National Park Service
U.S. Department of the Interior

Alaska Region

Alaska Region
Invasive Plant Management Plan
Environmental Assessment

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Invasive Plant Management Plan

Revised Environmental Assessment
August 2009

National Park Service
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ACRONYMS

ABO	Alaska Bird Observatory
AD	After Death
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOTPF	Alaska Department of Transportation and Public Facilities
AKEPIC	Alaska Exotic Plant Information Clearinghouse
ALACC	Alaska Lands Act Coordination Committee
ALAG	Alagnak National Wild River
ANIA	Aniakchak National Monument and Preserve
ANILCA	Alaska National Interest Lands Conservation Act of 1980
ATV	all terrain vehicle
BELA	Bering Land Bridge National Preserve
BLM	Bureau of Land Management
BP	before present
BMP	best management practice
CAKR	Cape Krusenstern National Monument
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulation
CNIPM	Committee for Noxious and Invasive Plant Management
DENA	Denali National Park and Preserve
DMTS	Delong Mountain Transportation System
DO	Director's Orders
EA	environmental assessment
EIS	environmental impact statement
EO	Executive Order
EPA	Environmental Protection Agency
EPMT	exotic plant management team
FAA	Federal Aviation Administration
GAAR	Gates of the Arctic National Park and Preserve
GIS	geographical information system
GLBA	Glacier Bay National Park and Preserve
GMP	general management plan
GPS	global positioning satellite
IPM	integrated pest management
IPMP	invasive plant management plan
JHA	job hazard analysis
KATM	Katmai National Park and Preserve
KEFJ	Kenai Fjords National Park
KLGO	Klondike Gold Rush National Historic Park
KOVA	Kobuk Valley National Park
LACL	Lake Clark National Park and Preserve
MHW	mean high water
MSDS	material safety data sheet
MSU	Montana State University

NANA	Northwest Alaska Native Association
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Act
NHPA	National Historic Protection Act
NHS	National Historic Site
NOAT	Noatak River National Preserve
NPS	National Park Service or National Park System
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OHV	off-highway vehicle
ORV	off-road vehicle
OSHA	Occupational Safety and Health Act
PEPC	Planning Environment and Public Comment
PIF	Partners in Flight
PL	public law
PPE	personal protective equipment
RAVE	Relative Aquifer Vulnerability Evaluation
SDWA	Safe Drinking Water Act
SITK	Sitka National Historic Park
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WRST	Wrangell-Saint Elias National Park and Preserve
YUCH	Yukon-Charley Rivers National Preserve

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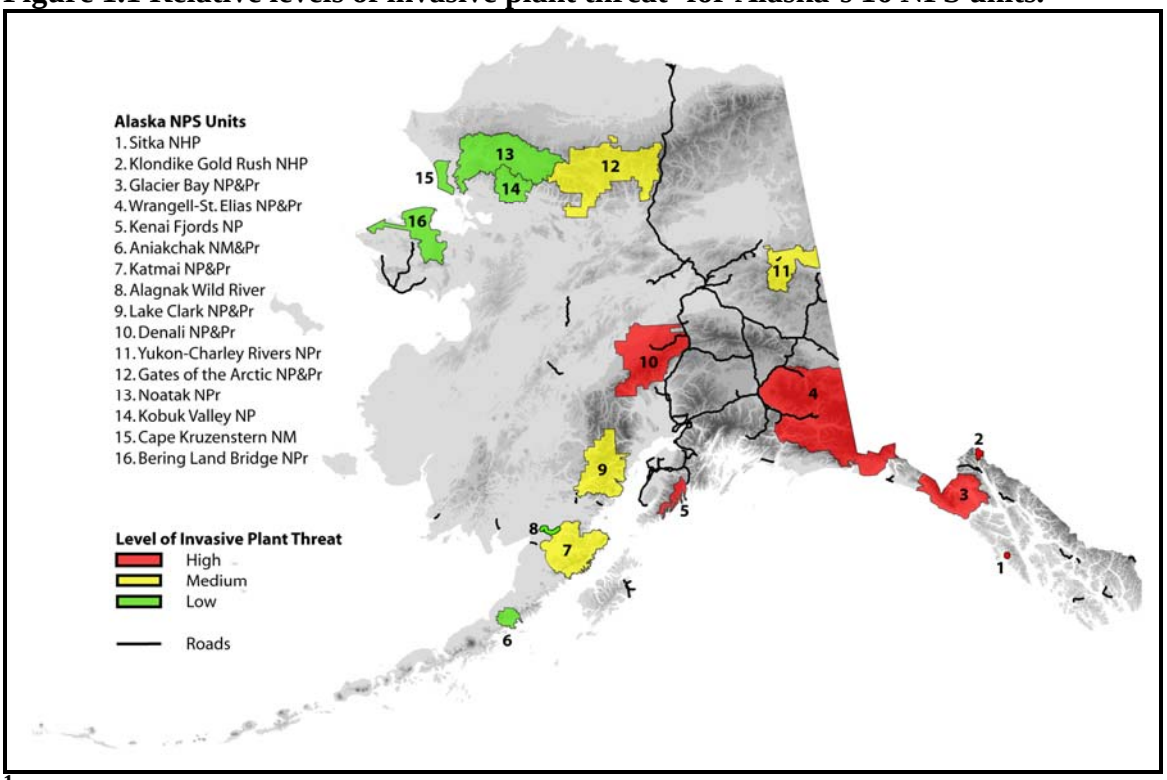
1.0 Purpose and Need

