well established and will take more resources to control and many years to eradicate. Smaller areas of slow spreading, less aggressive invasive species such as black locust should be treated as a lower priority. Infestations within paved areas are less critical and should be treated when resources and time permit.



Figure 3-43
Washington Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry Mesic Inland Mixed Oak Forest
- Gravel
- Maintained Grass
- Open Field
- Pavement
- Scrub Shrub

0 45 90 180 270 360

Feet

Scale:	1:2,000
Created By:	Parsons
File:	20050616_Washington_ Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-43
Page Number:	3-120

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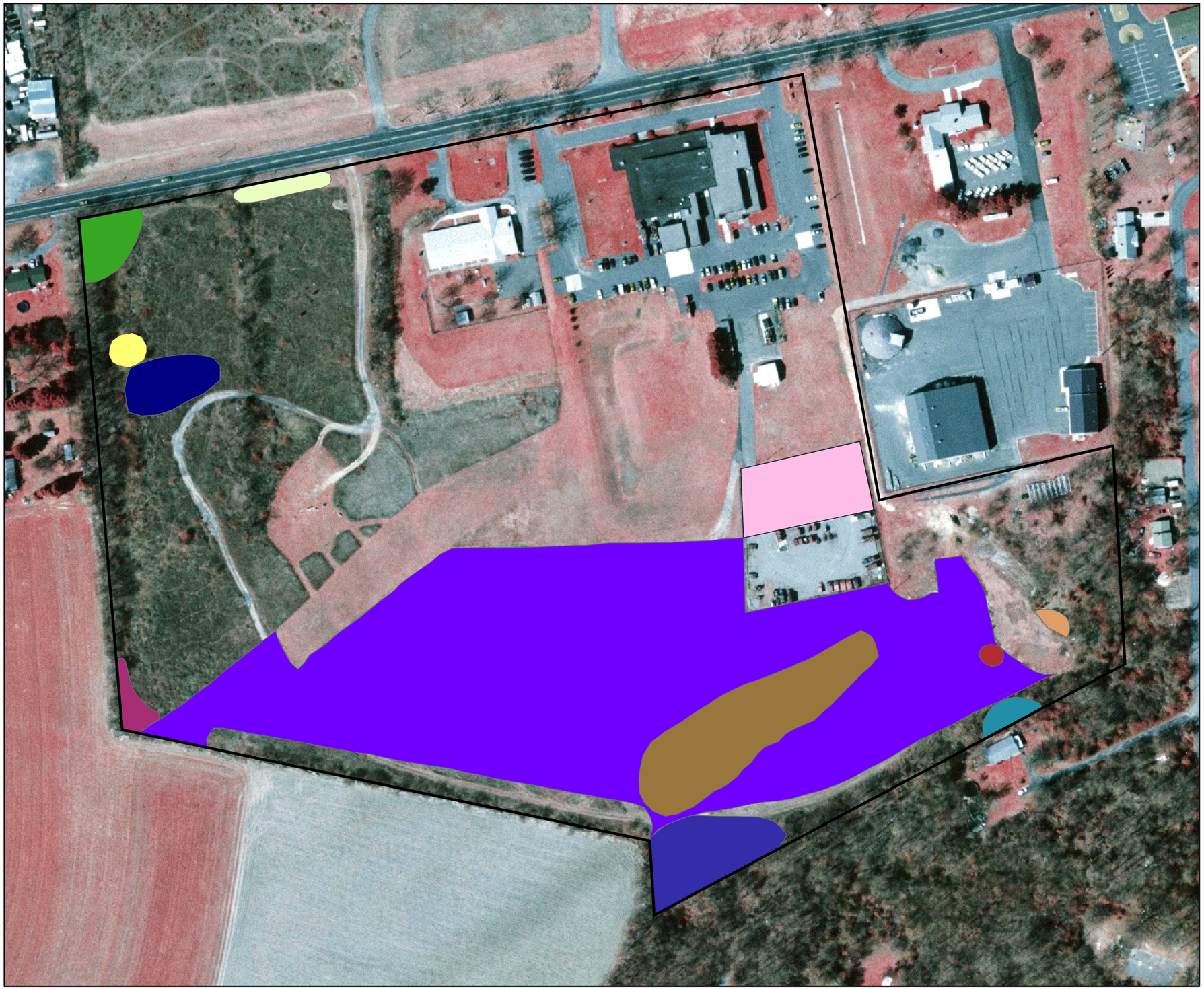

Figure 3-44
Washington Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11
- Polygon 12

See Table 3.87 for list of invasive plants within each polygon

0 45 90 180 270 360
Feet

Scale:	1:2,000
Created By:	Parsons
File:	20050612_Washington_Armory_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-44
Page Number:	3-121

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3.24 WESTFIELD ARMORY/OMS

TABLE 3.89

WESTFIELD ARMORY/OMS

Westfield Armory/OMS	
Facility Identification Number	34C35
City/Township	Westfield
County	Union
Facility Acreage	12.05

TABLE 3.90

LAND COVER AND ECOLOGICAL COMMUNITIES

AT WESTFIELD ARMORY/OMS

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	1.21	10.05
Paved Road/Paved Parking	4.52	37.56
Maintained Grass	1.37	11.36
Dry-Mesic Inland Mixed Oak Forest	3.71	30.76
Scrub Shrub	0.29	2.42

TABLE 3.91

INVASIVE PLANTS AT WESTFIELD ARMORY/OMS

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Poison ivy	3.71	30.79
2	English ivy, Norway maple, Japanese barberry	2.11	17.51
3	Winged spindletree	0.03	0.25
4	Winged spindletree	0.03	0.25
5	Wineberry	0.04	0.33
6	Japanese honeysuckle	0.06	0.50
7	Multiflora rose	0.01	0.08
8	Multiflora rose	0.04	0.33

TABLE 3.92

PERCENTAGE COVER OF INVASIVE PLANTS

AT WESTFIELD ARMORY/OMS

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Dry-Mesic Inland Mixed Oak Forest	Poison ivy	High
	English ivy	High
	Norway maple	High
	Multiflora rose	Medium
	Japanese barberry	Medium
	Japanese honeysuckle	Low
	Wineberry	Low
	Winged spindletree	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – WESTFIELD ARMORY/OMS

Overall Facility Priority: Medium
Infested Area Priorities: 1 near developed areas, 6, 3, 4, 7, 8, 5, and 2
High Priority Species: Poison ivy, Norway maple, Japanese barberry, and Japanese honeysuckle

The Westfield Armory/OMS has a relatively high level of infestation of invasive plants. The most widely observed invasive plant is poison ivy, which was observed throughout most of the facility property. In several places poison ivy is growing in close proximity to the facility buildings, such areas should be prioritized for removal, since they could expose the greatest number of personnel to poison ivy. The remaining poison ivy should be treated as a lower priority for control and eradication, and should only be treated if there is a risk of exposure and as time and resources permit.

The smaller infestations of invasive plants should be a higher priority for treatment as these are much more easily controlled and eradication of the invasive species is likely over a period of a few years. The infested areas located within the forest should be prioritized over those along the pavement edge, due to the plants potential to rapidly spread throughout the forest community. Those areas with highly invasive plants should be prioritized over those species that spread slowly and are less aggressive. The large infested area containing English ivy, Japanese barberry and Norway maple located within the Dry-Mesic Inland Mixed Oak Forest should be treated as a lower priority. Norway maple and Japanese barberry are highly invasive and control of these species is necessary to prevent further spread into the forest. However, due to the size of the infestation and the strong establishment of those species in the area, a higher priority to treat smaller areas of infestation is recommended.



Figure 3-45
Westfield Armory/OMS
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry-Mesic Inland Mixed Oak Forest
- Maintained Grass
- Pavement
- Scrub Shrub

0 40 80 160 240 320

Feet

Scale:	1:1,700
Created By:	Parsons
File:	20050616_Westfield_ Armory_OMS_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-45
Page Number:	3-125

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Figure 3-46
Westfield Armory/OMS
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8

See Table 3.91 for list of invasive plants within each polygon

0 45 90 180 270 360
Feet

Scale:	1:2,000
Created By:	Parsons
File:	20050612_Westfield_Armory_OMS_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-46
Page Number:	3-126

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3.25 WEST ORANGE ARMORY

TABLE 3.93

WEST ORANGE ARMORY

West Orange Armory	
Facility Identification Number	34C40
City/Township	West Orange
County	Essex
Facility Acreage	65

TABLE 3.94

LAND COVER AND ECOLOGICAL COMMUNITIES

AT WEST ORANGE ARMORY

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	3.36	5.20
Paved Road/Paved Parking	11.44	17.72
Maintained Grass	7.09	10.98
Dry-Mesic Inland Mixed Oak Forest	38.23	59.24
Open Field	3.53	5.47
Robust Emergent Marsh	0.03	0.04
Deciduous Wooded Wetlands	0.86	1.33

TABLE 3.95

INVASIVE PLANTS AT WEST ORANGE ARMORY

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Japanese barberry, Japanese stiltgrass, Wineberry, Asian bittersweet	37.27	57.34
2	Black locust, Tree-of-heaven	0.88	1.35
3	White sweeetclover, Chinese bush-clover	2.10	3.23
4	Common reed	0.03	0.05
5	Japanese knotweed, Asian bittersweet, Multiflora rose, Japanese honeysuckle, Tree-of-heaven, Japanese stiltgrass, Common mugwort, Crown vetch	0.82	1.26
6	Japanese knotweed, Japanese stiltgrass, Common mugwort, Crown vetch	1.31	2.02
7	Common buckthorn	0.70	1.08
8	Asian bittersweet, Japanese stiltgrass, Porcelain berry, Wineberry, Multiflora rose, Japanese barberry, Japanese honeysuckle	0.92	1.42
9	Japanese knotweed, Japanese stiltgrass, Multiflora rose, Asian bittersweet	1.25	1.92
10	Japanese knotweed	0.20	1.54
11	Japanese honeysuckle, Asian bittersweet, Japanese knotweed	1.74	2.68

TABLE 3.96

PERCENTAGE COVER OF INVASIVE PLANTS

AT WEST ORANGE ARMORY

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Robust Emergent Marsh	Common reed	High
Open Field	Japanese knotweed	High
	Asian bittersweet	High
	Japanese stiltgrass	High
	Multiflora rose	Medium
	Japanese honeysuckle	Medium
	Wineberry	Medium
	Tree-of-heaven	Low
	White sweetclover	Low
	Chinese bush-clover	Low
	Japanese barberry	Low
	Porcelain berry	Low
Dry-Mesic Inland Mixed Oak Forest	Japanese stiltgrass	High
	Asian bittersweet	Medium
	Japanese knotweed	Medium
	Multiflora rose	Low
	Japanese honeysuckle	Low
	Tree-of-heaven	Low
	Wineberry	Low
	Japanese barberry	Low
	Porcelain berry	Low
	Common buckthorn	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – WEST ORANGE ARMORY

Overall Facility Priority: High
Infested Area Priorities: 4, 7, 8, 9, 2, 3, 11, 5, 6, 1, and 10
High Priority Species: Poison ivy, Norway maple, Japanese barberry, and Japanese honeysuckle

West Orange Armory has a relatively high level of infestation of invasive plants that threaten to spread and invade large undeveloped areas. This facility does offer on-site outdoor field training operations that may be affected by the presence of some invasive species and therefore it is a higher priority for treatment.

It is recommended that the Deciduous Wooded Wetlands and the Robust Emergent Marsh communities at West Orange Armory be prioritized for invasive plant removal due to their high ecological value. Smaller areas within the forested community should be the next priority for treatment. Nearly all of the Dry-Mesic Inland Mixed Oak Forest community is infested with highly invasive plants. Being a large area these invasive plants will require a considerable amount of resources to control and should be considered last for treatment. However, controlling the smaller areas of infestation within the forest will require less effort and prevent the spread of these species throughout the forest.

The Open Field community contained a large number of invasive plants several of which have high levels of percentage cover. This community is relatively small in size and is located adjacent to the forest community. To prevent the spread of the highly invasive plants into the adjacent forest, control or removal of the invasive plants present in the Open Field community should be the next priority.

Figure 3-47
West Orange Armory
Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Deciduous Wooded Wetlands
- Dry-Mesic Inland Mixed Oak Forest
- Maintained Grass
- Open Field
- Pavement
- Robust Emergent Marsh

0 70 140 280 420 560

Feet

Scale:	1:3,000
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Date:	12/5/05
Figure Number:	3-47
Page Number:	3-131

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Figure 3-48
West Orange Armory
Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5
- Polygon 6
- Polygon 7
- Polygon 8
- Polygon 9
- Polygon 10
- Polygon 11

See Table 3.95 for list of invasive plants within each polygon

0 65 130 260 390 520
Feet

Scale:	1:3,000
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File:	20050612_West_Orange_Armory_OMS_CSMS_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-48
Page Number:	3-132

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3.26 WEST TRENTON AASF/OMS

TABLE 3.97

WEST TRENTON AASF/OMS

West Trenton AASF/OMS	
Facility Identification Number	34C15
City/Township	West Trenton
County	Mercer
Facility Acreage	20.48

TABLE 3.98

LAND COVER AND ECOLOGICAL COMMUNITIES AT WEST TRENTON AASF/OMS

Land Cover and Ecological Communities	Acres	Percent of Installation
Buildings	1.62	7.94
Paved Road/Paved Parking	7.22	35.28
Maintained Grass	9.88	48.26
Dry-Mesic Inland Mixed Oak Forest	0.56	2.74
Forested Wet Weather Conveyance	1.17	5.72

TABLE 3.99

INVASIVE PLANTS AT WEST TRENTON AASF/OMS

Polygon Number	Invasive Plants Present	Acres	Percent of Installation
1	Poison ivy, Japanese honeysuckle, Asian bittersweet, Multiflora rose, Wineberry, Canadian thistle, Garlic mustard	0.56	2.73
2	Poison ivy, Multiflora rose, Japanese honeysuckle, Garlic mustard, Japanese stiltgrass, Asian bittersweet, Autumn olive, Purple loosestrife, Porcelain berry	1.17	5.71
3	Purple loosestrife	0.03	0.15
4	Poison ivy	0.02	4.88
5	Asian bittersweet, Poison ivy, Spotted knapweed, Japanese honeysuckle	0.09	0.44

TABLE 3.100

PERCENTAGE COVER OF INVASIVE PLANTS

AT WEST TRENTON AASF/OMS

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
Forested Wet Weather Conveyance	Poison ivy	High
	Multiflora rose	High
	Japanese honeysuckle	High
	Asian bittersweet	High
	Japanese stiltgrass	Medium
	Garlic mustard	Medium
	Purple loosestrife	Low
	Autumn olive	Low
	Porcelain berry	Low
Dry-Mesic Inland Mixed Oak Forest	Japanese honeysuckle	High
	Poison ivy	High
	Asian bittersweet	Medium

Land Cover and Ecological Communities	Invasive Plants	Percentage Cover[(1)]
	Multiflora rose	Medium
	Wineberry	Low
	Canadian thistle	Low
	Autumn olive	Low

(1) High >30% cover; Medium 10-30% cover; Low < 10% cover.

MANAGEMENT ISSUES AND PRIORITIES – WEST TRENTON AAFS/OMS

Overall Facility Priority: Low
Infested Area Priorities: 3, 2, 1, 4, and 5
High Priority Species: Purple loosestrife, Japanese honeysuckle, Japanese stiltgrass, garlic mustard, and Asian bittersweet, and autumn olive

The West Trenton AASF/OMS has a low level of infestation of invasive plants. Of greatest importance at this facility is the small area of purple loosestrife that was observed in the Forested Wet Weather Conveyance community. This is a highly invasive plant that spreads rapidly and could quickly establish itself throughout this community. In addition, the other highly invasive plants within this community should be removed or controlled, if possible, to prevent spread into the forested area. The next priority should be to remove the invasive plants present within the Dry-Mesic Inland Mixed Oak Forest. The remaining two are of least importance in terms of reducing the spread of invasive plants or protecting vegetative communities. These areas include a fenced area on pavement (square) and a drainage ditch and should be treated last.



Figure 3-49
West Trenton AASF/OMS Ecological Communities Map

New Jersey Army National Guard

Legend

- Installation Boundary
- Building
- Dry-Mesic Inland Mixed Oak Forest
- Forested Wet Weather Conveyance
- Maintained Grass
- Pavement

0 50 100 200 300 400
Feet

Scale:	1:2,000
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File:	20050616_Trenton_Mercer_Aviation_Armory_INRMP_EcoComm.mxd
Date:	12/5/05
Figure Number:	3-49
Page Number:	3-136

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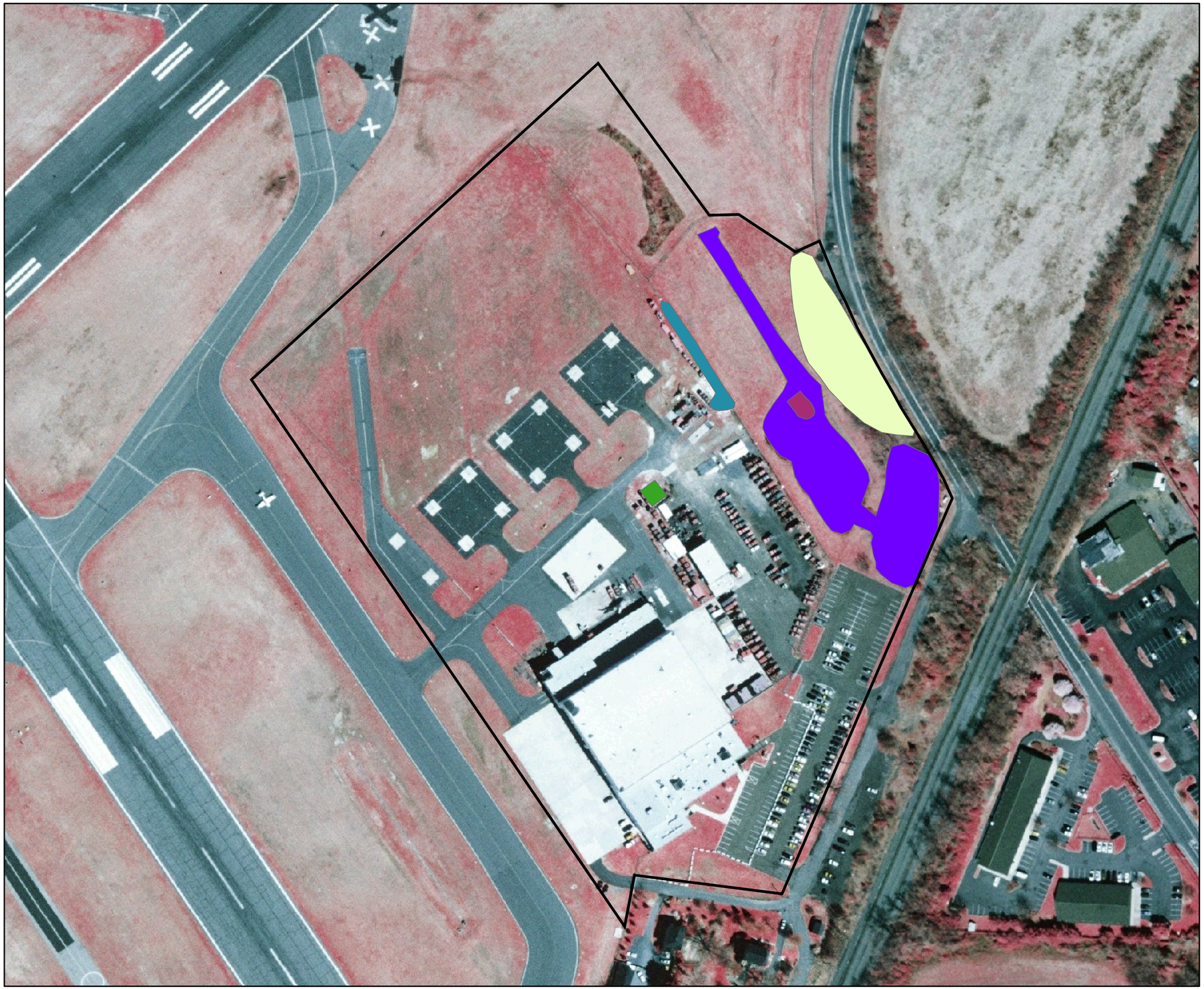

Figure 3-50
West Trenton AASF/OMS
Armory Invasive Plants

New Jersey Army National Guard

Legend

- Installation Boundary
- Polygon 1
- Polygon 2
- Polygon 3
- Polygon 4
- Polygon 5

See Table 3.99 for list of invasive plants within each polygon

0 45 90 180 270 360
Feet

Scale:	1:2,000
Created By:	Parsons
File:	20050612_Trenton_Mercer_Aviation_Armory_OMS24_Floral_InvasiveSpecies.mxd
Date:	12/5/05
Figure Number:	3-50
Page Number:	3-137

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SECTION 4

MANAGEMENT PLAN

4.1 SUMMARY OF INVASIVE PLANT SURVEY RESULTS

Table 4.1 provides a summary of the invasive plant survey result for the 25 NJARNG installations. A total of 33 invasive plant species were identified at the installations, 19 of which are considered highly invasive (Appendix A). Two or more invasive plant species were identified at each installation. Approximately 220 acres (29 percent) of the 765 acres surveyed were infested. Priorities for invasive plant treatments were established based on the criteria described in Section 2.4. Of the 25 installations surveyed, 7 are considered high priority for invasive plant treatments, 10 are medium priority, and 8 are low priority.

4.2 GENERAL APPROACH TO INVASIVE PLANT MANAGEMENT

This management plan has been designed to provide a framework for adaptive management of invasive plants at the 25 NJARNG installations based on priorities and resources available to implement specific treatments. The overall goal is to implement invasive plant treatments on as many installations as possible and within as many infested areas as possible based on available resources.

Two basic options exist for implementing treatments: (1) using DMAVA grounds maintenance staff and (2) hiring a contractor if/when funding is available and when DMAVA staff cannot accomplish the treatments. Generally, DMAVA grounds maintenance staff will focus on the use of mechanical treatments to eradicate relatively small infestations (note: certification is required for chemical treatments, see Section 4.3.5). The objective is to integrate invasive plant treatments into the installation's routine grounds maintenance regime. This approach should be cost-effective and can provide for frequent re-treatment, when necessary. The ID-OEC Natural Resources Manager will work closely with the

TABLE 4.1

SUMMARY OF INVASIVE PLANT SURVEYS AND MANAGEMENT PRIORITIES

Facility Name	Acreage	Invaded Acreage	Specific Species	Priority Factors	Priority for Treatment
Cape May Court House Armory	22.17	8.21	Common reed, Japanese honeysuckle, poison ivy, multiflora rose, autumn olive, Chinese bush-clover, porcelain berry, and spotted knapweed.	Medium level of invasive plant infestation; wetland habitats infested.	High
Dover Armory	16.17	8.59	Japanese knotweed, tree-of-heaven, Japanese stiltgrass, garlic mustard, Japanese barberry, winged spindletree, reed canary grass, Morrow's bush honeysuckle, porcelain berry, Asian bittersweet, poison ivy, common reed, multiflora rose, autumn olive, black locust, spotted knapweed, Norway maple, and Canadian thistle.	OMS; high level of invasive plant infestation; wetland areas are surrounded by invasive plants and could become infested.	High
Fort Dix HQ, OMS, and RTS-M	44.3	10.1	Garlic mustard, poison ivy, black locust, Chinese bush-clover, multiflora rose, spotted knapweed, Japanese honeysuckle, wineberry, Japanese stiltgrass, common mugwort, and common reed.	HQ and OMS; high level of invasive plant infestation; wetland areas are infested.	High
Franklin Armory	10.85	7.49	Multiflora rose, spotted knapweed, porcelain berry, purple loosestrife, Canadian thistle, Asian bittersweet, common reed, Morrow's bush honeysuckle, poison ivy, Japanese barberry, Norway maple, autumn olive, garlic mustard, Japanese stiltgrass, tree-of-heaven, and winged spindletree.	High level of invasive plant infestation; wetlands infested; potential habitat for state and/or federal listed species.	High
Sea Girt NGTC	171	9.54	Common reed, English plantain, Japanese honeysuckle, Japanese knotweed, Norway maple, Oriental bittersweet, purple loosestrife, and poison ivy.	Military on-site outdoor field training; low level of invasive plant infestation; federally listed plant and animal species and habitat present or adjacent to property; wetlands are infested.	High

TABLE 4.1 (continued)

Facility Name	Acreage	Invaded Acreage	Specific Species	Priority Factors	Priority for Treatment
Toms River Armory/OMS	30.21	2.04	Common reed, Canadian thistle, and spotted knapweed.	OMS; low level of invasive plant infestation; large undeveloped areas; low level of infestation; wetland area infested.	High
West Orange Armory	65	47.31	Japanese barberry, Japanese stiltgrass, wineberry, Asian bittersweet, black locust, tree-of-heaven, white sweetclover, Chinese bush-clover, common reed, Japanese knotweed, multiflora rose, Japanese honeysuckle, common mugwort, common buckthorn, and porcelain berry.	OMS/CSMS; provides for on-site outdoor field training; high level of invasive plant infestation; wetlands are infested.	High
Bordentown CSMS (Route 130)	14.9	4.35	Multiflora rose, Japanese honeysuckle, poison ivy, autumn olive, Morrow's bush honeysuckle, Canadian thistle, purple loosestrife, tree-of-heaven, and Japanese stiltgrass.	CSMS; medium level of invasive plant infestation; highly invasive wetland species present.	Medium
Cherry Hill Armory/OMS	11.3	6.62	Japanese stiltgrass, garlic mustard, Japanese honeysuckle, poison ivy, and common mugwort.	OMS; high level of invasive plant infestation in maintained lawn area.	Medium
Fort Dix UTES	27.67	0.06	Chinese bush-clover and spotted knapweed.	Relatively large undeveloped areas; low level of invasive plant infestation; potential habitat for state listed pine snake; small infestation.	Medium

TABLE 4.1 (continued)

Facility Name	Acreage	Invaded Acreage	Specific Species	Priority Factors	Priority for Treatment
Hackettstown Armory	15.9	13.97	Morrow's bush honeysuckle, poison ivy, garlic mustard, Japanese honeysuckle, Asian bittersweet, multiflora rose, autumn olive, porcelain berry, Norway maple, Japanese stiltgrass, Japanese barberry, crown vetch, Canadian thistle, tree-of-heaven, common reed, spotted knapweed, and wineberry.	High level of invasive plant infestation; wetland area is infested.	Medium
Hammonton Armory	9.21	1.27	Tree-of-heaven, Japanese honeysuckle, garlic mustard, Japanese knotweed, autumn olive, common reed, Japanese barberry, porcelain berry, and yellow sweetclover.	Low level of invasive plant infestation; high potential for spread of invasive plant into wetland area.	Medium
Lawrenceville Complex	78.14	13.84	Common mugwort, multiflora rose, tree-of-heaven, black locust, winged spindletree, Pachysandra, Asian bittersweet, poison ivy, Japanese honeysuckle, porcelain berry, garlic mustard, Japanese stiltgrass, Norway maple, English ivy, and Canadian thistle.	Headquarter facility; relatively large undeveloped area; low level of infestation.	Medium
Newton Armory	5.97	2.96	Purple loosestrife, reed canary grass, Teasel, Japanese stiltgrass, Canadian thistle, multiflora rose, autumn olive, poison ivy, Morrow's bush honeysuckle, Asian bittersweet, spotted knapweed, and garlic mustard.	High level of invasive plant infestation but a very small installation; wetland area is infested.	Medium
Somerset Armory/OMS	18.06	5.81	Black locust, poison ivy, Japanese honeysuckle, multiflora rose, garlic mustard, and tree-of-heaven.	OMS; medium level of invasive plant infestation.	Medium
Vineland Armory/OMS	46	6.66	Poison ivy, tree-of-heaven, Japanese honeysuckle, multiflora rose, porcelain berry, spotted knapweed, black locust, Morrow's bush honeysuckle, autumn olive, Canadian thistle, and Chinese bush-clover.	OMS; provides for on-site outdoor field training; low level of invasive plant infestation.	Medium
Westfield Armory/OMS	12.05	6.04	Poison ivy, English ivy, Norway maple, Japanese barberry, winged spindletree, wineberry, Japanese honeysuckle, and multiflora rose.	OMS; high level of invasive plant infestation.	Medium

TABLE 4.1 (continued)

Facility Name	Acreage	Invaded Acreage	Specific Species	Priority Factors	Priority for Treatment
Bordentown Armory/OMS	4.22	1.09	Garlic mustard, Japanese honeysuckle, poison ivy, tree-of-heaven, multiflora rose, black locust, common reed, Morrow's bush honeysuckle, autumn olive, and wineberry.	OMS; medium level of invasive plant infestation; small base	Low
Flemington	13	8.68	Purple loosestrife, Japanese stiltgrass, common periwinkle, multiflora rose, poison ivy, wineberry, autumn olive, Morrow's bush honeysuckle, and spotted knapweed.	High level of invasive plant infestation in the forested area.	Low
Morristown Armory	41.7	27.58	Wineberry, Japanese barberry, black locust, poison ivy, multiflora rose, porcelain berry, Japanese stiltgrass, garlic mustard, common mugwort, Canadian thistle, tree-of-heaven, Asian bittersweet, Japanese knotweed, Japanese honeysuckle, Norway maple, Pachysandra, and autumn olive.	High level of invasive plant infestation.	Low
Picatinny Arsenal (AASF)	28.48	9.24	Autumn olive, multiflora rose, poison ivy, spotted knapweed, reed canary grass, Japanese knotweed, Canadian thistle, Asian bittersweet, Japanese barberry, Japanese stiltgrass, and common reed.	Medium level of invasive plant infestation.	Low
Princeton Warehouse	8.21	6.33	Multiflora rose, wineberry, Japanese stiltgrass, Japanese honeysuckle, garlic mustard, autumn olive, Japanese barberry, porcelain berry, common buckthorn, poison ivy, Asian bittersweet, Canadian thistle, Morrow's bush honeysuckle, and tree-of-heaven.	High level of invasive plant infestation; however it is a small installation.	Low
Tuckerton Armory	16	0.14	Tree-of-heaven, garlic mustard, Japanese stiltgrass, poison ivy, porcelain berry, and common periwinkle.	Very low level of invasive plant infestation.	Low
Washington Armory	34.67	12.06	Multiflora rose, spotted knapweed, garlic mustard, poison ivy, Japanese barberry, Asian bittersweet, autumn olive, porcelain berry, Japanese stiltgrass, mile-a-minute, black locust, and Japanese honeysuckle.	Medium level of invasive plant infestation.	Low

TABLE 4.1 (continued)

Facility Name	Acreage	Invaded Acreage	Specific Species	Priority Factors	Priority for Treatment
West Trenton AASF/OMS	20.48	1.88	Poison ivy, Japanese honeysuckle, Asian bittersweet, multiflora rose, wineberry, Canadian thistle, garlic mustard, Japanese stiltgrass, autumn olive, purple loosestrife, porcelain berry, and spotted knapweed.	OMS; low level of infestation of invasive plants; site is largely developed.	Low

installation's grounds maintenance staff to provide training on plant identification, treatment methods, treatment priorities, and monitoring. For larger infestations and when chemical treatments and/or specialized equipment are required, a certified herbicide applicator would be contracted to provide assistance.

This plan provides several tools to assist in implementation of invasive plant management. Table 4.1 prioritizes installations for invasive plant treatments and specific areas within the installations are prioritized in the results tables in Section 3. General treatment methods are discussed in Section 4.3 below and species-specific treatments are described in Appendix A. Installation-specific and area specific treatment options are summarized in Section 4.4 and Appendix D. An approach for monitoring is provided in Section 4.5.

4.3 GENERAL MANAGEMENT PRACTICES AND TREATMENTS

4.3.1 Overview

An IPM approach will be used for invasive plant treatments at the NJARNG installations. The IPM approach is a means of planning and implementing a coordinated program, utilizing a combination of methods to contain, control, or replace invasive plants to manageable levels. Other components equally important to the IPM program include non-treatment practices such as invasive plant prevention. The IPM program targets individual plant species, and then prescribes a combination of methods that would best achieve the desired result. Control of invasive plants on the installations will involve the use of both non-chemical and chemical techniques. Where feasible and effective non-chemical controls have been emphasized as the preferred technique. When herbicides are necessary, careful attention is paid to application and dosage in order to achieve effective control with the least detrimental effects to the environment. When practicable, control efforts will be coordinated with other local or regional control programs.

Using the IPM approach, the site managers will employ a single method or a variety of techniques or practices to control invasive plants including prevention, mechanical, biological, chemical, and potentially prescribed burning. The plan considers the following factors in selecting the most appropriate treatment method: the risk of invasive plant spread or expansion, invasive plant species biology, time of year, environmental setting, and management objective. Appendix

A provides a description of the species-specific control measures that could be used on NJARNG installations.

4.3.2 Prevention

The prevention method is a way to avoid establishment of invasive plants. This can be accomplished through employing sanitary procedures to prevent invasive plants from spreading or entering an area; recognizing and eliminating new weeds before they multiply and become established; and changing land use practices.

Sanitary practices are used to prevent invasive plant infestations and to prevent establishment of invasive plants through repeated control measures. Examples of these practices include cleaning equipment between sites and infestations and examining landscape plants, seeds, or imported soil for seeds.

Invasive plants can infest areas because of improper maintenance practices. These include improper mowing, mowing too short and not mowing often enough; improper watering (e.g. frequent sprinkling) encourages weed seed germination, disease, and shallow rooted plants that are less competitive than the invasive plants; compacted soil in which vegetation is unable to compete effectively with invasive species; and excessive wear in turf areas that are used for recreation, sports, or training fields which can result in soil compaction and invasive plant infestation.

In all instances, invasive plant spread can be prevented on the installations by monitoring any treated sites and those areas most likely to become infested such as along roadways and fences and removing any pioneering invasive plants that are detected.

4.3.3 Mechanical Controls

Mechanical treatment consists of methods that physically destroy, disrupt growth, or interfere with the reproduction of invasive plants. Mechanical treatment can be accomplished by hand, hand tool, power tool, or heavy equipment (such as bulldozers) and may include manual pulling, digging, hoeing, tilling, cutting, mowing, and mulching invasive plants. More remote locations or marshy conditions make it difficult or impossible to perform mechanical treatment in some areas of the installations.

Manual pulling of invasive plants is very labor intensive and often leaves root fragments in the ground. If sufficient root mass is removed, the individual plant can be destroyed - this can be done successfully with shallow-rooted plants. Mechanical treatments must be repeated several times a year for many years in order to eradicate invasive plant species that are prolific seed producers and have built up a residual seed bank in the soil. To be most effective, mechanical treatment must occur before seed production occurs.

4.3.4 Biological Controls

Biological control involves the introduction and management of selected natural enemies to attack, weaken, and kill a targeted invasive plant and reduce its competitive and reproductive capacity. Biological controls may decrease the production of viable invasive plant seed and may slow the rate of invasive plant spread, but by themselves, they do not eradicate or contain invasive plant infestations. Biological treatment is more effective when used in combination with, or prior to, other treatment methods such as herbicides.

The U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) rigorously screens and tests new biological agents for impacts on agricultural plants and on threatened, endangered, and sensitive plant species. Only APHIS-approved biological controls could be used and released according to APHIS requirements. It is unlikely that the NJARNG staff would initiate introduction of a biological control species at the installations but rather it is more probable that the NJARNG will work cooperatively with other agencies that may be introducing biological controls at a regional level.

4.3.5 Chemical Controls

Chemical treatment involves the application of herbicides at certain stages of invasive plant growth in order to kill the species. Herbicides are extensively screened and tested before they are approved and registered for use by the USEPA.

Many herbicides are "selective" and kill specific types of plants, such as forbs or certain groups of plants, while others are "general" and kill almost all actively growing plant species contacted. It is recommended that non-selective herbicides, where practical, be applied before native plants have produced leaves or after native plants have dropped leaves to limit non-target

damage. Some of these herbicides are pre-emergent and absorbed through the roots, which is effective on grasses, but most herbicides affect established plants through foliar and root absorption. The primary herbicides identified as appropriate for use on the installations have metsulfuron methyl, triclopyr, imazapyr, or glyphosate as their active ingredients. These herbicides are discussed briefly below and summarized in Table 4.2:

- **Metsulfuron methyl (e.g., Escort®) -** Metsulfuron methyl is a broad-spectrum, nonselective herbicide that is absorbed through roots and foliage and moves rapidly through the plant, inhibiting cell division in roots and shoots. This nonselective, broad-spectrum herbicide can impact all plant species (IVI, 2004).
- **Triclopyr (e.g., Garlon®) –** Triclopyr is a selective herbicide used to control broadleaf and woody plants. Small amounts of triclopyr can impact non-target native woody plants if it is absorbed through roots and leaves. It is not especially effective on grasses and other plants with a single seed leaf (IVI, 2004).
- **Imazapyr (e.g., Arsenal®) -** Imazapyr is a broad-spectrum, nonselective herbicide used to control grasses, brush, vines, and trees. Very small amounts of the spray can impact non-target native plants if absorbed into the roots through the soil or allowed to contact leaves (IVI, 2004).
- **Glyphosate (e.g., Roundup®, Rodeo®, Accord®) -** Glyphosate is a systemic (kills roots), nonselective herbicide used in the treatment of grasses, herbaceous plants, some broadleaf trees and shrubs, and some conifers. Absorbed through the leaves, it inhibits growth. Small amounts of over-spray can kill or injure susceptible non-target native plants, and improper use may damage essential habitat by impacting plants (IVI, 2004). Rodeo® has been approved by the USEPA for use in wetlands.

Although chemical treatments have the potential to impact native species, the choice of application method can minimize impacts on non-target species. Generally, the more selective methods are also more labor-intensive. Application methods include the following:

- **Foliar application -** A dilute herbicide solution is sprayed on leaves ensuring that the leaves are thoroughly wetted but not to the point of runoff.

- **Basal bark application -** The herbicide is sprayed around the circumference of each tree about a foot above the ground. For this treatment, the base of the tree stem must be free of snow, ice, or water on the bark from recent rainfall.
- **Frilling or girdling -** Frilling and girdling are methods of killing standing trees that may be done with or without an herbicide. Girdling involves cutting a groove or notch into the trunk of a tree to interrupt the flow of sap between the roots and crown of the tree. Frilling is a variation of girdling in which a series of downward angled cuts are made completely around the tree, leaving the partially severed bark and wood anchored at the bottom.
- **Cut surface or hack and squirt application -** The herbicide is applied immediately into cuts made into the cambium around the surface of the tree (cambium is the layer of cells in plant roots and stems that produces new tissue responsible for increased girth; for example, bark).
- **Cut stump treatment -** The herbicide is sprayed or painted on the cut surface immediately after removing trees or brush.

Selection of an herbicide depends on its chemical effectiveness on a particular invasive plant species, success in previous similar applications, habitat types, soil types, proximity of the invasive plant infestation to water, and the presence or absence of sensitive plant, wildlife, and fish species. Only those herbicides that are known to be less toxic to non-target species and/or less persistent in the environment, and are registered by the USEPA are recommended for use.

Any herbicide applied will be done in accordance with label instructions, specifications, and precautions as well as any additional DoD guidance. NJARNG staff or contractors applying herbicides will be required to be certified for pesticide application according to DoD or state policy. Any herbicides or equipment used to apply herbicides that are maintained on site will be stored and disposed of according to DoD policy. Herbicide characteristics, properties, application rates, and methods of application to be used on the installations are included in Table 4.2.

TABLE 4.2

SUMMARY OF HERBICIDES TO TREAT INVASIVE PLANTS

Active Ingredient	Trade Name(s)	Target Plants	Mode of Action	Method of Application	Use Rates
Metsulfuron methyl	• Escort® • Escort XP® • Ally®	Brush, certain woody plants, annual and perennial broadleaf weeds, and annual grassy weeds.	Absorbed through roots and foliage and moves rapidly through the plants. It inhibits cell division in the roots and shoots, stopping growth.	Foliage spraying from ground equipment and/or a handgun sprayer.	0.33–4.0 ounces of active ingredient per acre.
Triclopyr	• Garlon® • Renovate® • Grazon® • Pathfinder®	Woody plants, broadleaf weeds.	Disturbs plant growth. Absorbed through green bark, leaves, and roots, then moves throughout the plant. It accumulates in the meristem (growth region) of the plant. It mimics the plant hormone, auxin, causing hypertrophy (excessive enlargement of cells).	Ground foliage spray, basal bark and stem treatment, cut-surface treatment, and/or tree injection.	0.25–9 pounds of acid equivalent per acre.
Imazapyr	• Arsenal® • Chopper® • Contain® • Habitat® • Stalker®	Annual and perennial grasses, broadleaf weeds, brush, vines, and some deciduous trees.	Absorbed through leaves and roots and moves rapidly through the plant. Accumulates in meristem (growth region) of the plant. It disrupts protein synthesis and interferes with cell growth and DNA synthesis.	Ground foliage methods; low-volume hand-held equipment, high-volume spray equipment, boom equipment, basal treatment, cut-stump treatment, and/or frill treatment.	2–6 pints per acre.
Glyphosate	• Roundup® • Rodeo® • Accord®	Grasses, herbaceous plants (including deep-rooted perennial weeds), some broadleaf trees and shrubs, and some conifers.	Inhibits the 5-enolpyruvylshikimate-3-phosphate (EPSP) synthase enzyme; leads to the depletion of key amino acids necessary for protein synthesis and plant growth.	Ground foliage spraying from a truck, backpack, or hand-held sprayer; wipe application; frill treatment; cut stump treatment; and/or basal bark and stem treatment.	0.3–4.0 pounds of active ingredient per acre.

Sources: Information Venture Inc. (www.infoventure.com/e-health) and the Weed Science Society of America (WSSA, 2002).

"Carriers" are used to dilute or suspend herbicides during application and allow for proper placement of the herbicide on stems or foliage. Water is by far the most widely used carrier because it is readily available and inexpensive, and the herbicides identified for use are formulated for effective application with water. Oil is also used as a carrier and is particularly effective for treatment of plants that have thick leaf cuticles. Dyes could be used in some instances in conjunction with herbicide applications to help determine where the herbicide has been applied and to detect areas that are missed (Tu et al., 2003).

4.3.6 Prescribed Burning

The use of fire to control invasive plants may facilitate return of the natural fire regime. Prescribed burning is most effective when the invasive plant is more susceptible to the effects of fire compared to intermingled native species. Specially trained personnel and open burn permits are required for prescribed burning. The use of prescribed burning is unlikely to be used as a management tool strictly for invasive plant species control at NJARNG installations. However, NJARNG may consider the use of prescribed burning in coordination with other programs at a local or regional level to reduce fuel hazards or promote ecosystem restoration.