1.1 Purpose of and Need for Action

The National Park Service (NPS) is considering an Invasive Plant Management Plan (IPMP) to address invasive plant infestations in National Park System units throughout the Alaska Region. Invasive plants are defined as nonnative plant species whose introduction does or is likely to cause economic or environmental harm or harm to human health. The IPMP uses a decision tree to select appropriate plant control methods, including physical (pulling, digging, burial, mowing, cutting, burning, and other heat treatments) and chemical (herbicide) treatments to eradicate or contain invasive plant infestations.

The purpose of the plan is to evaluate alternatives for managing invasive plants in Alaska National Park System units. The NPS goal is to manage invasive plants in a manner to prevent adverse impacts to park resources and values while minimizing adverse impacts of the management efforts. The NPS needs a long-term management strategy to avoid invasive plant establishment and expansion on local or landscape levels as seen elsewhere in the nation. Figure 1.1 shows National Park System units in Alaska with the relative threat of invasive plants in these units. Detailed maps of invasive plant infestations in some parks are provided in Chapter 3, existing conditions in the affected environment.

Figure 1.1 Relative levels of invasive plant threat[1] for Alaska's 16 NPS units.



[1] Threat of invasive is not uniform across any one park. High threats are localized in high traffic areas.

Alaska is unique among the United States in retaining vast landscapes inhabited by only native species. The sixteen Alaska Region National Park System units are representative of this condition, but invasive plants are beginning to infest areas of high human use. Invasive plant species are becoming widespread in towns and along roadways throughout the state. Most invasive plants are introduced to Alaska by humans from various transport mechanisms, such as imported animal feed and straw, vehicle tires and bodies, construction equipment, contaminated fill material, human clothing and shoes, and various camping and recreational equipment. Impacts of invasive plants to natural areas include displacement of native plant communities, degradation of fish and wildlife habitat, and alteration of ecosystem processes. Invasive plants can also affect visitor perceptions and recreational use as natural areas are degraded over time. While invasive plants have affected only small spatial areas in Alaska NPS units to date, the rapid spread of many invasive species across Alaska indicates that more serious problems are on the horizon. A proactive strategy providing consistency and direction to manage invasive plants will never be more cost-effective than now, when we can focus on prevention, early detection, and rapid response to remove small-scale infestations.

This environmental assessment (EA) analyzes the proposed Invasive Plant Management Plan and alternatives and their impacts on the environment. While chemical and biological control methods could prove more effective than physical means, these methods have greater associated risks. This EA is being prepared to evaluate the potential impacts of invasive plants and their control methods toward the goal of minimizing overall impacts to Alaska Region NPS units. The EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and regulations of the Council on Environmental Quality (40 CFR 1508.9).

1.2 Background

Prior to the establishment of the Alaska Region Exotic Plant Management Team (EPMT) program in 2003, invasive plant management in Alaska parks was limited to preliminary surveys in about half of the parks and small-scale control efforts in several parks. Since 2003, the EPMT has coordinated efforts throughout the Region toward invasive plant prevention, survey, control, monitoring, and restoration. Field employees watch for new infestations, control and monitor existing infestations, and map and collect relevant data about each site.