4.4 SITE-SPECIFIC TREATMENTS

Infestations at the NJARNG installations were evaluated to determine site specific treatment methods given consideration of the invasive species present and the overall size of the infested area. In keeping with DoD guidance, those methods that could efficiently and effectively be implemented that are least environmentally harmful were identified and are recommended for use as the primary control method. This method can be labor intensive on a larger scale and repeated removal is typically required to ensure success. In most instances, if the size of the infestation was less than an acre in size, mechanical removal and treatment is recommended. In larger areas of infestation the use of herbicides is recommended as a more efficient use of resources and time. Many of the invasive plant species can be treated with the same herbicide at similar concentrations and using a similar method. Appendix D provides a brief summary of the methods recommended for the site specific treatment of invasive species. This summary also provides a recommendation of the re-treatment and monitoring schedule for each specific infested area. Appendix A should be referred to for the detailed description of each method that is appropriate for each invasive plant species, with the understanding that in

some instances, the most effective treatment may be a combination of treatments such as mechanical treatments followed by the use of herbicide.

4.5 MONITORING AND DATA COLLECTION

Monitoring is the process of recording observations and collecting information to assess the effects of a previous action. Monitoring will be conducted at each installation to gather data on any new invasive plant infestations and the effectiveness of treatments in meeting management objectives. The objectives of the plan are to eradicate any new infestations that may occur, as the infestation will be small and easy to control, eradicate small infestations of established invasive plant species, and to prevent or control the spread of existing infestations of large areas of highly invasive species where eradication may be unlikely.

A high priority for monitoring will be given to areas where the potential for new infestation is greatest; this will include areas along roadways, trails, boundaries with infested lands, and recent anthropogenic (human-caused) disturbance. Data recorded will include infestation location, date of discovery, species, condition, and distribution.

Monitoring the reduction in infestation and the success of native plant recovery will occur every 4 to 12 months, depending on the re-treatment schedule for each treated area. The minimum re-treatment schedule for an area is based on the invasive species present. The invasive species that requires the most frequent re-treatment will determine the monitoring and re-treatment schedule for that area. Re-treatment for seedlings and resprouting for most invasive species identified in this plan would need to occur annually. However, some species that have a high rate of reproduction and spread need to be monitored more frequently. Species such as tree-of-heaven and mile-a-minute should be monitored twice during the growing season because of vigorous regrowth that may occur after treatment. All sites should be monitored and retreated as necessary over a five-year period to ensure that management objectives have or are being met and that new infestations are not occurring in treated areas.

Data collected during monitoring of treated sites will relate to implementation of control methods and the effectiveness of the controls. Implementation monitoring will be conducted to create a record of all treatments so that effects of particular methods and

conditions can be assessed and information can be used for future management programs. Data collected will include:

1. Location, timing, and method of treatment
2. Herbicide used (if applicable) and species targeted
3. Acreage of area treated
4. Condition of area at time of treatment (percentage cover of infestation)
5. Weather conditions at time of treatment

Effectiveness monitoring will be conducted to determine the effectiveness of the treatment in reaching plan objectives. This will entail surveying sites after treatment using the same methods outlined in Section 2 for invasive plant surveys. The data collected will include the level of infestation and a photographic and graphic representation of the distribution. The results can then be compared to the baseline presented in the Section 3 of this document. This information will also give an indication of the success of restoration of native species from seed sources adjacent to the treatment areas as well as allow for monitoring of any new infestations.

4.6 STAFFING

The Natural Resources Manager within the DMAVA ID-OEC has overall responsibility for coordination and implementation of the invasive plant management plan. The primary sources for staffing for implementation of invasive plant treatments will be DMAVA grounds maintenance staff and contractors (e.g., certified herbicide applicators, invasive plant control companies, landscape/grounds maintenance companies). Other possible staffing sources for mechanical treatments (under proper supervision) include summer interns, Department of Corrections work crews, and volunteers (e.g., other DMAVA staff, New Jersey Native Plant Society members, etc.). In addition, DMAVA will continue to identify other ongoing or planned state, regional, and local level invasive plant management programs as potential cooperative partners.

4.7 FUNDING

The primary sources of funding available for invasive plant management at NJARNG installations includes the Department of the Army Conservation Program through the Environmental Programs (EPR) report and Real Property Operations and Maintenance. Department of Defense Legacy Program funding might also be available for selected treatments.

Availability of funding for invasive plant management is likely to be highly variable from year to year and will be dependent upon other priorities. Therefore, DMAVA will integrate invasive plant treatments into routine grounds maintenance activities, to the extent possible.

Contractor costs associated with invasive plants treatments will depend upon the methods and equipment used. For planning purposes, a cost of $136 to $224 per acre can be used for chemical applications. Labor costs for mechanical controls could range from $20 to $150 per person hour depending upon the equipment being used.

4.8 IMPLEMENTATION SCHEDULE

The implementation schedule for invasive plant management at NJARNG installations is intended to be flexible based on available staffing/funding and changing priorities. Figure 4-1 provides the planned implementation schedule for the next five years. Because the invasive species found at the installations are not identified on the federal noxious weed list, nor do the species threaten federally listed plant or animal species, no environmental driver is present to seek funding through the usual funding channels for control of invasive species. However, the project will remain on the NJARNG funding request system (i.e. EPR).

Task Name	Start	Finish
Coordinate Treatments With DMAVA Grounds Staff/Contractors	**1/1/2006**	**6/30/2008**
High priority installations	1/1/2006	6/30/2006
Medium priority installations	1/1/2007	6/30/2007
Low priority Installations	1/1/2008	6/30/2008
Implement Initial Treatments	**7/1/2006**	**6/30/2009**
High priority installations	7/1/2006	6/30/2007
Medium priority installations	7/1/2007	6/30/2008
Low priority Installations	7/1/2008	6/30/2009
Monitoring and Re-treatment	**7/1/2007**	**12/31/2010**
High priority installations	7/1/2007	12/31/2010
Medium priority installations	7/1/2008	12/31/2010
Low priority Installations	7/1/2009	12/31/2010

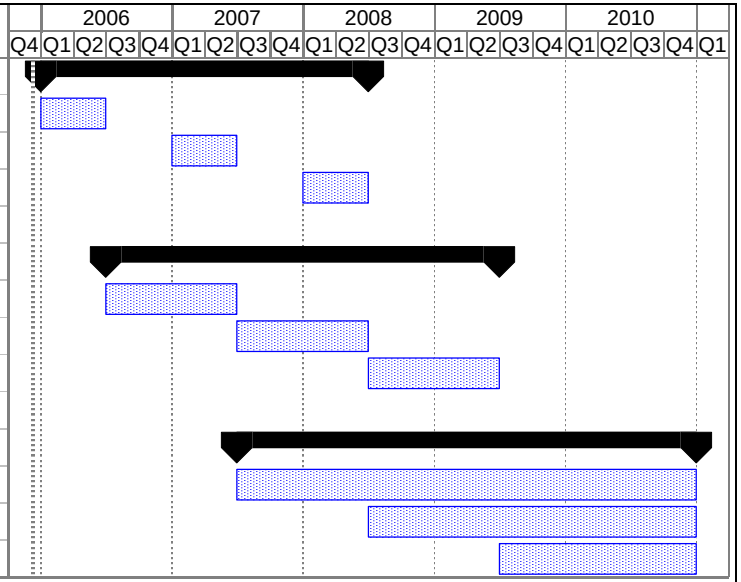

FIGURE 4-1
NJARNG INVASIVE PLANT MANAGEMENT PLAN
IMPLEMENTATION SCHEDULE

SECTION 5

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APPENDIX A

INVASIVE PLANT DESCRIPTIONS AND TREATMENT

This appendix provides a detailed description of the invasive plants found on the installations which includes identification, life history and habitat, key threats, and appropriate control methods. Table A.1 provides a list of the invasive plant species found at the NJARNG installations and their degree of invasiveness. Highly (H) invasive plants are those that invade natural habitats and replace native species. Moderately (M) invasive species are less invasive but may be replacing native species only in localized areas. Low (L) invasive species are often restricted to disturbed grounds and are not especially invasive in natural habitats. The designation of invasiveness was based on the categorization by the U.S. Forest Service Eastern Region unless noted otherwise.

TABLE A.1
INVASIVE DESIGNATION FOR INVASIVE PLANTS
FOUND AT THE INSTALLATIONS

Common Name	Scientific Name	Invasiveness
INVASIVE SPECIES		
Norway maple	*Acer platanoides*	H
Tree-of-heaven	*Ailanthus altissima*	H
Garlic mustard	*Alliaria petiolata*	H
Porcelain berry	*Ampelopsis brevipedunculata*	H
Mugwort or common wormwort	*Artemesia vulgaris*	M[1]
Japanese barberry	*Berberis thunbergii*	H
Asian bittersweet	*Celastrus orbiculatus*	H

TABLE A.1 (CONTINUED)
INVASIVE DESIGNATION FOR INVASIVE PLANTS
FOUND AT THE INSTALLATIONS

Common Name	Scientific Name	Invasiveness
INVASIVE SPECIES		
Spotted knapweed	*Centaurea biebersteinii*	H
Canadian thistle	*Cirsium arvense*	M
Crown vetch	*Coronilla varia*	H
Wild teasel	*Dipsacus fullonum*	L
Cut-leaf teasel	*Dipsacus laciniatus*	L
Autumn olive	*Elaeagnus umbellate*	H
Winged spindletree	*Euonymus alata*	M
English ivy	*Hedera helix*	L
Chinese bush-clover	*Lespedeza cuneata*	L
Japanese honeysuckle	*Lonicera japonica*	H
Morrow's bush honeysuckle	*Lonicera morrowii*	H
Purple loosestrife	*Lythrum salicaria*	H
Yellow sweetclover	*Melilotus officinalis*	M
Japanese stiltgrass	*Microstegium vimineum*	H
Pachysandra or Japanese spurge	*Pachysandra terminalis*	L
Japanese knotweed	*Polygonum cuspidatum*	H
Mile-a-minute	*Polygonum perfoliatum*	H
Common buckthorn	*Rhamnus cathartica*	H
Black locust	*Robinia pseudoacacia*	L

TABLE A.1 (CONTINUED)
INVASIVE DESIGNATION FOR INVASIVE PLANTS
FOUND AT THE INSTALLATIONS

Common Name	Scientific Name	Invasiveness
INVASIVE SPECIES		
Multiflora rose	*Rosa multiflora*	M
Wineberry	*Rubus phoenicolasius*	L
Periwinkle	*Vinca minor*	M
NATIVE SPECIES		
Reed canary grass	*Phalaris arundinacea*	H[1]
Common reed	*Phragmites australis*	H[2]
Poison ivy	*Toxicodendron radicans*	H[3]

H= Highly invasive; M= Moderately invasive; L= Low
Designation based on:
(1)Ohio Department of Natural Resources 2003a
(2)Virginia Natural Heritage Program n.d.
(3)Francis 2003a, b

A.1 NORWAY MAPLE (*Acer platanoides*)

A.1.1 Description

Norway maple is a deciduous tree that ranges from 40 to 98 feet in height. The leaves have five to seven lobes that are sharply pointed. The trees can be distinguished from all native species of maples occurring in New Jersey by the milky sap present when the leaf petiole is detached. The leaves are 4-7 inches long and are arranged opposite along the stem. The tree produces small yellow-green flowers in April, and the seeds are 2-winged samaras that are wind dispersed and are 1½ to 2 inches long. Leaves turn yellow in late autumn (NJDEP, 2004).

Norway maple readily establishes on disturbed sites, such as road and railroad embankments, vacant lots, and fallow fields. It also invades and establishes in natural plant

communities. It is particularly successful on alluvial soils in floodplain forests and along riverbanks, as it grows best on moist, "adequately" drained, deep, fertile soils (NJDEP, 2004, USFS, 2005). It can invade woodlands and forests at cleared edges or where blow-down occur within the interior (NJDEP, 2004).

Norway maple is an aggressive colonizer able to survive under a range of habitat conditions. The Norway maple is also effective because it can invade undisturbed habitats and out compete other species. The Norway maple is highly effective in replacing diverse native hardwood forests because of its prolific seed production, tolerance to shade and aggressive competition. The dense shade produced by the canopy decreases under story plant diversity, but does not affect establishment of its own seedlings (Wyckoff and Webb, 1996, Danoff-Burg, 2005).

A.1.2 Control Methods

A.1.2.1 Mechanical Treatment

For small infestations, dig seedlings or saplings from the ground. Small to medium sized trees should be girdled in the spring or in mid-to-late summer. Using a hand axe, make a cut through the bark encircling the base of the tree, approximately 6in above the ground. Be sure that the cut goes well into the cambium layer.

A.1.2.2 Chemical Treatment

Norway maple can be treated with foliar, cut-stump, or hack and squirt application of glyphosate. Foliar application of 48% concentration of glyphosate (1.25 oz/gal) should occur in mid-October to early November. Hack and squirt methods should be employed in mid-to-late summer (mid-July through September). Cut stump can be conducted with 50% solution of glyphosate with water or 8% triclopyr undiluted at any time during the growing season.

A.1.2.3 Monitoring and Retreatment

Sites should be revisited annually and any sprouts from cut stumps should be foliar treated with herbicide and seedlings should be hand pulled.

A.2 TREE-OF-HEAVEN (*Ailanthus altissima*)

A.2.1 Description

Tree-of-heaven is a deciduous tree that can reach 90 feet tall (Hunter, 1996). The bark is gray, smooth to bumpy and becomes fissured with age. The tree is characterized by a straight gray smooth bark. The leaves are pinnately compound with up to 41 lance-shaped leaflets (Danoff-Burgh, 2005). Most leaflets have 1-3 coarse teeth at the base of the leaflet (VNHP, 1998e). The leaflets are fuzzy when young and the leaves can be distinguished from sumac (*Rhus hirta*) by 1-4 small round glands on the leaflet's underside (Hunter, 1996). These oil glands at the base produce a foul smell, burnt peanut butter, when the leaves are crushed.

Trees bloom in late spring, forming small green flowers at the ends of new shoots which develop into clusters of samaras. The seedpods are reddish brown and produced in late summer (Danoff-Burgh, 2005). The seeds are wind dispersed (VNHP, 1998e). While seedlings are highly shade intolerant, saplings appear to be more tolerant of varying light conditions (Knapp and Canham, 2000). Tree-of-heaven can also reproduce asexually, spreading by aggressive suckers or runners (Danoff-Burgh, 2005).

Tree-of-heaven readily establishes on disturbed sites including vacant lots, roadsides, and railroad embankments (VNHP, 1998e). It can tolerate poor soils, air pollution, drought, frost, and rocky conditions giving it a competitive edge over native species (TNEPPC, 1998, Danoff-Burgh, 2005). It can establish in forested areas when gaps in the forest canopy occurs as a result of disturbances (NJDEP, 2004). In New Jersey, it is frequent in floodplain forests and in woods occurring on trap rock or diabase (NJDEP, 2004).

Tree-of-heaven grows swiftly to become a large tree, growing four feet per year and blocking the light for native species beneath it. A single tree can produce 325,000 seeds in a year thereby allowing it to disperse rapidly. In addition, its leaves are toxic to over 40 native species of plants, and it is unpalatable to herbivores. Because these toxins accumulate in the soils, native species can not establish. It can out compete indigenous plants for underground resources with its long taproot. Because of its rapid growth, it quickly and significantly alters plant community structure and disrupts the process of natural plant succession (NJDEP, 2004). Because of its long tap root, the trees can do extensive damage to foundations and sewers.

A.2.2 Control Methods

A.2.2.1 Mechanical Treatment

For small infestations, plants should be removed by hand during flowering in June through mid-August making sure that the upper half of the root is removed. In a small infestation of larger trees, the trees can be cut twice a year, once in the early growing season (early April) and once in the late growing season (September). Cutting needs to be continued over several years to exhaust the root reserves.

A.2.2.2 Chemical Treatment

Foliar application of glyphosate or triclopyr should be mixed with water and a small amount (0.5%, or as per label) of a non-ionic surfactant (except for Roundup®, which contains a surfactant) to help the spray spread over and penetrate the leaves. The mixture should be applied to leaves and green stems, including sprouts and suckers. With backpack sprayers 1.5% to 2% solution of a triclopyr herbicide should be applied June 1 - September 1. For higher volume applications such as would be applied by a truck mounted sprayer, the concentration for these products could be reduced by 0.5% to 1-1.5%.

For saplings or slightly larger trees, basal bark application works best during late winter/early spring (February 15 -April 15) and in summer (June 1 - September 15). For larger trees, treat the bark up to 24 inches in height. A 20% solution of oil-soluble triclopyr product in 80% oil (fuel oil, diesel, kerosene, mineral oil, or special vegetable oils), adding a pine oil based additive (e.g., Cide-Kick® II) at the rate of 10% helps penetrate the bark. Another option is to use a pre-mixed, ready-to-use triclopyr product designed for basal bark (and cut stump) application (e.g., Pathfinder® II).

The hack-and-squirt method is effective and minimizes sprouting and suckering when applied during the summer. Apply a 100% concentration of a water-soluble triclopyr product into the cuts so that the bottom of the cut is covered, but liquid doesn't run out of it.

The cut stump method is useful in areas where the trees need to be removed from the site and will be cut as part of the process. Conduct treatment from April through September. A mixture of 20% triclopyr herbicide plus 80% oil diluent, as for basal bark spraying (above),

should be applied to the stump surface and sides. Another option is to use a 100% triclopyr solution, treating only the outer 1/3 of the stump surface.

A.2.2.3 Monitoring and Retreatment

Treated areas should be monitored annually. Those areas treated by mechanical methods need to be revisited annually and mechanical treatments conducted every year for multiple years. Chemical treated sites need to be revisited in subsequent years to either hand-pull seedlings or treat resprouts or root suckers with foliar application of herbicide.

A.3 GARLIC MUSTARD (*Alliaria petiolata*)

A.3.1 Description

Garlic mustard is an oblong biennial herb that ranges in height from 5 to 46 inches in height (VNHP, 2005). Seedlings emerge in spring and form rosettes of kidney-shaped leaves by midsummer. In the second year, plants have a stem with leaves that are triangular and sharply toothed. A cluster of white, four-petaled flowers form at the end of the stems and branches in spring. Seeds are black, oblong, and are found in rows with a long narrow capsule (VNHP, 2005). Plants produce an average of 136-295 seeds (Nuzzo, 2000). Garlic mustard has the ability to form seed banks which can be viable for up to 4 years. Seeds are readily dispersed by people as they get stuck on boots or clothing and by automobiles and mowers. Seeds may also be dispersed by floodwaters, or indirectly by rodents, birds, and deer (Nuzzo, 2000).

Garlic mustard is found most commonly in deciduous forest and in rich moist habitats, along stream banks and in floodplains. It can also be found along trails and forest edges. It is especially abundant in soils occurring over limestone, trap rock, or diabase and is rarely found in acidic soils such as peat (NJDEP, 2004). It frequently establishes on disturbed areas such as a tree falls or trail edges, and then spreads into undisturbed habitats (VNHP, 2005, Nuzzo, 2000).

Garlic mustard is shade tolerant and is frequently found in sites subjected to continued or repeated disturbance, such as floodplains and in early successional or low quality communities. The greatest increases in presence occur in sites subjected to large-scale natural

disturbances (Nuzzo, 1999). Garlic mustard can dominate forest understories, resulting in a reduction in diversity of native ground cover altering habitat for native animal species. Garlic mustard restricts the establishment of native plants through the production of phytotoxic chemicals which inhibit mycorrhizal activity in native plants (Nuzzo, 2000).

A.3.2 Control Methods

A.3.2.1 Mechanical Treatment

For small infestations, hand pulling through the growing season and before seeds have matured (mid-June through September) and cutting flowering stalks when in full bloom (early April through May) is effective but must be followed up for up to 5 years to exhaust the seed bank.

A.3.2.2 Chemical Treatment

In early spring (March to mid-April), spray seedlings with 1 to 3% concentration of glyphosate or triclopyr mixed with water at 7oz/5 gallons in spring before second-year plants begin to flower. Glyphosate can be used to treat year-one rosettes in mid-November to early winter when plant is still green. Glyphosate is recommended for use in forested areas. Triclopyr can be applied in areas with grasses during the growing season.

A.3.2.3 Monitoring and Retreatment

Sites should be monitored once or twice annually over a 5 year period and new growth treated by hand pulling or foliar application of herbicide to seedlings.

A.4 PORCELAIN BERRY *(Ampelopsis brevipedunculata)*

A.4.1 Description

Porcelain berry is a deciduous climbing vine in the grape family that can grow to a height of 16 feet with support. The leaves are bright green and slightly hairy on the underside, with 3-5 lobes per leaf (VNHP, 1998d). Young twigs are also hairy. Small, inconspicuous, yellow flowers bloom in mid-summer (Antenen, 1996). The fruits of the plant distinguish it from similar species and form in late summer, and mature in the fall. They are hard and change

color from white to pastel shades of yellow, lilac, and green, and finally to a sky blue color (VNHP, 1998d). The plant is spread predominantly through seed dispersal by birds but can also reproduce vegetatively from stem or root segments (NJDEP, 2004).

Porcelain berry grows well in moist soils, along pond margins, and stream banks. It tends to initially colonize disturbed open areas, such as forest edges and forest gaps. It is especially abundant in open thickets and sand dunes along coastal portions of New Jersey (NJDEP, 2004). Porcelain berry favors areas of full sunlight to partial shade and is less tolerant of heavily shaded areas (Young, 2005).

Porcelain-berry vigorously invades open and wooded habitats and spreads quickly in areas with high to moderate light. It forms thick mats which shades out native plants and alters wildlife habitat as it spreads and climbs over shrubs and other vegetation (NJDEP, 2004).