Invasive plant control efforts in Alaska parks have targeted particular species that are not yet widespread in a given park unit and present a threat to park resources and values. Where feasible, field employees manually or mechanically remove infestations, with youth or volunteer crew assistance for large infestations. Because most infestations are extremely small and root removal maximizes control effectiveness relative to cutting, hand-pulling with minor digging is the prevailing control method. In a few cases, brush trimmers have been used for large populations of species for which root reserves are not a concern. Most infestations are monitored and retreated for multiple years, and the detection of new infestations requires additional effort. Recently more aggressive invasive plants have become established in Alaska NPS units or are not contained with current control methods, which point to a need for more effective control methods.

Authorities to manage exotic plants in Alaska National Parks are derived from the 1916 NPS Organic Act, the 1980 Alaska National Interest Lands Conservation Act (ANILCA), the Federal Noxious Weed Act of 1974 amended in 1990, Plant Protection Act of 2000, Noxious Weed Control & Eradication Act of 2004, the 1999 Executive Order 13112 – Invasive Species, and the 2006 NPS Management Policies. These are briefly described below.

1.2.1 NPS Organic Act

The Act creating the NPS states the NPS will "… conserve the scenery and the natural and historic objects and the wild life therein and … provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The NPS Organic Act and the General Authorities Act prohibit impairment of park resources and values. The 2001 NPS Management Policies uses the terms "resources and values" to mean the full spectrum of tangible and intangible attributes for which the park is established and managed, including the Organic Act's fundamental purpose and any additional purposes as stated in the park's establishing legislation. The impairment of park resources and values may not be allowed unless directly and specifically provided by statute. The primary responsibility of the NPS is to ensure that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

The evaluation of whether impacts of a proposed action would lead to an impairment of park resources and values is included in this environmental assessment. Impairment is more likely when there are potential impacts to a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

The National Park Service Omnibus Management Act of 1998 (P.L. 105-391, 112 Statute 3497) addresses resources inventory and management in Title II. Section 201 defines the purposes of this title to enhance and encourage scientific study in National Park System (NPS) units. Section 202 authorizes and directs the Secretary of the Interior to assure management is enhanced in NPS units by a broad program of high quality science and information, such as inventory and monitoring and exotic plant management programs.

1.2.2 Alaska National Interest Lands Conservation Act (ANILCA)

Title 1 of ANILCA broadly defines the purpose of the Act. Section 101 states the units are established to "… preserve for the benefit, use, education, and inspiration of present and future generations certain lands and waters in the State of Alaska that contain nationally significant

natural, scenic, historic, archeological, scientific, wilderness, cultural, recreational, and wildlife values." Furthermore, this section emphasizes preserving scenic and geological values of *natural landscapes and habitat for wildlife in their natural state and maintaining undisturbed ecosystems*, among other values.

1.2.3 Federal Noxious Weed Act (Public Law 93-629)

Enacted January 3, 1975, the Act established a Federal program to control the spread of noxious weeds. P.L. 101-624, the 1990 Farm Bill, enacted November 28, 1990 (104 Stat 3611) amended the Act by requiring each Federal land-managing agency to:

(1) Designate an office or person adequately trained in the management of undesirable plant species to develop and coordinate an undesirable plants management program for control of undesirable plants on Federal lands under the agency's jurisdiction;

(2) Establish and adequately fund an undesirable plants management program through the agency's budgetary process;

(3) Complete and implement cooperative agreements with State agencies regarding the management of undesirable plant species on Federal lands under the agency's jurisdiction; and

(4) Establish integrated management systems to control or contain undesirable plant species targeted under cooperative agreements.

In general, Federal agencies, as appropriate, shall enter into cooperative agreements with State agencies to coordinate the management of undesirable plant species on Federal lands. The contents of a plan pursuant to a cooperative agreement shall:

(A) Prioritize and target undesirable plant species or group of species to be controlled or contained within a specific geographic area;

(B) Describe the integrated management system to be used to control or contain the targeted undesirable plant species or group of species; and

(C) Detail the means of implementing the integrated management system, define the duties of the Federal agency and the State agency in prosecuting that method, and establish a timeframe for the initiation and completion of the tasks specified in the integrated management system.

(D) Exception: A Federal agency is not required under this section to carry out programs on Federal lands unless similar programs are being implemented generally on State or private lands in the same area.

1.2.4 Plant Protection Act of 2000 (7 U.S.C 7701, Public Law 106-224)

This Act consolidated many previous agriculture-related laws into a comprehensive law. Noxious weeds are defined as "any plant or plant product that can directly or indirectly injure or

cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, natural resources of the United States, the public health, or the environment." It recognizes that the "detection, control, eradication, suppression, prevention, or retardation of the spread of plant pests or noxious weeds is necessary for the protection of the agriculture, environment, and economy of the United States." It includes interstate transport, importation, and exportation regulations.