A.4.2 Control Methods

A.4.2.1 Mechanical Treatment

Hand pull vines in fall or early spring before flowering (prior to mid-June) or before fruiting in September to prevent seed production. Larger vines can be cut to the ground and then repeat cutting of regrowth as needed.

A.4.2.2 Chemical Treatment

From summer to fall (June through October), foliar applications of a 2.5% solution of triclopyr to leaves or cutting the plants allowing for some regrowth and then applying herbicide is recommended. For basal bark applications to vines 2 to 3 feet long, a 20-30% solution of triclopyr mixed with basal oil, horticultural oil, diesel fuel, or kerosene to sections should be applied on the stem near the base of the vines.

A.4.2.3 Monitoring and Retreatment

Retreatments should be conducted during the growing season annually for several years by either hand pulling or treating seedlings with herbicide.

A.5 MUGWORT OR COMMON WORMWOOD (*Artemesia vulgaris*)

A.5.1 Description

Artemisia vulgaris is a perennial herb that can reach 2 to 4 feet in height, with many thin lateral roots. The stems are branched and parallel grooved with twigs covered with short hairs. The leaves are papery, deeply lobed, and alternate on the stem. The purple and yellow flowers are small and range in number from 8 to 20 and are clustered at the top of the plant (Bradley and Hagwood, 2001). The fruits appear from August to October. Mugwort reproduces vegetatively by means of rhizomes (Jordan et al., 2002).

Mugwort grows in high-elevation pastures, forest edges, valleys, hillside wasteland, ditches, and roadsides.

Mugwort is a rapidly growing herb that is spread easily. It becomes a dominating groundcover species that out competes native species for space and nutrients.

A.5.2 Control Methods

A.5.2.1 Mechanical Treatment

Mow mugwort infestations 2 or 3 times each year for 3 years.

A.5.2.2 Chemical Treatment

Chemical treatment consists of foliar application of 1.5 to 2% glyphosate herbicide solution in water for 2 consecutive years in late summer (August and September).

A.5.2.3 Monitoring and Retreatment

Monitor treated sites annually and hand pull or retreat with foliar application of glyphosate as needed.

A.6 JAPANESE BARBERRY (*Berberis thunbergii*)

A.6.1 Description

Japanese barberry is a woody deciduous shrub with dense spiny branches. It typically grows 2-3 feet high but can reach up to 6 feet in height. The simple rounded leaves form rosettes along the branches in an alternate pattern. Below the rosettes there is a spine of wedge-shaped untoothed leaves (Brunelle and Lapin, 1996). It produces small clusters of yellow flowers along the stem in spring. The flowers produce bright red oblong berries in late summer. Reproduction is primarily through seeds that are dispersed by birds and small mammals (Brunelle and Lapin, 1996, WDNR, 1998), although it can develop vegetatively from roots and branches (NJDEP, 2004).

Barberry is shade tolerant, drought resistant, and highly adaptable (NPS, 2004). Barberry can be found along roads and in old fields and open forests. It also grows along forest edges and in disturbed areas. It can be found in moist areas such as along stream or river banks as well as in saturated soils (NJDEP, 2004).

Barberry forms thick under stories which crowd out and prohibit the establishment of native plants. This degrades wildlife habitat and the recreational value of lands. Barberry also alters soil properties including pH, nitrogen levels, and biological activity (NPS, 2004).

A.6.2 Control Methods

A.6.2.1 Mechanical Treatment

For small infestations, mechanical removal in early spring (late March or April) by hand pulling or with a hoe, weed wrench, or mattock is suggested to remove the entire bush and root system.

A.6.2.2 Chemical Treatment

For larger infestations, a 2% solution of glyphosate mixed with water and a surfactant should be applied in late summer (end of August through September) during fruiting. Triclopyr or glyphosate may be used on cut stumps or as a basal bark application in a 25% solution with water, covering the outer 20% of the stump.

A.6.2.3 Monitoring and Retreatment

Monitor treated sites annually and hand pull or retreat with foliar application of glyphosate as needed

A.7 ASIAN OR ORIENTAL BITTERSWEET (*Celastrus orbiculatus*)

A.7.1 Description

Asian bittersweet is a deciduous, woody, perennial vine which sometimes grows as a trailing shrub. The leaves are arranged alternately along the stem and are glossy, rounded and finely toothed. Asian bittersweet flowers in spring, producing clusters of small greenish flowers in the leaf axils (NJDEP, 2004). Fruits mature in late summer to early fall and the capsule that surrounds the seeds ripens to a bright orange. Asian bittersweet reproduces prolifically by seed which are dispersed by birds and small mammals. The vine also reproduces vegetatively by stolons (above-ground stems), rhizomes, and through root suckering (NJDEP, 2004, Bergmann and Swearingen, 1999). Asian bittersweet is easily confused with the native climbing bittersweet vine (*Celastrus scandens*), which flowers at the tips rather than along the stems, and it is imperative that correct identification be made before controls are attempted (Bergmann and Swearingen, 1999).

Asian bittersweet infests forest edges and gaps, floodplains, early successional fields, hedgerows, coastal areas, and salt marsh edges (Bergmann and Swearingen, 1999). It is often found in open sunny areas but it can tolerate shade and can establish under a closed forest canopy (NJDEP, 2004, Bergmann and Swearingen, 1999).

The vine aggressively invades areas and covers vegetation killing it by preventing photosynthesis, girdling, and uprooting from the massive weight (Bergmann and Swearingen, 1999). It threatens dune areas by altering erosion patterns and out competing native dune vegetation (NJDEP, 2004). Asian bittersweet is displacing the native American bittersweet through competition for resources and hybridization (NJDEP, 2004, Bergmann and Swearingen, 1999).

A.7.2 Control Methods

A.7.2.1 Mechanical Treatment

Hand pull plants between April and August before fruiting in small areas of infestation. All plant parts should be removed from the site to prevent reestablishment.

A.7.2.2 Chemical Treatment

Foliar application of triclopyr herbicide as a 2% solution (8 ounces per 3-gallon mix) in water with a surfactant should occur from July to October.

For stems too tall for foliar sprays, apply triclopyr herbicide as a 20% solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) with a penetrant to the lower 16 inches of stems as a basal spray. Or cut stems and immediately treat surface with triclopyr or glyphosate herbicide as a 25% solution (32 ounces per 1-gallon mix). September through October would be recommended.

A.7.2.3 Monitoring and Retreatment

Because seeds of Asian bittersweet are persistent in the soil, annual monitoring and follow up treatment of seedlings either through hand pulling or foliar herbicide application should be conducted as needed. Where clones have been well established, monitoring and retreatment should occur annually for 5 or more years.

A.8 SPOTTED KNAPWEED (*Centaurea biebersteinii*)

A.8.1 Description

Spotted knapweed is a biennial herb that grows in clumps, with one plant giving rise to 1 to 20 slender, up right stems 1 to 3 feet in height (VNHP, 1999e). Its name is derived from the spots formed by black margins on the flower bract tips. Seedlings form a rosette of pinnately to bipinnately dissected leaves 4 to 8 inches long. The flowering stems are branched above the middle and sparsely to densely hairy. Stem leaves are pinnate low on the stem and alternate and become smaller towards the tip of the stem. They are unstalked, and may be slightly lobed, or linear and unlobed. The flowers at the end of the stems are thistle-like and

are commonly pink or purple, rarely white (Carpinelli, 2003). Leaf like bracts surrounding the base of the flower head are oval and yellow green, becoming brown near the base. The bract margins have a soft spine like fringe, with the center spine being shorter than the lateral spines. The seeds are brown and oval, are 1/16 to 1/8 inch long, with pale longitudinal lines and a short fringe on one end (Carpinelli, 2003). The plants bloom from June to October. The seeds are dispersed near the parent plant but can be dispersed further by people, wildlife, and vehicles (Carpinelli, 2003).

Spotted knapweed grows in dry sterile, gravelly, or sandy openings such as pastures, old fields, and roadsides and establishes and spreads rapidly in disturbed areas (VNHP, 1999e, Carpinelli, 2003).

Infestation of spotted knapweed leads to a decline in biodiversity, decrease in native plant and wildlife habitat, and reduced quality forage for wildlife. In New Jersey, spotted knapweed invades areas where it replaces native plant species and significantly alters plant community structure (NJDEP, 2004). Spotted knapweed infestation can also degrade soil stability, resulting in increased erosion, surface runoff, and stream sedimentation (Carpinelli, 2003).

A.8.2 Control Methods

A.8.2.1 Prevention

Spotted knapweed reproduces by seed, so it is important that the production and spread of seed be limited as much as possible. Travel through infested areas should be avoided or minimized. Do not drive vehicles through infested areas. If an infested area is driven through, thoroughly clean the underside of the vehicle. If walking or hiking through an infested area, clothing, shoes, backpacks, should be cleaned to avoid spread to non-infested areas.

A.8.2.2 Mechanical Treatment

Hand-pulling of plants, ensuring the removal of tap root and crown, during the summer (June through August) prior to seed set can be used to control light infestations. Gloves should be worn because of the possibility of skin irritation.

Mowing or hand-cutting should be conducted early in summer (June and July) when in the flower stage as plants are less likely to regrow if allowed to bolt before cutting. Mechanical treatments will need to be repeated over several years.

Because it is thought to be a carcinogen, protective clothing and gloves should be worn when treating spotted knapweed.

A.8.2.3 Chemical Treatment

Spot spray knapweed with a 3% solution of triclopyr in the water-soluble formulation with dye can be sprayed on the entire plant. This application should be repeated 3-4 times per year for two years. Spot spray application of 2% glyphosate effectively controls knapweed plants also. Apply to actively growing plants in the bud stage (July or August).

A.8.2.4 Monitoring and Retreatment

Mechanical treatments need to be repeated over several years to control populations. Annual applications of glyphosate herbicides are recommended over several years to exhaust the seed bank. Triclopyr would need to be applied multiple times per year over the growing season and the process repeated for 2 years.

A.9 CANADIAN THISTLE (*Cirsium arvense*)

A.9.1 Description

Canada thistle is an herbaceous perennial that can grow to 5 feet in height with prickly leaves and an extensive creeping rootstock. Stems are branched, often slightly hairy, and ridged. It has lance-shaped, dark green, sharp, bristly leaves that are borne singly and alternate on the stem. It can be distinguished from other thistles by creeping lateral root system, dense clonal growth, and small (1–1.5 cm diameter) dioecious flowerheads (Nuzzo, 1998a).

Flowers which range in color from lavender to pink or white and occur in rounded umbrella shaped clusters appear from June through October. The seeds are 1 to 1 ½ inches long and have a feathery structure at the base (Thunhorst and Swearingen, 1998). One plant can produce nearly 40,000 seeds, which may remain viable in the soil for up to 20 years

(NJDEP, 2004, Thunhorst and Swearingen, 1998). Seeds are easily dispersed by the wind. Vegetative reproduction is accomplished by the lateral root system, from which shoots sprout up at frequent intervals, and by regeneration from root fragments.

Canadian thistle prefers open areas with full sun. It is found in open disturbed sites such as roadsides, ditches, and fields, but also occurs in meadows and limestone fens (NJDEP, 2004, VNHP, 1999a). It will also invade barrens, glades, savannahs, meadows, and dunes (VNHP, 1999).

Canadian thistle crowds out and replaces native plants, alters native plant community structure and composition, and reduces biodiversity. It prevents the growth of other native species through shading, competition for soil resources and through the release of chemical toxins poisonous to other plants (VNHP, 1999a, Thunhorst and Swearingen, 1998).

A.9.2 Control Methods

A.9.2.1 Mechanical Treatment

Cut small infestations 3 times a year in June, August, and September. Mow larger infestations in late June to prevent seed production and again in early fall (September).

A.9.2.2 Chemical Treatment

Foliar application of glyphosate at a low concentration, 2.5% solution, in the fall (September through October) when leaves are still green is most effective.

A.9.2.3 Monitoring and Retreatment

If using mechanical treatments, sites need to be monitored 2 or 3 times a year and retreated as needed. If using herbicides, monitoring should be done annually and repeated as necessary to eliminate the seed bank.

A.10 CROWN VETCH (*Coronilla varia*)

A.10.1 Description

Crown vetch is a perennial herb in the pea/legume family with creeping stems that may reach 2 to 6 feet in height (VNHP, 1999b). The leaves are dark green and odd-pinnately-compound that bear 9 to 25 leaflets that are generally oblong, elliptic to obovate in shape (Tu, 2003).

The pea-like flowers appear from late spring through summer, and occur bunched (14 to 20 flowers) in umbels on extended stalks. The flowers vary in color from pinkish-white to deep pink. The seed pods are leathery, slender and 2 to 3 inches long (Tu, 2003). This plant can be distinguished from other legumes by the odd number of leaflets, the leaves and flower stalk arise from the main stem, and the flowers occur in a radiating cluster or umbel (VNHP, 1999b). Crown vetch has a multi-branched root system and can spread vegetatively by its strong fleshy rhizomes.

Crown vetch can tolerate a wide range of environmental conditions however it prefers open sunny areas. It can be found along roadsides, rights-of-way, open fields, waste grounds and on gravel bars and it can invade high quality wildlands and dune areas (Tu, 2003).

Crown vetch can invade and dominate a variety of vegetation types due to its prolific seeding ability and its rapid rate of vegetative spread via its rhizomes, which can create dense monotypic stands. Infestation results in a decrease in biodiversity and disruption of natural successional processes. It competitively excludes growth of native species due to shading and thereby degrades native wildlife habitat (Tu, 2003). In areas infested with crown vetch, soil nitrogen is increased due to its ability to fix nitrogen with a symbiotic cyanobacteria and fuel loads are altered in fire-adapted communities (Tu, 2003).

A.10.2 Control Methods

A.10.2.1 Mechanical Treatment

Late spring mowing repeated over several years is effective.

A.10.2.2 Chemical Treatment

When using herbicides, complete coverage of all stems is necessary for good control. Foliar application of 1 or 2% glyphosate solution or 2% solution of triclopyr in early spring (end of March and April) when the plant is actively growing can be effective. Follow-up treatments in the fall or early spring are necessary to obtain good control results.

A.10.2.3 Prescribed Fire

Burn in late spring followed by application of 1-2% glyphosate solution in the fall (end of September through November) is most effective.

A.10.2.4 Monitoring and Retreatment

Sites should be monitored annually and retreated either with mowing or foliar application of herbicide as needed.

A.11 COMMON OR WILD TEASEL (*Dipsacus fullonum*) CUT-LEAF TEASEL (*Dipsacus laciniatus*)

A.11.1 Description

Teasels grow as prickly biennial or perennial herbs with hollow stems that grow up to 2 meters tall. They form a rosette of lanceolate, prickly leaves in spring, and overwinter as rosettes. The rosette leaves have a wrinkled appearance and have margins with rounded or 'scalloped' teeth. The second year leaves are simple and opposite. The lower stem leaves can have scalloped edges. Compared to the wild teasel, the cut-leaf teasel tends to have broader leaves with deeply incised lobes. Flowers bloom from July to September and are egg-shaped in outline but cut off squarely at the base and are 4 to 10 centimeters long. The flowers of the wild teasel consist of many individual purple to pink flowers that bloom in a circular pattern around the seedhead (NJDEP, 2004, VT, 2005). Flowers of the cut-leaf teasel are white. Several long, spiny bracts branch out from the base of the flower and curve upward around the head. The seeds are ribbed, hairy, and 4-5 mm long (NJDEP, 2004). A single plant can produce approximately 3,000 seeds (ODNR, 2003b).

Teasels prefer open sunny conditions in mesic to dry habitats (ODNR, 2003b). The cut-leaf teasel can tolerate wetter soils than the wild teasel and both can tolerate saline conditions (ODNR, 2003b). Teasels are commonly found in abandoned fields, pastures, along roadsides, and in waste places, but they also invade natural plant communities, such as limestone fens, meadows, moist forest openings, and stream corridors (NJDEP, 2004, ODNR, 2003b).

The prolific seed production and high germination rate of these species allow it to successfully invade areas and develop monocultures which enable it to out compete native species (ODNR, 2003b). Teasels significantly alter the structure of rare natural plant communities and reduce plant diversity (NJDEP, 2004).

A.11.2 Control Methods

A.11.2.1 Mechanical Treatment

For small infestations, hand pull rosettes in late fall or early spring ensuring that the entire root is removed. Stems can be cut once the plant has initiated flowering from July to September. The cut stalks should be removed as seeds will continue to develop and mature even after cutting.

A.11.2.2 Chemical Treatment

Foliar herbicide application of glyphosate (1.5 to 2% solution with water) or triclopyr at 2% solution should be applied to actively growing teasel in the rosette stage, late fall or early spring.

A.11.2.3 Monitoring and Retreatment

Sites should be monitored annually and retreated either with mechanical methods or foliar application of herbicide as needed. Cutting and hand pulling will need to occur over 2 to 3 year period.

A.12 AUTUMN OLIVE (*Elaeagnus umbellate*)

A.12.1 Description

Autumn olive is a deciduous shrub or small tree that can grow to a height of 20 feet. The dark green leaves are simple, oval to lance shaped, and alternate with silver-white scales on the underside (VNHP, 1998a). Small, light yellow flowers along the twigs, are produced in the spring following emergence of the leaves. The fruit, which ripens in late summer, is small, pink or red and dotted with silver-white scales. Birds eat and disperse the fruits. The autumn olive is commonly confused with the Russian olive which can be distinguished by its narrower lance-shaped leaves, silvery on both sides, thorny branches, and yellow, dry, mealy fruits (VNHP, 1998a).

Autumn olive is able to thrive in poor soils due to its nitrogen-fixing root nodules (VNHP, 1998a). Typical habitats include disturbed areas, roadsides, pastures, fields, forest edges, and open woodlands. According to the NJDEP (2004), it also invades uncommon or rare plant communities including limestone and trap rock woodlands, shale bluffs, glades, limestone fens and meadows, and dune thickets.

Autumn olive is an aggressively out competes native plants through its prolific fruiting, ability to resprout after cutting or burning, and its ability to alter soil properties by affecting the nitrogen cycle. It can also produce dense shade suppressing native plants that require sunlight. Dense monocultures of the species results in reduced biodiversity and alteration of the natural plant community structure (NJDEP, 2004, VNHP, 1998a).

A.12.2 Control Methods

A.12.2.1 Mechanical Treatment

For small infestations, remove small plants and seedlings by hand.

A.12.2.2 Chemical Treatment

For seedlings, a foliar application of 1-2% solution of glyphosate in late August or September is effective for small infestations. For larger trees, basal bark application of triclopyr herbicide as a 20% solution with basal oil, diesel fuel, or kerosene with a penetrant to

young bark in January to February or May to October. Cut stump application of glyphosate herbicide as a 10-20% solution is also effective for larger trees.

A.12.2.3 Monitoring and Retreatment

Retreat seedlings with herbicide or hand pulling. Monitor annually and retreat as necessary.

A.13 WINGED SPINDLETREE (*Euonymus alata*)

A.13.1 Description

Winged spindletree is a deciduous shrub that can grow to 20 feet in height. It has small inconspicuous green flowers that appear in May to early June. It has elliptical to obovate, opposite to sub-opposite, toothed leaves. The leaves turn bright red to purplish red in the fall before dropping, which is why it is also called burning bush. The fruits are red or purple and are dispersed by birds (NJDEP, 2004).

Winged spindletree grows well in full shade and full sun. It is frequent in rich woodlands over trap rock, shale, and limestone. It also grows in alluvial soils in floodplain forests and along stream banks (NJDEP, 2004).

Winged spindletree is able to replace native plants, alter native plant community structure and composition, and reduce biodiversity due to its ability to tolerate a range of environmental conditions, its ease of dispersal, and high rate of germination (NJDEP, 2004, VNHP, 1999f). Open woodlands and floodplain forests are particularly vulnerable, but upland forests are also invaded (NJDEP, 2004).

A.13.2 Control Methods

A.13.2.1 Mechanical Treatment

For small infestations, remove small plants and seedlings by hand.

A.13.2.2 Chemical Treatment

For larger trees, cut specimens and apply 50-100% solution of glyphosate immediately to surface of stump. For very large infestations where cutting is not practical, foliar application of an imazapyr herbicide as a 1% solution in water with a surfacant during early summer (mid-June through mid-July). Or apply a triclopyr herbicide as a 20% solution in basal oil, diesel fuel, or kerosene (2.5 quarts per 3-gallon mix) with a penetrant to young bark as a basal spray (January to February or May to October).

A.13.2.3 Monitoring and Retreatment

Retreat seedlings and resprouts with herbicide or hand pulling annually as needed.

A.14 ENGLISH IVY (*Hedera helix*)

A.14.1 Description

English ivy is an evergreen climbing vine. It has the ability to attach to trees and structures by way of numerous, small rootlike structures, which exude a gluelike substance (Swearingen and Diedrich, 2000). Vines can reach a foot in diameter. Leaves are green and waxy and arranged alternates on the stem. The leaves can vary in shape with the most common being a 3-lobed leaf with a heart-shaped base. Leaves in full sun are often unlobed, oval and have wedge-shaped bases (Swearingen and Diedrich, 2000). Mature plants will bear greenish-white flowers in the fall. The fruit which matures in the spring is berry-like and black.

English ivy grows easily in many types of soil and in sun or shade and it is fairly drought tolerant (Morisawa, 1999). It does not grow well in extremely wet conditions. It is often associated with disturbance and infests woodlands, forest edges, fields, hedgerows, coastal areas, salt marsh edges, and other upland areas (Swearingen and Diedrich, 2000).

English ivy is an aggressive invader and out competes grasses, herbs and trees, often reducing animal feeding habitats (Morisawa, 1999, Swearingen and Diedrich, 2000). The dense growth and abundant leaves prevent sunlight from reaching other plants. Vines climbing up tree trunks prevent sunlight from reaching the leaves of the host tree which results in a loss of host tree vigor and eventual death of the tree. The weight of the vines also make trees susceptible to blow-over during storms. English ivy also serves as a reservoir for bacterial leaf

scorch (*Xylella fastidiosa*), a plant pathogen that is harmful to native trees such as elms, oaks, and maples (Swearingen and Diedrich, 2000). In addition, the ivy is can be harmful to humans and it contains toxic compounds that can cause gastrointestinal problems, nervous conditions, and dermatitis in sensitive individuals.

A.14.2 Control Methods

A.14.2.1 Mechanical Treatment

Vines on the ground can be pulled up by hand. Vines climbing into trees should be cut using a hand-tool and the rooted portion of the plant pulled. Because cutting will promote regrowth at the base, monitoring and repeated cuttings are necessary for long-term control.

A.14.2.2 Chemical Treatment

Cut-stump application of a 1:1 ratio of glyphosate herbicide to water solution to cut vines is effective. Because English ivy is an evergreen, herbicides can be applied any time the temperature is above 55º Fahrenheit.

Foliar applications can be conducted from summer to fall with a 2.5% mixture of triclopyr amine (Garlon 3A®) and water to the leaves or cut first, allow to regrow, and repeat the application to the new foliage.

A.14.2.3 Monitoring and Retreatment

Sites should be revisited after several months for any resprouting from roots that were missed the first time. English ivy grows slowly, and once the roots have been eliminated the only follow-up necessary should be annual monitoring, with re-pulling of any new seedlings or regrowth.

A.15 CHINESE BUSH-CLOVER (*Lespedeza cuneata*)

A.15.1 Description

Chinese bush-clover is an aggressive warm season, perennial legume (NJDEP, 2004, Remaley, 1998). It has an erect growth form and can range in height from 1.5 to 5 feet. Leaves

alternate on the stem and each leaf is divided into three smaller leaflets, about ½ to 1 inch long, which are narrowly oblong and pointed, and are covered with flattened hairs that give the leaves a grayish-green appearance (NJDEP, 2004, Remaley, 1998). Small cream-colored flowers with purple marking grow in the leaf axils from the middle and upper parts of the branches. The flowers bloom from July through October (Stevens, 2002). This specie can reproduce by seeds, as well as spread vegetatively, forming dense stands with many upright stems.

Chinese bush-clover is adapted to a wide range of conditions but is intolerant of shade. It occurs in disturbed habitats such as along roads, ditches, railroad tracks, abandoned fields, meadows, and marshes. According to the NJDEP (2004), it reaches its greatest abundance on the Coastal Plain in New Jersey where it grows along the edge of pine and oak woodlands and in dry, sandy soils in successional communities within the Pine Barrens.

Chinese bush-cover, is primarily a threat to open areas such as meadows, prairies, open woodlands, wetland borders and fields. It crowds out native species and develops an extensive seed bank. It alters natural successional patterns by displacing shade intolerant early successional species (NJDEP, 2004). It also produces tannins that inhibit the growth of other plants, that make it unpalatable to native wildlife species, and promotes the formation of monotypic stands (Remaley, 1998, Stevens, 2002).

A.15.2 Control Methods

A.15.2.1 Mechanical Treatment

Plants can be mowed during the flower bud stage (mid-May to mid-August) for up to 3 consecutive years ensuring that plants are cut as low to the ground as possible.

A.15.2.2 Chemical Treatment

Foliar applications with herbicides should occur June to August. In dry areas, a 2% solution of triclopyr mixed with water is effective prior to branching or during flowering (August through October). On wet sites a 2% solution of an aquatic-approved glyphosate (Rodeo®, Aquamaster®) is effective from late June until October.

A.15.2.3 Monitoring and Retreatment

Monitor annually and retreat by hand pulling or foliar application of herbicide as needed.

A.16 JAPANESE HONEYSUCKLE (*Lonicera japonica*)

A.16.1 Description

Lonicera japonica grows as a perennial climbing woody vine that can grow to more than 30 feet in length. The leaves are opposite and oval to oblong and 1.5 to 3 inches (VNHP, 1998b). The leaves are semi-evergreen and are all separate, which distinguishes them from the indigenous vine honeysuckles, which have leaves joined at the base (NJDEP, 2004). Some leaves are retained through the winter (Nuzzo, 1998b). Young stems are often hairy, reddish-brown to light brown, and older stems are hollow with a brownish bark that peels in long strips (VNHP, 1998b). Extremely fragrant flowers are produced throughout the summer and are borne in pairs on axillary peduncles (Nuzzo, 1998b). The tubular flowers are typically white (fading to yellow) with long curved stamens projecting from the corolla. Black globose berries mature in the early autumn (VNHP, 1998b). The berries are distinct from native honeysuckle fruits which are red to orange-red (Nuzzo, 1998b, VNHP, 1998b). The fruits are bird dispersed. Japanese honeysuckle creates dense thickets by stem branching, rooting at the nodes, and vegetative spread from rhizomes (Nuzzo, 1998b).

Japanese honeysuckle tolerates a wide range of environmental conditions but grows most vigorously in full sun and on rich soil (Nuzzo, 1998b). It establishes in disturbed areas including fields, roadsides, forest edges, and fencerows (Nuzzo, 1998b). In New Jersey the species also grows in limestone woods, trap rock glades, flood plain forests, sand dunes, beaches, salt marsh borders, Coastal Plain marl ravines, borders and thickets of Coastal Plain ponds, oak and pine woodlands, and shale bluffs (NJDEP, 2004). It invades natural communities after disturbance such as from floods or windstorms (VNHP, 1998b).

Japanese honeysuckle vines grow and spread rapidly and are strong competitors, for both above and below-ground resources (Nuzzo, 1998b). It can affect native vegetation by decreasing light availability, depleting soil moisture and nutrients, or collapsing shrubs and trees from the weight of the accumulated vines (VNHP, 1998b). In New Jersey, it occupies

habitats of rare plants resulting in decline of these species (NJDEP, 2004). Honeysuckle also leafs out very early in spring, which could inhibit flowering by spring ephemerals (Nuzzo, 1998b). The change in native plant communities results in alteration of habitat used by native wildlife species (VNHP, 1998b).

A.16.2 Control Methods

A.16.2.1 Mechanical Treatment

Repeated removal of smaller vines and roots by hand when the soil is loose is effective for small areas of infestation. All parts of the plant should be removed from the site to prevent re-establishment. For larger infestations, mow twice a year in mid-July and mid-September to limit spread.

A.16.2.2 Chemical Treatment

Foliar application of 2.5% glyphosate mixed with water and an appropriate surfactant or 2% solution of triclopyr in water from spring through fall.

A 25% glyphosate or triclopyr mixed in water applied to cut stems can be applied any time of year when the ground is not frozen.

A.16.2.3 Prescribed Fire

In fire adapted habitats, prescribed burning in November through March followed by application of glyphosate a month after resprouts emerge (March or April) can be effective.

A.16.2.4 Monitoring and Retreatment

Mechanical treatments by mowing need to be conducted twice year and monitoring should occur annually and retreated as needed.

A.17 MORROW'S BUSH HONEYSUCKLE (*Lonicera morrowii*)

A.17.1 Description

Morrow's bush honeysuckle are upright, multi-stemmed, oppositely branched, deciduous shrub that ranges from 6 to 15 feet in height (Batcher and Stiles, 2000). Like the other invasive honeysuckles, its stem is hollow which distinguishes it from indigenous species. Morrow's bush honeysuckle has downy leaves that are simple, entire, opposite, and are oblong to ovate in shape, ranging in length from 1 to 2.5 inches (NJDEP, 2004). Pairs of tubular fragrant flowers are borne in the leaf axils along the stems in spring that are white and turn pale yellow with age. The many seeded fruit is red and are dispersed by birds (Batcher and Stiles, 2000, NJDEP, 2004).

Morrow's honeysuckle is widespread and can be found in disturbed areas and at the edges of forests and wetlands, but they can also be found in forested areas (NJDEP, 2004). In New Jersey, this plant has been collected from disturbed or successional habitats such as old fields, roadsides, thickets, and fencerows. In addition, it has been found in calcareous woods and bluffs, rich rocky woods, traprock glades, floodplain forests, calcareous fens, and damp woods (NJDEP, 2004).

Morrow's honeysuckle grow rapidly and overtake a site forming a dense shrub layer that adversely affect native woody and herbaceous plants. The honeysuckle decreased light availability and depletes soil moisture and nutrients (NJDEP, 2004). This honeysuckle may also be allelopathic, releasing toxins into the soil, prohibiting the establishment of native species. The fruits of the bush honeysuckle are also not high in fats and nutrients thereby degrading the quality of foraging materials for birds and small mammals (Batcher and Stiles, 2000).

A.17.2 Control Methods

A.17.2.1 Mechanical Treatment

Small infestations can be cleared with hand-tools ensuring the entire root is removed. Larger infestations can be controlled by cutting twice a year, once in the early spring (mid-March through mid-April) and once in the late summer (September).

A.17.2.2 Chemical Treatment

Herbicides can be used either as a foliar or cut-stump application. For cut-stump treatments, 20-25%solutions of glyphosate or triclopyr should be applied from late summer through the dormant season (August through November). A 2% solution of the herbicides should be used for foliar applications late in the growing season (September and October) when leaves are still green.

A.17.2.3 Prescribed Fire

Repeated prescribed burning annually during the growing season (April through October) will inhibit new shoot production.

A.17.2.4 Monitoring and Retreatment

Monitoring of sites and retreatments need to be conducted 3 to five years post initial treatment. Prescribed fires should be conducted every year or every other year for several years to have effective control.

A.18 PURPLE LOOSESTRIFE (*Lythrum salicaria*)

A.18.1 Description

Purple loosestrife is an erect perennial herb with a square woody stem that reaches up to 3 to 4 feet in height (NJDEP, 2004). The leaves are usually opposite or whorled in groups of three or four along the stem. The leaves are lance-shaped without a stalk and heart-shaped or rounded at the base (Swearingen, 2005b). Showy flowers of magenta or white or light pink are produced from June to September each with 5 to 7 petals which occur in dense clusters on terminal spikes (NJDEP, 2004, VNHP, 1999d). Mature plants can have from 30 to 50 stems arising from a single rootstock which are capable of producing two to three million, minute seeds per year (Swearingen, 2005b). The seeds are mostly wind dispersed, but they can be transported on the feet of waterfowl, by other wetland animals, and on the water (NJDEP, 2004). Purple loosestrife can also reproduce vegetatively through underground stems (Swearingen, 2005b).

Purple loosestrife invades a variety of wetland habitats, including wet meadows, marshes, river banks, and the edges of ponds and reservoirs (Swearingen, 2005b). In New Jersey it occurs along river edges, lake and pond shores, salt and freshwater marsh edges, meadows, limestone fens, floodplain forests, and from disturbed areas such as ditches and filled wetlands (NJDEP, 2004).

Purple loosestrife adapts readily to natural and disturbed wetlands. As it establishes and expands due to its prolific seed production and rapid growth, it out competes and replaces native grasses, sedges, and other flowering plants. Its ability to form dense, monotypic stands restricts native wetland plant species and reduces habitat for waterfowl (Swearingen, 2005b). Dense stands can also change drainage patterns by restricting the flow of water (Colorado Division of Plant Industry, 2000). It is a threat to state listed sensitive plant species and rare limestone fens, which support a diverse assemblage of rare plants, animals, and insects (NJDEP, 2004). According to the NJDEP (2004), purple loosestrife threatens populations of the federally listed bog turtle (*Clemmys muhlenbergii*) and the state listed endangered wiry panic grass (*Panicum flexile*) due to habitat loss.

Early detection of this species is important as it is easier to control smaller populations. Large populations are not easy to control as current methods for eradicating large, dense populations of loosestrife are not totally effective. Small populations can be controlled by hand-pulling before flowering so as not to disperse the seeds. Spot application of glyphosate herbicide is most common for purple loosestrife control. Broadleaf herbicides can also be used on larger infestations where spot applications are not practical (MNAP, 2005).

A.18.2 Control Methods

A.18.2.1 Mechanical Treatment

Mechanical removal is recommended for small populations and isolated stems. Pull plants from early July through August before seed has set. Clip flowers in early July through August to prevent seed dispersal and cut stems close to the ground. Bag and remove all plant material.

A.18.2.2 Chemical Treatment

Cut-stem application of glyphosate to stems cut 6 inches above the ground. Or spray seedlings before they reach 12 inches in height with glyphosate. Application of 20 to 30% glyphosate solution to stems cut at about 6 inches is also recommended as being safe for native species. Spraying should be conducted prior to the peak bloom period of late August.

Use broadleaf herbicides such as triclopyr for larger infestations. These herbicides will minimize harm to grasses and other grass-like species which are dominant in most wetlands.

A.18.2.3 Biological Treatment

Three biological control species, a root-mining weevil (*Hylobius transversovittatus*), and two leaf-feeding beetles (*Galerucella calmariensis* and *Galerucella pusilla*) are approved for use on purple loosestrife. The NJARNG may collaborate with New Jersey Department of Environmental Protection (NJDEP) in the future to release biocontrols on NJARNG lands to control purple loosestrife. Because establishment and development of biological controls and better herbicides are several years away, containment and minimizing seed production are the present control objectives for large dense populations.

A.18.2.4 Monitoring and Retreatment

Follow up treatments must be conducted the same growing season and for several years following initial treatment to treat plants that were missed and new seedlings.

A.19 YELLOW SWEETCLOVER (*Melilotus officinalis* including *Melilotus alba*)

A.19.1 Description

Yellow sweetclover (including *M. alba*, or white sweetclover) is an erect biennial herbaceous plant of the pea family. In the first year, the plants are small with a smooth multi-branched stem. The leaves are alternate and divided into 3 finely toothed leaflets. In the second year, the root system grows rapidly and the bushy plant reaches heights of 3 to 5 feet. The second year plant produces yellow or white flowers which are held in small spike-like racemes from May to September (ODNR, 2003c, NJDEP, 2004). The seeds form in small leathery pods, and are mostly dispersed by water but wind can also facilitate spread of seeds. A

single plant can bear an estimated 350,000 seeds (ODNR, 2003c). Seedling development occurs from mid-March through April although some seedlings continue to emerge until fall.

Yellow sweetclover has adapted to a variety of climatic conditions. Its long tap root allows it to withstand drought conditions and make it winter-hardy. They grow well in calcareous soil and can survive in nutrient poor areas due to their ability to fix nitrogen (ODNR, 2003c). Yellow sweetclover grows in opened, disturbed areas, such as roadsides, fallow fields, and utility corridors (ODNR, 2003c). It also grows in open habitats maintained by natural disturbances such as fire, flooding, or ice scouring. Sweet-clover invades upland habitats such as prairies, dunes, alvars, and meadows. It can also invade moist habitats such as limestone fens and in northwestern New Jersey it occurs abundantly on calcareous riverside seepage communities along the Delaware River (NJDEP, 2004).

Yellow sweetclover out competes native vegetation for space, light, nutrients, and water. They threaten plant species that depend on open areas such as stream edges, fens, floodplains, and dunes. Once established they can alter community structure and succession. The seeds can stay viable in the seed bank for several years and have been shown to be viable up to 30 years (NJDEP, 2004, ODNR, 2003c).

A.19.2 Control Methods

A.19.2.1 Mechanical Treatment

Hand pulling of small infestations of first year plants should occur in late summer/early fall (August to September). Second year plants can be hand pulled in spring and summer before plants go to seed.

A.19.2.2 Prescribed Fire

It is recommended that prescribed fires for control of sweetclover in an even-age stand should be conducted in the dormant season (late fall or early spring) to stimulate germination in the subsequent growing season.

This should be followed by a later spring burn the next season to eliminate the second year plants before they set seed. Another option is to mow the first year plants in mid-to-late

August leaving the cut tops to dry in the field and then burn again in mid-to-late September. For control of uneven aged stands it is recommended that burning for 3 to 5 years take place in late spring after shoots emerge (May and June) but prior to second-year plants set seed.

A.19.2.3 Monitoring and Retreatment

Because seeds remain viable in the soil for several years, monitoring and repeated treatments will be needed. Patches should be monitored several weeks after a prescribed fires and hand pull those plants that survived or escaped the burn.

A.20 JAPANESE STILTGRASS (*Microstegium vimineum*)

A.20.1 Description

Japanese stiltgrass is a shade tolerant C4 grass that forms dense mats. It is a straggling plant that reaches up to 2 ½ to 3 feet in height. The leaves are pale green, lance-shaped, and have a distinctively shiny mid-rib. The leaves grow alternately along the branched stem. The stalk is distinctly divided by nodes, with the segments between the nodes flattened and widening toward the upper end (Smith, 1998). Tiny flowers are produced along a delicate spike in late summer (August to September) (Swearingen, 2005a).

Yellowish to reddish fruits are produced in September and October. Seeds are dispersed by animals, water, or deposition of contaminated soils (Swearingen, 2005a) and can remain viable in the soil for up to 5 years. The plant also spreads by rooting at stem nodes that touch the ground (Swearingen, 2005a).

Japanese stilt grass occurs in a wide variety of habitats from wetlands to early successional fields and uplands. In New Jersey, it thrives in floodplain forests and moist soils (NJDEP, 2004). It grows in disturbed areas such as those subject to regular mowing, foot traffic, and roadsides (Swearingen, 2005a).

The dense stands that Japanese stilt grass results in a loss of native vegetation and a decrease in biodiversity. Because it is fast growing and spreads rapidly it alters light and moisture regimes and reduces native seed germination (NJDEP, 2004).

A.20.2 Control Methods

A.20.2.1 Mechanical Treatment

Remove plants by hand in August through late September prior to seed production. For large areas, mechanical removal with a weed whacker in August and September is effective.

A.20.2.2 Chemical Treatment

For larger infestations, a 2% solution of glyphosate mixed with water and a surfactant should be applied in August. If it occurs in wetland areas, use a glyphosate herbicide registered for use in aquatic systems such as Rodeo®.

A.20.2.3 Monitoring and Retreatment

Treatment areas should be monitored annually or biannually where there is a threat to sensitive resources. Following all control treatments, further control efforts and monitoring is needed for at least seven years due to the viability of seeds in the seed bank or re-invasion from nearby seed sources.

A.21 PACHYSANDRA OR JAPANESE SPURGE (*Pachysandra terminalis*)

A.21.1 Description

Pachysandra is a perennial herbaceous ground covering species that reaches up to 6 to 10 inches tall with leaves that form a dense canopy. Its evergreen leaves are clustered in whorls at the end of short stalks and are obvate, coarsely toothed near the ends, and very glossy. The flowers of the Japanese spurge are creamy white and tightly clustered with a bristly appearance. They flower from March to mid-April (OSU, 2005) and develop whitish berry-like fruits. This plant does not reseed easily but is spread by underground rhizomes. Pachysandra is shade tolerant and prefers moist, well-drained, acidic soils.

This plant is a vigorous grower but not considered to be especially invasive (USFS, 2004) or considered to be an ecological threat. It can form a dense ground cover which would inhibit the growth of other native ground cover species.

A.21.2 Control Methods

A.21.2.1 Mechanical Treatment

Hand pulling and use of hand tools such as digging fork, spade, or shovel. Removal is best accomplished when soils are moist. Dig beneath the edge of the patch, pulling upward and towards the center of the patch ensuring that all root material is removed. All pulled plant material should be bagged and removed from site. Late autumn removal is recommended because it is easier to see when other native plants have died back. However, this action can be accomplished in the spring as well.

A.21.2.2 Monitoring and Retreatment

Treatment areas should be monitored annually and new plants manually removed.

A.22 REED CANARY GRASS (*Phalaris arundinacea*)

A.22.1 Description

Reed canary grass is a cool-season, sod-forming, perennial rhizomatous grass that grows to heights of 3 to 6 feet. The leaf blades on the plant are flat and have rough surfaces on both sides. The flowers are borne in panicles, which are 3 to 6 inches in length, high above the leaves. Single flowers occur in dense clusters in May to mid-June (WDNR, 2004). The flowers begin as green or purple and then change to beige. This species produces a prolific amount of seeds which are shiny brown in color. The species spreads at a high rate by rhizomatous roots.

Reed canary grass is a wetland plant that typically occurs in saturated or nearly saturated soils but where standing water does not persist for extended periods (WDE, 2005). This species can invade most types of wetlands, including marshes, wet prairies, sedge meadows, fens, stream banks, and seasonally wet areas (WDNR, 2004). It is also found in ditches, right-of-ways, and dikes and levees. Reed canary grass can also grow on dry soils in upland habitats and in the partial shade of oak woodlands (WDNR, 2004).

Reed canary grass is extremely aggressive and forms monocultures that shade out native grasses and forbs. Infestations cause a decline in diversity in both plants and animals as dense

stands provide do not provide adequate habitat for small mammals and waterfowl. The grass can also lead to increased siltation along waterways (WDE, 2005).

A.22.2 Control Methods

A.22.2.1 Prevention

Prevent establishment by eliminating or reducing erosion along hillsides and wetlands and replanting denuded areas with native species.

A.22.2.2 Mechanical Treatment

Mowing twice a year, once in mid-June and early October is effective.

A.22.2.3 Chemical Treatment

For small infestations, cut stems and apply glyphosate (33% solution) to cut stems in early spring (mid-March and early April). A 5% solution of glyphosate formulated for use over water applied as a foliar spray will kill reed canary grass found in wet areas. Two herbicidal applications may be necessary to ensure complete coverage.

A.22.2.4 Prescribed Fire

Mowing or application of 5% glyphosate herbicide in early June followed by a prescribed fire in late June to mid-July will reduce grass cover and deplete seed bank. Mowing or herbicide application followed by burning in the late spring will also eliminate seed production for that year.

A.22.2.5 Monitoring and Retreatment

Mowing or foliar herbicide treatments should be conducted annually until seed bank and rhizomes are exhausted. Monitor treated sites annually at the time of initial treatment and repeat prescribed fire methods as needed.

A.23 COMMON REED (*Phragmites australis*)

A.23.1 Description

Common reed is a native plant of New Jersey; however, it is a very successful competitor that displays invasive characteristics (NJDEP, 2004). It is a tall perennial grass or reed which ranges in height from 3 to 13 feet (VNHP, nd). The sheath-type leaves are typically 1 to 2 inches wide at the base and tapered to a point at the end. Flowers form purple or golden bushy panicles by late June. Seeds are formed by August (VNHP, nd). In the fall, the plant turns tan and the leaves drop off leaving only a plumed-topped shoot. The common reed spreads by a dense network of roots and rhizomes which can be several feet deep and spread more than 10 feet horizontally (Saltonstall, 2005). It also is spread by seeds.

Common reed thrives in sunny wetland habitats and can be found in tidal and non-tidal brackish and freshwater marshes, along the shores of rivers, ponds, and lakes. It is also found in drier and disturbed areas such as along roadsides, ditches, and dredged areas (VNHP, nd, Saltonstall, 2005).

Common reed inhibits the growth of native plant species through the accumulation of dead leaves and stem and its pervasive rhizome system. Stands of common reed eliminate diverse wetland communities and provide little food or habitat for native wildlife species (VNHP, nd).

A.23.2 Control Methods

A.23.2.1 Prevention

Minimizing land disturbances and water pollution helps to deter this species from establishing.

A.23.2.2 Mechanical Treatment

Cut small stands in late July and early August 6 inches above the ground. Bag plants and remove from site.

A.23.2.3 Chemical Treatment

Foliar application of glyphosate (Roundup® in uplands; Rodeo® (concentration of 4-6 pints/acre) mixed with water and a surfacant in wet areas) when plants are growing and at mid-to-full bloom in late July through October. Cut, mow, or burn stalks 2 to 3 weeks after herbicide application. All cut materials should be bagged and removed from site.

A.23.2.4 Monitoring and Retreatment

Monitor treated sites annually and retreat by mechanical methods or with a foliar application of glyphosate. Herbicide treatments will be needed for 2 consecutive years and then spot treat areas in successive years.

A.24 JAPANESE KNOTWEED (*Polygonum cuspidatum*)

A.24.1 Description

Japanese knotweed is an herbaceous, shrublike, perennial that ranges in height from 3 to 10 feet in height. Stems are hollow, smooth, stout and swollen at the joints at the junction with the leaf. The base of the stems above each joint is surrounded by a membranous sheath (Remaley, 2004). The leaves are broadly oval to triangular and are pointed at the ends. The greenish-white flowers grow in clusters along the stem and bloom from August to September (VNHP, 1997). The seeds are very small, triangular, shiny, and black-brown in color. Japanese knotweed reproduces vegetatively via rhizomes. It is also often spread to new sites by seeds in fill dirt, distributed by water, and to a lesser extent by weeds (Remaley, 2004).

Japanese knotweed prefers moist open places and does poorly in forested a under story (Sieger, 1991, VNHP, 1997). It can tolerate a variety of adverse conditions including high temperatures, high salinity, and drought. It is found near water such as along river and stream banks and wetlands. It is also found in disturbed areas along right-of-ways, roadways, and old homesites (Remaley, 2004, VNHP, 1997).

Once established it can form dense monotypic stands which eliminate virtually all other native plants and alter natural ecosystems (Remaley, 2004, Sieger, 1991). Japanese knotweed poses a serious threat in riparian areas where it can survive flooding and rapidly expand populations into the newly disturbed areas (Remaley, 2004).

A.24.2 Control Methods

A.24.2.1 Mechanical Treatment

If soil is loose pull plants by hand making sure to remove all rhizomes. Remove all pulled material from the site. Cutting the stalks at least three times during the growing season (April through September) can also be conducted to offset rhizome growth.

A.24.2.2 Chemical Treatment

Herbicides can be used as a foliar or cut-stump application. Cut stalks low to the ground and apply a 25% solution of glyphosate or triclopyr and water to the cut stems in late August through September. Remove cut materials from the site. For large infestations, apply to the leaves a 2% solution of triclopyr or glyphosate and water with a 0.5% ionic surfactant to penetrate leaf cuticle.

A.24.2.3 Monitoring and Retreatment

Monitoring should occur annually with follow up treatment with manual removal or foliar application of herbicide as needed.

A.25 MILE-A-MINUTE (*Polygonum perfoliatum*)

A.25.1 Description

Mile-a-minute is a herbaceous annual trailing vine that grows up 20 feet in height (NJDEP, 2004). It has a reddish stem with downward pointing hooks which are also present on the underside of the leaves. Mile-a-minute differs from native *Polygonum* species primarily in its leaves and fruits (VNHP, 1998c). The leaves are light green and shaped like a perfect triangle with all sides being equal. There is also a saucer-shaped sheath at the base of each leaf (Mountain, 1989). The fruits are pea-sized, metallic blue and segmented with each segment containing a single glossy reddish-black to black seed (Mountain, 1989). The white flowers are very small and generally inconspicuous. Mile-a-minute is a prolific seed, producing seeds from June until October. The seeds are dispersed by birds, ants, rodents, and water (NJDEP, 2004).

Mile-a-minute establishes quickly in moist areas with plenty of sun but can also inhabit shadier areas. It generally invades open and disturbed areas along the edges of woods, wetlands, stream banks, roadsides, and open fields (NJDEP, 2004).

The vine grows rapidly, at approximately a half a foot per day. It can easily grow over other vegetation out competing plants for resources such as nutrients and sunlight (Mountain, 1989). Large infestations reduce native plant species and can severely impact rare plants (VNHP, 1998c).

A.25.2 Control Methods

A.25.2.1 Prevention

To prevent spread, brush and thick leaves that are forming a thick litter should be removed.

A.25.2.2 Mechanical Treatment

Mile-a-minute can be easily removed by hand pulling from early April through early July and rechecking the site frequently for regrowth. Protective clothing is required to prevent injury. Repeated mowing or cutting during the season can prevent flowering and seed production.

A.25.2.3 Chemical Treatment

Use pre-emergent herbicides in early spring to reduce seed germination. An herbicidal soap will help to burn back foliage of mile-a-minute. It will need to be reapplied all season long to any regrowth.

A.25.2.4 Monitoring and Retreatment

If hand pulling is used, the site must be monitored frequently through the season and any new regrowth pulled. Frequent monitoring through the growing season and reapplication of herbicides will also be necessary if using a chemical method of control.

A.26 COMMON BUCKTHORN (*Rhamnus cathartica*)

A.26.1 Description

Common buckthorn is a deciduous shrub or small tree that can grow to be 22 feet tall. The leaves are smooth, broadly oval, rounded or pointed at the tip with very finely toothed edges. The leaves are nearly opposite on the stem. First year seedlings have two heart shaped leaves (NJDEP, 2004). The twigs have prominent raised patches or lenticles and are often tipped with a spine (Converse, 1984a). Dense umbrella shaped clusters of flowers emerge from the stem near the base of the leaf stalks. The yellow-green flowers are 4-petaled. Small black fruits bearing 3 to 4 seeds ripen in the fall and persist through the winter (NJDEP, 2004). Seeds are dispersed primarily by birds and rodents but may also be spread by water (NJDEP, 2004, Wieseler, 2005a).

Common buckthorn prefers partially shaded conditions and is tolerant of many soil types. It invades openings in woodlands, wood edges, and can be found in prairies and open fields (Wieseler, 2005a). In New Jersey it is also found in floodplain forest and along margins of sinkhole ponds and is frequently found along edges and in open woods adjacent to calcareous fens (NJDEP, 2004).

Common buckthorn threatens native vegetation by forming dense, even-aged stands that allow it to out compete other vegetation for light, space, and nutrients. The parts of the plant are also poisonous to humans if ingested. The plant is also an alternate host for oat rust (NJDEP, 2004, Wieseler, 2005a).

A.26.2 Control Methods

A.26.2.1 Mechanical Treatment

Uproot seedlings by hand or with a wrench in areas of low infestation. Cut twice from early June through late August for 2 or 3 years. Mowing 1 or 2 times a year in June or July prevents seedling establishment.

A.26.2.2 Chemical Treatment

Cut stump application of triclopyr (25% solution in water) or 14% solution of triclopyr and oil from late May to October has been effective. Other methods include, a frill application during the growing season (late April through September) of 25% solution of triclopyr and oil or basal bark application of 6% solution of triclopyr with oil. Foliar application of 2 to 5% glyphosate solution can also be effective.

A.26.2.3 Prescribed Fire

Prescribed fire can be conducted from late March to early May. Retreatment with fire will be needed every year or every other year for 5 or 6 years.

A.26.2.4 Monitoring and Retreatment

Retreatments of mechanical means should be done twice annually for consecutive years until seed bank is exhausted. Fire needs to be conducted every year or every other year for 5 or 6 years. If initial treatment was by chemical means, monitor sites annually and remove seedlings by hand or treat regrowth with foliar application of herbicide.

A.27 BLACK LOCUST (*Robinia pseudoacacia*)

A.27.1 Description

Black locust is a large deciduous tree that can reach 40 to 100 feet in height (Wieseler, 2005b). Mature trees can be distinguished by the dark brown, deeply furrowed bark. Seedlings and sprouts are easily identified by long paired thorns. Leaves alternate along the stem and are composed of 7 to 20 leaflets that are round to oval in shape and are dark green on the top and pale below (NJDEP, 2004). The fragrant flowers which are white with a yellow blotch on the uppermost petal appear in May and June and form dropping clusters (Converse, 1984b, NJDEP, 2004). The fruit pods that develop through the summer are smooth and 2 to 4 inches long containing 4 to 8 seeds (Wieseler, 2005b). Black locust reproduces vegetatively by root suckering and stump sprouting (Converse, 1984b).

Black locust is an early successional plant and is commonly found in disturbed areas such as old fields, roadsides, and utility right-of-ways. It prefers sunny areas with well drained

soils (Wieseler, 2005b). In New Jersey it is also found invading natural communities along riverbanks, grasslands, and pine and oak woods (NJDEP, 2004).

Black locust is able to expand rapidly into areas forming dense clones thereby shading out other native vegetation. The loss of native ground cover can also alter the natural fire regime (Wieseler, 2005b). It also can alter soil properties and available nutrient for native plants due to its ability to fix nitrogen (NJDEP, 2004). The black locust seeds, leaves, and bark are also toxic to humans (NJDEP, 2004).

A.27.2 Control Methods

A.27.2.1 Mechanical Treatment

Mechanical methods are not recommended in control of this species as vigorous suckers and sprouts usually increase following top removal by cutting, mowing, or dozing.

A.27.2.2 Chemical Treatment

Cut-stump treatment using 6 to 7% glyphosate in water solution or 25% triclopyr solution in basal oil from mid-June to August is effective in controlling the trees.

A.27.2.3 Monitoring and Retreatment

Retreatments of new sprouts and suckers from the dense clones with herbicides will need to occur for several years following initial treatment.

A.28 MULTIFLORA ROSE (*Rosa multiflora*)

A.28.1 Description

Multiflora rose is a thorny perennial shrub with 9 to 12 foot arching stems (canes) but can also sprawl and climb into trees (NJDEP, 2004). The leaves are made up of 5 to 11 oval leaflets that are sharply toothed (Bergmann and Swearingen, 2005). Fragrant white or pinkish white flowers are produced in clusters beginning in May or June. The fruit, bright red rose hips, are formed during the summer and remain on the plant through winter. The plant spreads by seeds which are dispersed by birds. It has been estimated that an average plant can produce

a million seeds per year which can remain viable in the soil for up to 20 years (Bergmann and Swearingen, 2005). The plant can also reproduce by forming new plants that root from the tips of stems that contact the ground (Bergmann and Swearingen, 2005).

Multiflora rose tolerates a wide range of environmental conditions. It occurs in disturbed area such as along roadside, fields, agricultural lands, and utility right-of-ways. It can also invade natural areas and can be found in openings in woodlands, floodplains, and grasslands (NJDEP, 2004).

Multiflora rose can form dense thickets which eliminate native vegetation and degrade wildlife habitat as well as restricting animal movements. It also has the ability to out compete native vegetation for soil nutrients (VNHP, 1999c).

A.28.2 Control Methods

A.28.2.1 Mechanical Treatment

For small infestations or individual plants, remove plants by digging out the crown. For larger areas, mow 3 to 6 times per year during the growing season for 2 to 4 years dependent upon monitoring.

A.28.2.2 Chemical Treatment

Apply 1% glyphosate herbicide solution in water to cut stems late in the growing season (August and September). Foliar application of 1% glyphosate solution during the growing season (April through September) is also effective.

A.28.2.3 Monitoring and Retreatment

Monitoring of treated sites needs to occur annually with follow up mechanical or spot treatment with herbicide as needed. Mowed areas will need to be mowed 3 to 6 times annually for up to 4 years. Monitoring and retreatment will need to occur for several years until seed bank is exhausted and because birds and wildlife can disperse seeds from adjacent infested areas.

A.29 WINEBERRY (*Rubus phoenicolasius*)

A.29.1 Description

Wineberry is a deciduous perennial with arching stems (canes) that grows in height from 6 to 9 feet (Spencer, 2005, Mehrhoff et al., 2003). The stems are covered with red hairs and small spines. The leaves are arranged alternately on the stem with three heart-shaped, serrated, leaflets. The leaves are green on top with a white tomentose underside. Small greenish flowers with white petals and reddish hairs occur in the spring (Spencer, 2005). The edible raspberry like red fruit ripens in June and July (Mehrhoff et al., 2003, Spencer, 2005). Wineberry is mainly dispersed by birds and mammals that eat the fruits but can also reproduce vegetatively by root buds or when the canes contact the soil (Mehrhoff et al., 2003, Spencer, 2005).

Wineberry prefers moist soils and sunny areas but can tolerate a range of conditions. The species can be found in early successional forests, floodplain forests, wetlands, wet meadows, and along roadsides and vacant fields.

Wineberry can rapidly form dense monotypic thickets over large areas that displace native vegetation, threaten rare plant survival, and reduce biodiversity. In New Jersey, wineberry in combination with other invasive species have completely altered habitat of a rare indigenous blackberry species which is resulting in the species decline (NJDEP, 2004).

A.29.2 Control Methods

A.29.2.1 Mechanical Treatment

Wineberry can be treated by manually removing plants by hand or with hand tools when the soil is moist or loose. Stems containing berries should be bagged and removed from site.

A.29.2.2 Chemical Treatment

In small areas, the site can be mowed or stems cut, followed by a herbicide treatment of foliage resprouts using triclopyr with surfactant (4.5 to 6 pints per acre for broadcast spray; 0.75 to 1.12% solution for hand-held spraying) or glyphosate solution with water (1.5 to 3.5% solution). A cut stump application of glyphosate or triclopyr in the fall can be effective.

A.29.2.3 Monitoring and Retreatment

The site should be monitored yearly and resprouts or seedlings should be pulled or foliar treated with herbicide.

A.30 COMMON PERIWINKLE (*Vinca minor*)

A.30.1 Description

Common periwinkle is a semi-evergreen to evergreen, trailing vine that reaches length up to 3 feet. The glossy leaves grow opposite on the stem and are narrowly elliptical in shape. Some varieties have variegated leaves (Miller, 2003). The pinwheel shaped flowers with 5 petals range in color from violet, to blue, or white. Flowers are produced from April to May (Miller, 2003). Cylindrical fruits that are approximately 2 inches long containing 3 to 5 seeds are produced from May to July (Miller, 2003). The vines are able to root at the nodes.

Periwinkle prefers moist soils and partial shade but it can tolerate open sunny areas and is adapted to a wide range of soil conditions (NRCS, 2002). Periwinkle invades open to shady forests and is often found around former plantings at old homesites. It is often found in patches around the bases of trees or spreads up and down drainages where the cover is dense because of its preference for shady conditions (Bean and Russo, 1988).

Periwinkle threatens native plants and communities due to its ability to form dense and extensive mats along forest floors.

A.30.2 Control Methods

A.30.2.1 Mechanical Treatment

Small infestations can be treated mechanically by hand-pulling or using a rake to remove runners. Monitor site and repeat as needed.

A.30.2.2 Chemical Treatment

Foliar application of triclopyr herbicide (4% solution) in water with a surfactant from July to October for successive years is effective. Or, during the growing season, repeatedly apply a triclopyr or a glyphosate herbicide as a 2% solution in water with a surfactant.

A.30.2.3 Monitoring and Retreatment

Monitor every 6 months for regrowth and treat as needed.

A.31 POISON IVY (*Toxicodendron radicans*)

A.31.1 Description

Although it is native, poison ivy is a plant of concern that needs to be controlled on the installations because of its invasive characteristics and injurious effect on public health. Poison ivy grows as a shrub that can range between 3 and 10 feet tall. It also grows as a woody vine that grows along the ground or climbs into trees and shrubs (Burrill et al., 1994). The leaves alternate along the stem and are comprised of three leaflets. The edges of the leaves can be smooth, toothed, and/or lobed. In the fall the leaves turn brilliant red. The flowers are typically small and inconspicuous and are formed in clusters above the leaves. The berry-like fruit is smooth and is grey to white in color. It is a distinct identifier of the plant once the leaves are shed in the fall. Poison ivy reproduces by seed and by lateral underground rootstocks (Burrill et al., 1994). The seeds are dispersed by birds or wildlife.

Poison ivy is often found along fence rows, railroads, and roadsides. It can also be found in natural areas such as in open forests and along steam banks (Burrill et al., 1994, Lantagne and Kells, nd).

Poison ivy provides habitat and forage for animals and birds which do not appear to be sensitive to the plant. It is however poisonous to humans (Burrill et al., 1994). All parts of plant, leaves, fruits, stems, are considered poisonous and the vines are poisonous the year around.

A.31.2 Control Methods

A.31.2.1 Mechanical Treatment

Poison ivy and poison oak vines climbing on trees should be cut at the base, and as much of the vine as possible should be pulled away from the tree. Grub or pull plants ensuring to remove all of the roots. This should be done when the soil is moist.

Protective clothing including rubber gloves must be worn when treating poison ivy as all parts of the plant, stems, roots, and leaves are poisonous.

A.31.2.2 Chemical Treatment

Foliar application of 2% solution of glyphosate herbicide in water or spot treat with an 8% solution of triclopyr herbicide is recommended. Plant is most susceptible in late spring (late May or June). Do not treat leaves that are climbing other native vegetation or trees. Site should be revisited within a few months to retreat re-growth and missed plants.

Cut-stem treatments can be used when mature plants are climbing on trees and structures. Cut stem near the soil surface and then paint on a 50 to 100% solution of glyphosate or triclopyr herbicide to the cut stem surface.

A.1.2.3 Monitoring and Retreatment

Because of the extensive root system, repeated applications of herbicides will be necessary over several years.

APPENDIX B

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
Bordentown Armory/OMS	Maintained Grass	Clover (*Trifolium sp.*) and turf grasses
	Mesic Coastal Plain Mixed Oak Forest	Black cherry (*Prunus serotina*), box elder (*Acer negundo*), silver maple (*Acer saccharinum*), sweet gum (*Liquidambar styraciflua*), pin oak (*Quercus palustris*), green ash (*Fraxinus pennsylvanica*), blackberry (*Rubus sp.*), Virginia creeper (*Parthenocissus quinquefolia*), and arrowwood (*Viburnum dentatum*)
Bordentown CSMS (Route 130)	Maintained Grass	Plantain (*Plantago sp.*), clover, and turf grasses
	Emergent Wet Weather Conveyance	Narrow leaf cattail (*Typha angustifolia*), dogbane (*Apocynum cannabinum*), sedges (*Carex sp.*), morning glory (*Ipomoea sp.*), grape vine (*Vitis sp.*), and Virginia creeper
	Mesic Coastal Plain Mixed Oak Forest	Pin oak, sweet gum, white oak (*Quercus alba*), black cherry, red maple (*Acer rubrum*), black oak (*Quercus velutina*), black gum (*Nyssa sylvatica*), black jack oak (*Quercus marilandica*), and red oak (*Quercus rubrum*), and arrowwood
	Forested Wet Weather Conveyance	Black willow (*Salix nigra*), goldenrod (*Solidago sp.*), dogwood (*Cornus sp.*), blackberry, downy aster (*Aster pilosus*), red maple, green ash, pokeweed (*Phytolacca americana*), pin oak, arrowwood, tulip tree (*Liriodendron tulipifera*), and winged sumac (*Rhus copallina*)

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
Cape May Court House Armory	Maintained Grass	Clover and turf grasses
	Scrub Shrub	Goldenrod, Virginia creeper, bayberry (*Myrica pennsylvanica*), downy aster, tall bonset (*Eupatorium altissimum*), winged elm (*Ulmus alata*), arrowwood, and persimmon (*Diospyros virginiana*)
	Brakish Tidal Marsh Complex	**Common reed (*Phragmites australis*)**
	Coastal Plain Atlantic White Cedar Swamp	Red maple, Atlantic white cedar (*Chamaecyparis thyoides*), arrowwood, sweet gum, blackberry, American holly (*Ilex opaca*), black gum, and swamp azalea (*Rhododendron viscosum*)
Cherry Hill Armory/OMS	Maintained Grass	Clover, turf grasses, tulip tree, red maple, sweet gum, mulberry (*Morus sp*.), black cherry, and pin oak
Dover Armory	Maintained Grass	Clover and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	Red oak, red maple, silver maple, white oak, green ash, ironwood (*Carpinus caroliniana*), black cherry, black gum, black oak, witch hazel (*Hamamelis virginiana*), shagbark hickory (*Carya ovata*), and Virginia creeper

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Inland Red Maple Swamp	Jewelweed (*Impatiens capensis*), red maple, knotweed (*Polygonum sp*.), sedges, cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), and water horehound (*Lycopus americanus*)
Flemington	Maintained Grass	Plantain, clover, and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	Shagbark hickory, white oak, red oak, black oak, red maple, chinkapin oak (*Quercus muehlenbergii*), and white ash (*Fraxinus americana*), white snakeroot (*Argeratina sp*.), and blackberry
	Marshy Wet Weather Conveyance	Soft rush (*Juncus effusus*), woolgrass (*Scirpus cyperinus*), nut sedge (*Cyperus sp*.), narrow leaf cattail, and foxtail (*Setaria sp*.)
Fort Dix HQ, OMS, and RTS-M	Maintained Grass	Dandelion (*Taraxacum officinale*), clover, and turf grasses
	Virginia Pine-Oak Forest	White oak, Virginia pine (*Pinus virginiana*), hickory (*Carya sp*.), red maple, sassafras (*Sassafras albidum*), American holly, pin oak, black cherry, and blackberry
	Open Field	Purple-top (*Triodia flava*), black eyed Susan (*Rudbeckia hirta*), purple love grass (*Eragrostrum spectablis*), and foxtail

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Inland Red Maple Swamp	American sycamore (*Platanus occidentalis*), red maple, river birch (*Betula nigra*), willow (*Salix sp*.), white oak, green ash, hickory, and deciduous holly (*Ilex decidua*)
	Inland Graminoid Marsh	Cattails, willow, rush (*Juncus sp*.), goldenrod, curly dock (*Rumex crispus*), sedges, duckweed (*Lemna minor*), and spikerush (*Eleocharis sp*.)
Fort Dix UTES	Maintained Grass	Clover and turf grasses
	Dry Pine-Oak Forest	Pitch pine (*Pinus rigida*), chestnut oak (*Quercus prinus*), lowbush blueberry (*Vaccinium angustifolium*), highbush blueberry (*Vaccinium corymbosum*), mountain laurel (*Kalmia latifolia*), black jack oak, red maple, and white oak
Franklin Armory	Maintained Grass	Lanceleaf plantain (*Plantago lanceolata*), clover, and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	Basswood (*Tilia americana*), shagbark hickory, tulip tree, sugar maple (*Acer saccharum*), red oak, hop hornbeam (*Ostrya virginiana*), gray birch (*Betula populifolia*), and black oak
	Open Field	Dogbane, goldenrod, blackberry, foxtail, purple-top, wild bergamont (*Monarda fistulosa*), pokeweed, Queen Anne's lace (*Daucus carota*), and curly dock

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Riparian Forested	Green ash, American sycamore, box elder, dogwood, persimmon, slippery elm (*Ulmus rubra*), sensitive fern (*Onoclea sensibilis*), jewelweed, black cherry, witch hazel, basswood, and ironwood
	Inland Graminoid Marsh	Straggling St. John's wart (*Hypericum dolabriforme*), red twig dogwood (*Cornus sericea*), arrowhead (*Sagittaria sp*.), sedges, knotweed, iris (*Iris sp*.), ferns, blue lobelia (*Lobelia siphilitica*), sensitive fern, bulrush (*Scirpus sp*.), Joe pye weed (*Eupatorium fistulosum*), horsetail (*Equisetum arvense*), narrow leaf cattail, and ironweed (*Vernonia sp*.)
	Floodplain Forest	Turtle's head (*Chelone sp*.), American beech (*Fagus grandifolia*), jewelweed, sedges, and ferns
Hackettstown Armory	Maintained Grass	Clover and turf grasses
	Planted White Pine Forest	White pine, ferns, spice bush (*Lindera benzoin*), boneset (*Euphatorium sp*.), partridge berry (*Mitchella repens*), and blackberry
	Dry-Mesic Inland Mixed Oak Forest	White oak, black oak, flowering dogwood (*Cornus florida*), hickory, white pine (*Pinus strobes*), big-toothed aspen (*Populus grandidentata*), sugar maple, smooth sumac (*Rhus glabra*), butter and eggs (*Linaria vulgaris*), foxtail, and jewelweed

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Inland Red Maple Swamp	Red maple, green ash, and arrowhead
	Inland Graminoid Marsh	Rice cut grass (*Leersia oryzoides*) and duckweed
Hammonton Armory	Maintained Grass	Clover and turf grasses
	Mesic Coastal Plain Mixed Oak Forest	Black cherry, Atlantic white cedar, black gum, white oak, tulip tree, red maple, black jack oak, sassafras, sweet pepperbush (*Clethra alnifolia*), cinnamon fern, smilax (*Smilax sp*.), staggerbush (*Lyonia sp*.), and mountain laurel
	Coastal Plain Atlantic White Cedar Swamp	Atlantic white cedar, sensitive fern, red maple, smilax, cinnamon fern , and sedges
Lawrenceville Complex	Maintained Grass	Plantain, clover, and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	American beech, sweet gum, white oak, shagbark hickory, red oak, red maple, tulip tree, black gum, ironwood, deciduous holly, American holly, maple-leaved viburnum (*Viburnum acerifolium*), arrowwood, sensitive fern, pokeweed, Virginia creeper, blackberry, spice bush, common milkweed (*Asclepias syrica*), and Queen Anne's lace

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Marshy Wet Weather Conveyance	Blackberry, goldenrod, sweet gum, red maple, pokeweed, Joe pye weed, mulberry, black cherry, ironweed, bushy aster (*Aster dumosus*), dogbane, arrowwood, sensitive fern, dogwood, Virginia creeper, rushes, arrowhead, and sedges
Morristown Armory	Maintained Grass	Plantain, clover, dandelion, and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	Black oak, black cherry, sugar maple, green ash, red maple, American elm (*Ulmus americana*), and black snakeroot (*Sanicula canadensis*)
	Open Field	Foxtail, Queen Anne's lace, clover, broomsedge (*Andropogon virginicus*), common milkweed, purple-top, Timothy grass (*Phleum pretense*), and penstemon (*Penstemon sp*.)
	Inland Graminoid Marsh	Rice cut grass, sweet flag (*Acorus calamus*), knotweed, clearweed (*Pilea pumila*), sedges, jewelweed, and ferns
Newton Armory	Maintained Grass	Plantain, clover, and turf grasses
	Scrub Shrub	White ash, black cherry, arrowwood, dogwood, Virginia creeper, box elder, morning glory, goldenrod, mint, mullein (*Verbascum thapsus*), foxtail, pokeweed, and mulberry

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Inland Graminoid Marsh	Spikerush, sedge, barnyard grass (*Echinochloa crus-galli*), foxtail, bulrush, rushes, lance-leaved goldenrod (*Euthamia graminifolia*), knotweed, and curly dock
Picatinny Arsenal (AASF)	Maintained Grass	Queen Anne's lace, red clover (*Trifolium pretense*), yarrow (*Achillea sp*.), lanceleaf plantain, Kummerowia (*Kummerowia sp*.), and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	Red oak, red maple, big-toothed aspen, gray birch, and Lombardy poplar (*Populus nigra*)
	Scrub Shrub	Little blue stem (*Schizachyrium scoparium*), goldenrod, common evening primrose (*Oenothera biennis*), wild strawberry (*Fragaria virginiana*), dogbane, tick-trefoil (*Desmodium sp*.), Virginia creeper, bushy aster, round-headed bush clover (*Lespedeza capitata*), red clover, staghorn sumac (*Rhus typhina*), slender lespedeza (*Lespedeza virginica*), partridge pea (*Chamaecrista fasciculata*), butter and eggs, elm-leaf goldenrod (*Solidago ulmifolia*), and tall boneset
Princeton Warehouse	Maintained Grass	Clover and turf grasses
	Dry Oak-Pine Forest	White pine and ash
	Dry-Mesic Inland Mixed Oak Forest	Tulip tree, red maple, sweet gum, black cherry, red oak, sassafras, ash, and American elm, Virginia creeper, wild strawberry and ferns

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
Sea Girt NGTC	Coastal Dune Grass Community	American beach grass (*Ammophila breviligulata*), beach pea (*Lathyrus japonicus*), meadow fescue (*Festuca elatior*), **Canada thistle (*Cirsium arvense*)**, hedge bindweed (*Convolvulus sepium*), sandspurry (*Spergularia rubra*), and fringed brome (*Bromus ciliatus*)
	Coastal Dune Shrubland	Wax myrtle (*Myrica cerifera*), rugosa rose (*Rosa rugosa*), **poison ivy (*Toxicodendron radicans*)**, and seaside golden rod (*Solidago sempervirens*)
	Deciduous Scrub/Shrub Wetland	Box elder, red maple, black gum, black cherry, tree of heaven **(*Ailanthus altissima*)**, northern arrowwood (*Viburnum recognitum*), and **common reed**
	Hedgerow	Red cedar (*Juniperus virginiana*), American sycamore, Japanese black pine (*Pinus thunbergiana*), black cherry, choke cherry (*Prunus virgniana*), wax myrtle, and **Russian olive (*Elaeagnus angustifolia*)**
	Intertidal Unconsolidated Shore	Sea-rocket (*Cakile edentula*), sea-chickweed (*Arenaria peploides*), common saltwort (*Salsola kali*), seaside spurge (*Euphorbia polygonifolia*), sand-spur (*Cenchrus tribuloides*), and sea-purslane (*Sesuvium maritimum*)

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Managed Shrub Wetland	Soft rush (*Juncus effusus)*, Canadian rush (*Juncus canadensis*), three square (*Scirpus americanus*), fox sedge (*Carex vulpinoidea*), **common reed**, sea myrtle (*Baccharus halimifolia*), and wax myrtle
	Maintained Grass	Red fescue (*Festuca rubra*), sheep sorrel (*Rumex acetosella*), lanceleaf plantain, dwarf cinquefoil (*Potentilla canadensis*), wild strawberry, dandelion, American sycamore, Norway spruce (*Picea abies*), white pine, **Norway maple (*Acer platanoides*)**, silver maple, and pin oak
	Salt Marsh	Salt marsh cordgrass (*Spartina patens* and *S. alterniflora*) and **common reed**
	Successional Dune	**Poison ivy**, Japanese bamboo (*Polygonum cuspidatum*), **common reed**, Virginia rose (*Rosa virginiana*), oxeye daisy (*Chrysanthemum leucanthemum*), intermediate dogbane (*Apocynum medium*), and Virginia creeper
Somerset Armory/OMS	Maintained Grass	Clover, yarrow, and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	Sassafras, red oak, pin oak, tulip tree, red maple, black cherry, Virginia creeper, and sumac
Toms River Armory/OMS	Maintained Grass	Clover and turf grasses

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Dry Oak-Pine Forest	Pitch pine, red oak, pin oak, highbush blueberry, white oak, sweet pepperbush, lowbush blueberry, black jack oak, and sassafras
	Scrub Shrub	Mountain laurel and highbush blueberry
	Open Field	Sweet fern (*Comptonia peregrine*), sweet pepperbush, purple-top, bayberry, wild strawberry, little bluestem (*Schizachyrium. scoparium*), brome grass (*Bromus sp*.), boneset (*Eupatorium sp*.), goldenrod, blackberry, pine saplings, and oak saplings
	Coastal Plain Atlantic White Cedar Swamp	Atlantic white cedar
	Red Maple Swamp	American holly, ferns, red maple, sedges, sweet pepper bush, and black gum
	Successional Marsh	Sedges, sweet pepper bush, bayberry, and dangleberry (*Gaylussacia frondosa*)
Tuckerton Armory	Maintained Grass	Clover and turf grasses
	Dry Oak-Pine Forest	Chestnut oak, pitch pine, lowbush blueberry, white oak, mountain laurel, pin oak, red oak, winged sumac, and black jack oak

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Dry Pine-Oak Forest	Chestnut oak, pitch pine, lowbush blueberry, white oak, mountain laurel, pin oak, red oak, winged sumac, and black jack oak
	Open Field	Grass species and wild strawberry
Vineland Armory/OMS	Maintained Grass	Clover and turf grasses
	Mesic Coastal Plain Mixed Oak Forest	Black cherry, sassafras, white pine, chestnut oak, white oak, smilax, red cedar, American holly, dogwood, hickory, pitch pine, and black gum
	Dry Oak-Pine Forest	Sassafras, white oak, black oak, Virginia pine, pitch pine, red oak, hickory, lowbush blueberry, and highbush blueberry
	Dry Pine-Oak Forest	Pitch pine, Virginia pine, black cherry, sassafras, white pine, chestnut oak, white oak, smilax, red cedar, American holly, dogwood, hickory, pitch pine, and black gum
	Dry Pine-Oak Successional Forest	Black cherry, sassafras, white pine, chestnut oak, white oak, smilax, red cedar, American holly, dogwood, hickory, pitch pine, black gum, black oak, pin oak, winged elm, sweet fern, and blackberry
	Forested Depressional Wetland	False nettle (*Boehmeria cylindrical*), rushes, and sedges
Washington Armory	Maintained Grass	Plantain, clover, foxtail, and turf grasses

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Dry-Mesic Inland Mixed Oak Forest	Basswood, black cherry, silver maple, boneset, and privet (*Ligustrum sp*.)
	Scrub Shrub	Basswood, ash, red maple, goldenrod, pin oak, black gum, tulip tree, mulberry, black cherry, sumac, and highbush blueberry
	Open Field	**Spotted knapweed (*Centaurea biebersteinni*)**
Westfield Armory/OMS	Maintained Grass	Tall fescue (*Festuca arundinacea*)
	Dry-Mesic Inland Mixed Oak Forest	Black cherry, sweet gum, sassafras, pin oak, red maple, silver maple, honey locust (*Gleditsia triacanthos*), red oak, American beech, arrowwood, maple-leaved viburnum, and Virginia creeper
	Scrub Shrub	Common ragweed (*Ambrosia artemisiifolia*), Queen Anne's lace, and sedges
West Orange Armory	Maintained Grass	Clover and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	Black gum, red maple, red oak, tulip tree, black oak, hickory, sugar maple, American beech, black cherry, basswood, ash, trillium (*Trillium sp*.), and ferns
	Open Field	Canada goldenrod (*Solidago canadensis*), common evening primrose, blackberry, wild strawberry, black eyed Susan, tick-trefoil, bushy aster, curly dock, smilax, and little blue stem

APPENDIX B (CONTINUED)

DOMINANT PLANTS SPECIES OBSERVED AT

NEW JERSEY ARMY NATIONAL GUARD FACILITIES

Facility Name	Ecological Community	Dominant Plants
	Robust Emergent Marsh	Narrow leaf cattail, soft rush, barnyard grass, sedges, knotweed, and spikerush
	Deciduous Wooded Wetlands	False nettle, rushes, red maple, ironwood, slippery elm, and green ash
West Trenton AASF/OMS	Maintained Grass	Plantain, clover, and turf grasses
	Dry-Mesic Inland Mixed Oak Forest	American elm, pin oak, black cherry, red maple, silver maple, green ash, and spice bush
	Forested Wet Weather Conveyance	Black walnut (*Juglans nigra*), green ash, American elm, black cherry, silver maple, black willow, dogwood, pokeweed, New England aster (*Aster novae-angliae*), jewelweed, sumac, blackberry, and cattails
Westfield Armory/OMS	Maintained Grass	Tall fescue (*Festuca arundinacea*)
	Dry-Mesic Inland Mixed Oak Forest	Black cherry, sweet gum, sassafras, pin oak, red maple, silver maple, honey locust (*Gleditsia triacanthos*), red oak, American beech, arrowwood, maple-leaved viburnum, and Virginia creeper
	Scrub Shrub	Common ragweed (*Ambrosia artemisiifolia*), Queen Anne's lace, and sedges

Bold indicates invasive plants

APPENDIX C

PHOTOGRAPHS

Bordentown Armory/OMS

Multiflora rose observed in the forested portion of the property.



Bordentown CSMS (Route 130)

Purple loosestrife present along the fence in the southeastern portion of the property.



Purple loosestrife within the Emergent Wetland Ditch.



Mesic Coastal Plain Mixed Oak Forest community.



Cape May Court House Armory

Common reed observed in the Open Field community.



Coastal Plain Atlantic White Cedar Swamp community.



Common reed observed in the Brakish Tidal Marsh Complex.



Stream present near the edge of the southern property boundary. To the left (north) can be seen the Brakish Tidal Marsh Complex.



Cherry Hill Amory/OMS

Japanese honeysuckle “bush” that is within the maintained grass area.



Along the trunk is poison ivy, at the base of the trunk is garlic mustard, and to the left of the garlic mustard is Japanese stiltgrass.



Many trees at this site are covered in poison ivy like this one. All green leaves and branching along the trunk is poison ivy.



Dover Armory

Japanese knotweed found along the southern side of the storage building.



Cinnamon fern located in the Inland Red Maple Swamp.



Royal fern located in the Inland Red Maple Swamp.



Inland Red Maple Swamp overview.



Flemington

Marshy Wet Weather Conveyance located just north of the main facility building.



Forested portion of the property with an invasion of Japanese stiltgrass.



Fort Dix HQ, OMS, and RTS-M

Drainage ditch located adjacent to parking area in the northeast portion of the property.



Garlic mustard observed in the Virginia Pine Oak Forest.



Inland Graminoid Marsh community located in the northwest portion of the property.



Inland Red Maple Swamp community.



Fort Dix UTES

Front of the Fort Dix UTES facility building.



Chinese bush-clover located across the road from the facility building to the southeast.



Dry Pine Oak Forest community.



Franklin Armory

Stream located in the Dry Mesic Inland Mixed Oak Forest newar the western edge of the property.



Old field located centrally along the southern edge of the property.



Inland Graminoid Marsh located in the southwest corner of the property.



Multiflora rose located along the Riparian Forested community.



Hackettstown Armory

Garlic mustard observed in several areas of the forest.



Inland Graminoid Swamp located in the northwestern portion of the property.



Planted White Pine Forest community.



North of the facility building, crown vetch can be seen in front of the trees.



Hammonton Armory

Coastal Plain Atlantic White Cedar Swamp community.



Mesic Coastal Plain Mixed Oak Forest community.



Lawrenceville Complex

Building located in the southeastern portion of the property.



Morristown Armory

Japanese knotweed located at the southeastern portion of the parking area.



Pachysandra found in the forest along the southern property boundary.



Japanese stiltgrass found throughout much of the forest.



Porcelain berry and Japanese stiltgrass near the westernly located Inland Graminoid Marsh.



Newton Armory

Scrub Shrub portion of the facility showing porcelain berry.



Scrub Shrub portion with numerous invasive plants.



More invasive plants in the scrub shrub area.



Picatinny Arsenal (AASF)

Front of the Picatinny Arsenal facility building.



Northwest side of the Scrub Shrub area.



Facing west the largest Scrub Shrub area located northeast of the helicopter pad.



Japanese knotweed and Japanese barberry located at the southwest corner of the facility.



Princeton Warehouse

Multiflora rose observed in the forest area south of the facility building.



Canada thistle found along the northern edge of the parking area.



Japanese stiltgrass located adjacent to maintained grass southwest of the facility building.



Sea Girt NGTC

Japanese knotweed and common reed.



Japanese knotweed.



Somerset Armory/OMS

Somerset Armory facility sign.



Tree-of-heaven located near the western edge of the property.



Multiflora rose and poison ivy observed in the forest community.



Multiflora rose located in the northwestern portion of the forest.



Toms River Armory/OMS

Red Maple Swamp community.



Successional Marsh community.



Canada thistle and common reed located in the Coastal Plain Atlantic White Cedar Swamp.



Dry Oak-Pine Forest community.



Tuckerton Armory

Japanese stiltgrass, tree of heaven, and garlic mustard seen in the Dry Oak-Pine Forest.



Dry Pine-Oak Forest Community.



Common periwinkle observed in the northeast corner of the property.



Yucca plants observed in parts of the Dry Pine-Oak Forest.



Vineland Armory/OMS

Dry Pine-Oak Successional Forest community.



Large area in the north-central portion of the property blanketed in smilax.



Trumpet Creeper observed in the Dry Pine-Oak Successional Forest.



Trumpet creeper covering an area of the Mesic Coastal Plain Mixed Oak Forest.



Washington Armory

An area of the Open Field community composed almost entirely of spotted knapweed.



Porcelain berry located at the south central edge of the property.



The mile-a-minute invasive plant located east of the Scrub Shrub berm.



Scrub Shrub community located in the northwest corner of the property.



West Orange Armory

Japanese knotweed located at northwest edge of the parking lot in the old field area.



Japanese stiltgrass located in the forest behind the southern edge of the parking area.



Common reed located in the robust emergent marsh near the old field within the forest.



A large wall of porcelain berry growing over numerous trees in the forest.



West Trenton AASF/OMS

Facing west looking at the West Trenton facility building.



Asian bittersweet present in the Forested Wet Weather Conveyance.



Forested Wet Weather Conveyance community.



Westfield Armory/OMS

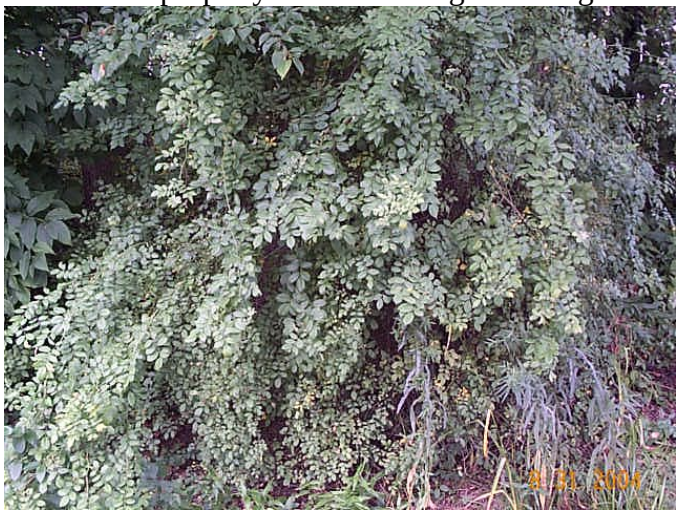
Poison ivy growing along the northwest corner of the storage building.



Facing southwest looking at the parking area and trees and shrubs bordering the property.



Multiflora rose found along the western edge of the property near the storage building.



APPENDIX D

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
	Bordentown Armory/OMS			
1	Garlic mustard, Japanese honeysuckle, Poison ivy, Tree-of-heaven, Multiflora rose, Black locust, Common reed, Morrow's bush honeysuckle, Autumn olive	1.04	M, C	2-3 times annually
2	Japanese honeysuckle, Multiflora rose, Wineberry, Black locust	0.4	M, C	2-3 times annually
	Bordentown CSMS (Route 130)			
1	Multiflora rose, Japanese honeysuckle, Poison ivy, Autumn olive, Morrow's bush honeysuckle, Canadian thistle	0.45	M, C	2-3 times annually
2	Purple loosestrife, Multiflora rose, Japanese honeysuckle, Autumn olive, Poison ivy	0.05	M, C	2-3 times annually
3	Tree-of-heaven, Japanese honeysuckle, Autumn olive, Multiflora rose	0.15	M, C	2-3 times annually
4	Japanese honeysuckle, Multiflora rose, Purple loosestrife, Japanese stiltgrass	2.66	M, C	2-3 times annually
5	Japanese honeysuckle, Poison ivy, Multiflora rose, Purple loosestrife, Autumn olive	0.27	M, C	2-3 times annually
6	Japanese honeysuckle, Poison ivy, Purple loosestrife	0.07	M	2 times annually
7	Japanese honeysuckle	0.16	M	2 times annually
8	Poison ivy, Japanese honeysuckle, Tree-of-heaven	0.54	M	2 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
	Cape May Court House Armory			
1	Common reed, Japanese honeysuckle, Poison ivy, Multiflora rose	1.38	M, C	2-3 times annually
2	Autumn olive	<0.01	M, C	Annually
3	Chinese bush-clover	0.01	M	Annually
4	Common reed	6.79	M, C	Annually
5	Porcelain berry	0.01	M	Annually
6	Spotted knapweed	0.01	M	Annually
	Cherry Hill Armory/OMS			
1	Japanese stiltgrass, Garlic mustard	6.42	C, M	1-2 times annually
2	Japanese honeysuckle	<0.01	M	2 times annually
3	Poison ivy	0.05	M	Annually
4	Poison ivy	<0.01	M	Annually
5	Poison ivy	<0.01	M	Annually
6	Poison ivy	<0.01	M	Annually
7	Japanese stiltgrass, Garlic mustard, Poison ivy, Common mugwort	0.13	M	1-2 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
	Dover Armory			
1	Japanese knotweed, Tree-of-heaven, Japanese stiltgrass	0.04	M	2-3 times annually
2	Japanese stiltgrass, Garlic mustard, Japanese barberry, Winged spindletree	7.49	C, M	1-2 times annually
3	Reed canary grass, Japanese knotweed	0.01	M, C	3 times annually
4	Japanese knotweed, Morrow's bush honeysuckle, Porcelain berry, Asian bittersweet, Poison ivy, Garlic mustard, Japanese barberry, Common reed, Multiflora rose, Autumn olive, Black locust, Spotted knapweed, Norway maple, Reed canary grass	0.42	M, C	2-3 times annually
5	Japanese knotweed	0.14	M	3 times annually
6	Japanese knotweed, Spotted knapweed	0.06	M	3 times annually
7	Canadian thistle, Spotted knapweed	0.01	M	3 times annually
8	Garlic mustard	0.43	M	2 times annually
	Flemington			
1	Purple loosestrife	0.06	M	Annually
2	Purple loosestrife	0.05	M	Annually
3	Japanese stiltgrass	7.18	C, M	Annually
4	Japanese stiltgrass	0.07	M	Annually
5	Common periwinkle	0.13	M	2 times Annually
6	Multiflora rose, Poison ivy	0.13	M	3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
7	Poison ivy	0.15	M	Annually
8	Wineberry, Multiflora rose	0.52	M	3 times annually
9	Autumn olive	0.22	M, C	Annually
10	Morrow's bush honeysuckle	0.10	M	2 times annually
11	Spotted knapweed	0.05	M	Annually
	Fort Dix HQ, OMS, AND RTS-M			
1	Garlic mustard, Poison ivy, Black locust, Chinese bush-clover, Multiflora rose	0.33	M, C	2-3 times annually
2	Chinese bush-clover, Black locust, Spotted knapweed	0.35	M, C	Annually
3	Japanese honeysuckle, Chinese bush-clover, Garlic mustard, Multiflora rose, Wineberry, Black locust, Japanese stiltgrass	5.46	C, M	2-3 times annually
4	Multiflora rose, Poison ivy	0.31	M	3 times annually
5	Poison ivy, Japanese honeysuckle, Multiflora rose	0.52	M	2-3 times annually
6	Spotted knapweed	0.46	M	Annually
7	Common mugwort, Multiflora rose	0.28	M	2-3 times annually
8	Black locust, Spotted knapweed	0.42	M, C	Annually
9	Common reed	0.08	M	Annually
10	Spotted knapweed, Poison ivy	0.07	M	Annually
11	Multiflora rose	0.05	M	3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
12	Japanese honeysuckle, Multiflora rose	0.06	M	2-3 times annually
13	Poison ivy, Japanese honeysuckle, Multiflora rose	0.02	M	2-3 times annually
14	Chinese bush-clover, Black locust, Spotted knapweed, Common mugwort, Common reed	1.67	M, C	2 times annually
15	Poison ivy	0.02	M	Annually
	Fort Dix UTES			
1	Chinese bush-clover	0.05	M	Annually
2	Spotted knapweed	0.01	M	Annually
	Franklin Armory			
1	Multiflora rose	<0.01	M	3 times annually
2	Multiflora rose	<0.01	M	3 times annually
3	Spotted knapweed, Porcelain berry, Multiflora rose, Purple loosestrife, Canadian thistle, Asian bittersweet, Common reed	0.44	M	1-3 times annually
4	Morrow's bush honeysuckle, Multiflora rose, Poison ivy, Japanese barberry, Asian bittersweet, Spotted knapweed, Purple loosestrife, Norway maple	0.34	M, C	2-3 times annually
5	Spotted knapweed, Porcelain berry, Multiflora rose, Purple loosestrife, Canadian thistle, Asian bittersweet, Common reed	0.17	M	1-3 times annually
6	Asian bittersweet, Multiflora rose	0.01	M	3 times annually
7	Purple loosestrife, Autumn olive, Multiflora rose, Japanese barberry	0.50	M, C	1-3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
8	Multiflora rose, Poison ivy, Garlic mustard	0.08	M	2-3 times annually
9	Japanese barberry, Garlic mustard, Multiflora rose, Japanese stiltgrass, Poison ivy, Morrow's bush honeysuckle, Tree-of-heaven, Asian bittersweet, Winged spindletree	5.08	C, M	1-2 times annually
10	Japanese stiltgrass, Japanese barberry, Multiflora rose, Winged spindletree	0.88	M	2-3 times annually
	Hackettstown Armory			
1	Morrow's bush honeysuckle, Poison ivy, Garlic mustard, Japanese honeysuckle, Asian bittersweet, Multiflora rose, Autumn olive, Porcelain berry, Norway maple, Japanese stiltgrass	9.61	M, C	1-2 times annually
2	Japanese barberry, Garlic mustard, Poison ivy, Asian bittersweet, Multiflora rose, Japanese stiltgrass	2.26	M, C	2-3 times annually
3	Japanese stiltgrass	0.05	M	Annually
4	Crown vetch, Canadian thistle, Garlic mustard	0.22	M	2-3 times annually
5	Japanese barberry, Garlic mustard, Poison ivy, Asian bittersweet, Multiflora rose, Japanese stiltgrass	1.12	M, C	2-3 times annually
6	Asian bittersweet, Japanese stiltgrass, Multiflora rose, Morrow's bush honeysuckle, Japanese honeysuckle, Tree-of-heaven, Norway maple	0.23	M, C	1-2 times annually
7	Common reed, Multiflora rose	0.16	M	2-3 times annually
8	Spotted knapweed	0.24	M	Annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
9	Japanese barberry	0.03	M	Annually
10	Wineberry	0.03	M	Annually
11	Porcelain berry	0.01	M	Annually
	Hammonton Armory			
1	Tree-of-heaven	0.02	M	1-2 times annually
2	Japanese honeysuckle, Garlic mustard, Tree-of-heaven, Japanese knotweed, Autumn olive, Common reed	0.92	M, C	2-3 times annually
3	Tree-of-heaven	0.06	M	1-2 times annually
4	Japanese barberry	<0.01	M	Annually
5	Tree-of-heaven	0.26	M	1-2 times annually
6	Porcelain berry, Japanese honeysuckle, Yellow sweetclover	0.02	M	2 times annually
	Lawrenceville Complex			
1	Common mugwort, Multiflora rose, Tree-of-heaven, Black locust, Winged spindletree	0.71	M	2 times annually
2	Pachysandra	0.10	M	Annually
3	Pachysandra	0.13	M	Annually
4	Pachysandra	0.08	M	Annually
5	Winged spindletree, Asian bittersweet, Poison ivy, Japanese honeysuckle, Porcelain berry, Garlic mustard, Japanese stiltgrass, Multiflora rose	1.73	M, C	2-3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
6	Poison ivy	0.10	M	Annually
7	Asian bittersweet, Multiflora rose, Japanese stiltgrass, Garlic mustard, Japanese honeysuckle	0.71	M	2-3 times annually
8	Japanese stiltgrass, Winged spindletree, Multiflora rose, Garlic mustard, Poison ivy, Japanese honeysuckle	7.82	C, M	2-3 times annually
9	Garlic mustard	0.09	M	1-2 times annually
10	Norway maple	0.27	M, C	Annually
11	English ivy	0.03	M	1-2 times annually
12	Garlic mustard, Multiflora rose, Black locust, Japanese honeysuckle, Poison ivy, Porcelain berry, Asian bittersweet, Canadian thistle	0.32	M	3 times annually
13	Japanese honeysuckle, Asian bittersweet, Porcelain berry, Common mugwort	0.23	M	2 times annually
	Morristown Armory			
1	Wineberry, Japanese barberry, Black locust	0.59	M, C	Annually
2	Poison ivy, Japanese barberry, Wineberry, Multiflora rose, Black locust	0.20	M, C	2-3 times annually
3	Porcelain berry, Japanese stiltgrass, Japanese barberry, Multiflora rose, Garlic mustard	7.67	C, M	1-2 times annually
4	Porcelain berry, Multiflora rose, Japanese stiltgrass, Wineberry	0.30	M	2-3 times annually
5	Common mugwort	0.22	M	2 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
6	Black locust	0.24	C	Annually
7	Canadian thistle, Japanese stiltgrass, Tree-of-heaven	0.07	M	3 times annually
8	Japanese stiltgrass, Tree-of-heaven, Porcelain berry	0.23	M	1-2 times annually
9	Japanese stiltgrass, Poison ivy	0.23	M	Annually
10	Japanese stiltgrass, Tree-of-heaven, Asian bittersweet, Poison ivy, Japanese knotweed, Japanese honeysuckle	0.32	M	2 times annually
11	Black locust, Japanese barberry	0.82	M, C	Annually
12	Japanese barberry, Japanese stiltgrass, Norway maple, Garlic mustard	8.49	C, M	1-2 times annually
13	Pachysandra	1.00	M	Annually
14	Multiflora rose, Japanese barberry, Japanese stiltgrass	0.29		
15	Japanese barberry, Canadian thistle, Japanese stiltgrass, Autumn olive	0.14	M, C	3 times annually
16	Multiflora rose	0.14	M	3 times annually
17	Tree-of-heaven	0.14	M	1-2 times annually
18	Japanese stiltgrass, Japanese barberry, Multiflora rose, Porcelain berry	6.27	C, M	Annually
19	Garlic mustard, Wineberry, Norway maple	0.03	M, C	1-2 times annually
20	Japanese stiltgrass	0.12	M	Annually
21	Norway maple	0.09	M, C	Annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
	Newton Armory			
1	Purple loosestrife, Reed canary grass, Teasel, Japanese stiltgrass, Canadian thistle, Multiflora rose, Autumn olive, Poison ivy	1.37	M, C	3 times annually
2	Poison ivy, Autumn olive, Multiflora rose, Morrow's bush honeysuckle, Asian bittersweet, Canadian thistle	0.06	M, C	3 times annually
3	Teasel	<0.01	M, C	Annually
4	Multiflora rose, Teasel, Poison ivy, Canadian thistle, Asian bittersweet, Spotted knapweed, Autumn olive	0.07	M, C	3 times annually
5	Multiflora rose, Teasel, Poison ivy, Canadian thistle, Asian bittersweet, Spotted knapweed, Autumn olive	0.94	M, C	3 times annually
6	Morrow's bush honeysuckle, Autumn olive, Multiflora rose, Asian bittersweet	0.48	M, C	2-3 times annually
7	Morrow's bush honeysuckle, Autumn olive, Multiflora rose, Spotted knapweed, Garlic mustard	0.04	M, C	2-3 times annually
	Picatinny Arsenal			
1	Autumn olive, Multiflora rose, Poison ivy, Spotted knapweed, Reed canary grass	7.14	M, C	3 times annually
2	Japanese knotweed	0.05	M	3 times annually
3	Autumn olive	0.27	M, C	Annually
4	Spotted knapweed	0.01	M	Annually
5	Poison ivy	0.02	M	Annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
6	Canadian thistle	0.02	M	3 times annually
7	Japanese knotweed, Asian bittersweet, Multiflora rose, Japanese barberry, Japanese stiltgrass	0.07	M	2-3 times annually
8	Autumn olive	0.05	M, C	Annually
9	Spotted knapweed, Autumn olive, Japanese knotweed, Multiflora rose, Common reed, Poison ivy	1.40	M, C	2-3 times annually
10	Canadian thistle, Asian bittersweet	0.09	M	3 times annually
11	Poison ivy, Asian bittersweet, Multiflora rose	0.10	M	2-3 times annually
	Princeton Warehouse			
1	Multiflora rose, Wineberry, Japanese stiltgrass, Japanese honeysuckle, Garlic mustard, Autumn olive, Japanese barberry, Porcelain berry, Common buckthorn, Poison ivy, Asian bittersweet	4.6	C, M	1-3 times annually
2	Japanese stiltgrass	0.21	M	Annually
3	Poison ivy, Wineberry, Japanese honeysuckle, Multiflora rose, Garlic mustard, Japanese stiltgrass	1.45	M, C	2-3 times annually
4	Canadian thistle, Morrow's bush honeysuckle, Multiflora rose, Wineberry, Japanese honeysuckle, Tree-of-heaven	0.09	M	3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
	Sea Girt NGTC			
	Common reed	1.02	M, C	Annually
	English plantain	0.01	M	Annually
	Japanese honeysuckle	0.11	M	2 times annually
	Japanese knotweed	0.12	M	3 times annually
	Norway maple	0.06	M, C	Annually
	Oriental bittersweet	0.04	M	Annually
	Purple loosestrife	0.01	M	Annually
	Poison ivy	3.4	M, C	Annually
	Somerset Armory			
1	Black locust, Poison ivy	<0.01	M, C	Annually
2	Black locust	0.10	C	Annually
3	Black locust, Japanese honeysuckle, Multiflora rose, Poison ivy	<0.01	M, C	2-3 times annually
4	Garlic mustard, Multiflora rose, Poison ivy, Japanese honeysuckle	1.84	M, C	2-3 times annually
5	Tree-of-heaven, Garlic mustard, Multiflora rose, Poison ivy, Black locust	1.35	M, C	2-3 times annually
6	Poison ivy, Multiflora rose, Japanese honeysuckle	2.55	M, C	2-3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
	Toms River Armory/OMS			
1	Common reed	0.01	M	Annually
2	Common reed	0.01	M	Annually
3	Canadian thistle	0.01	M	3 times annually
4	Spotted knapweed	0.09	M	Annually
5	Spotted knapweed	1.92	M, C	Annually
	Tuckerton Armory			
1	Tree-of-heaven, Garlic mustard, Japanese stiltgrass, Poison ivy, Porcelain berry, Common periwinkle	0.11	M	Annually
2	Porcelain berry	0.02	M	Annually
	Vineland Armory/OMS			
1	Poison ivy	4.10	M, C	Annually
2	Tree-of-heaven, Japanese honeysuckle, Multiflora rose	0.11	M	2-3 times annually
3	Porcelain berry	0.08	M	Annually
4	Japanese honeysuckle	0.05	M	2 times annually
5	Spotted knapweed	0.07	M	Annually
6	Japanese honeysuckle, Multiflora rose	0.02	M	2-3 times annually
7	Japanese honeysuckle, Multiflora rose	0.07	M	2-3 times annually
8	Japanese honeysuckle, Multiflora rose	0.06	M	2-3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
9	Porcelain berry	<0.01	M	Annually
10	Japanese honeysuckle, Black locust, Spotted knapweed, Morrow's bush honeysuckle, Autumn olive, Tree-of-heaven	1.63	M, C	2 times annually
11	Canadian thistle, Japanese honeysuckle, Multiflora rose, Black locust	0.50	M, C	2-3 times annually
12	Multiflora rose, Spotted knapweed, Chinese bush-clover	0.04	M	2-3 times annually
	Washington Armory			
1	Multiflora rose	0.10	M	3 times annually
2	Spotted knapweed	9.24	C, M	Annually
3	Garlic mustard	0.09	M	Annually
4	Poison ivy, Japanese barberry	0.21	M	Annually
5	Asian bittersweet	0.08	M	Annually
6	Autumn olive, Spotted knapweed, Multiflora rose	1.02	M, C	2-3 times annually
7	Porcelain berry, Japanese stiltgrass	0.50	M	Annually
8	Mile-a-minute	0.03	M	2-3 times annually
9	Autumn olive	0.03	M, C	Annually
10	Black locust	0.27	C	Annually
11	Asian bittersweet	0.06	M	Annually
12	Poison ivy, Asian bittersweet, Multiflora rose, Japanese honeysuckle	0.54	M	2-3 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
	Westfield Armory/OMS			
1	Poison ivy	3.71	M, C	Annually
2	English ivy, Norway maple, Japanese barberry	2.11	M, C	Annually
3	Winged spindletree	0.03	M, C	Annually
4	Winged spindletree	0.03	M, C	Annually
5	Wineberry	0.04	M	Annually
6	Japanese honeysuckle	0.06	M	2 times annually
7	Multiflora rose	0.01	M	3 times annually
8	Multiflora rose	0.04	M	3 times annually
	West Orange Armory			
1	Japanese barberry, Japanese stiltgrass, Wineberry, Asian bittersweet	37.27	C, M	Annually
2	Black locust, Tree-of-heaven	0.88	M, C	1-2 times annually
3	White sweeetclover, Chinese bush-clover	2.10	M, C	Annually
4	Common reed	0.03	M	Annually
5	Japanese knotweed, Asian bittersweet, Multiflora rose, Japanese honeysuckle, Tree-of-heaven, Japanese stiltgrass, Common mugwort	0.82	M	2-3 times annually
6	Japanese knotweed, Japanese stiltgrass, Common mugwort	1.31	M, C	Annually
7	Common buckthorn	0.70	M, C	1-2 times annually

APPENDIX D (CONTINUED)

SITE SPECIFIC TREATMENT METHODS FOR INVASIVE PLANTS

Polygon Number	Invasive Plants Present	Acres	Treatment	Retreatment and Monitoring
8	Asian bittersweet, Japanese stiltgrass, Porcelain berry, Wineberry, Multiflora rose, Japanese barberry, Japanese honeysuckle	0.92	M	2-3 times annually
9	Japanese knotweed, Japanese stiltgrass, Multiflora rose, Asian bittersweet	1.25	M, C	2-3 times annually
10	Japanese knotweed	0.20	M	3 times annually
11	Japanese honeysuckle, Asian bittersweet, Japanese knotweed	1.74	M, C	2-3 times annually
	West Trenton AASF/OMS			
1	Poison ivy, Japanese honeysuckle, Asian bittersweet, Multiflora rose, Wineberry, Canadian thistle, Garlic mustard	0.56	M	3 times annually
2	Poison ivy, Multiflora rose, Japanese honeysuckle, Garlic mustard, Japanese stiltgrass, Asian bittersweet, Autumn olive, Purple loosestrife, Porcelain berry	1.17	M, C	2-3 times annually
3	Purple loosestrife	0.03	M	Annually
4	Poison ivy	0.02	M	Annually
5	Asian bittersweet, Poison ivy, Spotted knapweed, Japanese honeysuckle	0.09	M	2 times annually