1.2.5 Noxious Weed Control & Eradication Act of 2004 (Public Law 108-412)

This legislation created a program to provide financial and technical assistance through states to eligible weed management entities to control or eradicate harmful, nonnative weeds on public and private lands.

1.2.6 Executive Order 13112 - Invasive Species:

Section 2 of Executive Order (EO) 13112 addresses federal agency duties with regards to management of invasive species. Each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law:

1. identify such actions;
2. subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and 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; (vi) promote public education on invasive species and the means to address then; and
3. not authorize, fund, or carry out action that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

1.2.7 NPS Management Policies of 2006:

Policy 4.4.4 Management of Exotic Species

> Exotic species will not be allowed to displace native species if displacement can be prevented.

Policy 4.4.4.1 Introduction or Maintenance of Exotic Species

> In general, new exotic species will not be introduced into parks. In rare situations, an exotic species may be introduced or maintained to meet specific, identified management needs when all feasible and prudent measures to minimize the risk of harm have been taken.

For historic properties, an exotic species would be maintained in NPS units only if:

It is needed to meet the desired condition of a historic resource, but only where it is noninvasive and is prevented from being invasive by such means as cultivating (for plants), or tethering, herding, or pasturing (for animals). In such cases, the exotic species used must be known to be historically significant, to have existed in the park during the park's period of historical significance, to be a contributing element to a cultural landscape, or to have been commonly used in the local area at that time.

Policy 4.4.4.2 Removal of Exotic Species Already Present

All exotic plant and animal species that are not maintained to meet an identified park purpose will be managed—up to and including eradication—if (1) control is prudent and feasible, and (2) the exotic species

- interferes with natural processes and the perpetuation of natural features, native species or natural habitats, or
- disrupts the genetic integrity of native species, or
- disrupts the accurate presentation of a cultural landscape, or
- damages cultural resources, or
- significantly hampers the management of park or adjacent lands, or
- poses a public health hazard as advised by the U.S. Public Health Service (which includes the Centers for Disease Control and the NPS Public Health Program), or
- creates a hazard to public safety.

High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controllable. Lower priority will be given to exotic species that have almost no impact on park resources or that probably cannot be successfully controlled. Where an exotic species cannot be successfully eliminated, managers will seek to contain the exotic species to prevent further spread or resource damage.

The decision to initiate management should be based on a determination that the species is exotic. For species determined to be exotic and where management appears to be feasible and effective, superintendents should

1) evaluate the species' current or potential impact on park resources;
2) develop and implement exotic species management plans according to established planning procedures;
3) consult, as appropriate, with federal and state agencies; and
4) invite public review and comment, where appropriate. Programs to manage exotic species will be designed to avoid causing significant damage to native species, natural ecological communities, natural ecological processes, cultural resources, and human health and safety.

Policy 4.4.5.2 Integrated Pest Management Program

The Service conducts an integrated pest management (IPM) program to reduce risks to the public, park resources, and the environment from pests and pest-related management strategies. IPM is a decision-making process that coordinates knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage, by cost-effective means, while posing the least possible risk to people, resources, and the environment.

The Service, and each park unit, will use an IPM approach to address pest issues. Proposed pest management activities must be conducted according to the IPM process prescribed in Director's Order #77-7: Integrated Pest Management. Pest issues will be reviewed on a case-by-case basis. Controversial issues, or those that have potential to negatively impact the environment, must be addressed through established planning procedures and be included in an approved park management or IPM plan. IPM procedures will be used to determine when to implement pest management actions, and which combination of strategies will be most effective for each pest situation. Under the Service's IPM program, all pesticide use on lands managed or regulated by the Service, whether that use was authorized or unauthorized, must be reported annually.

1.3 Issues

To focus the environmental assessment, the NPS selected specific issues for further analysis and eliminated others from evaluation. Issues were identified in two internal NPS scoping meetings in spring of 2006, from three public meetings in September 2006 (Juneau, Fairbanks, and Anchorage). Public input was also received through the NPS PEPC planning website, from personal correspondence, and through direct contact with likely stakeholders (e.g. Alaska Lands Act Coordination Committee on October 10, 2006, and the Committee for Noxious and Invasive Plant Management [CNIPM] meeting October 25 and 26, 2006). Over 200 scoping newsletters were sent to stakeholders in Alaska and abroad on or about September 1, 2006. See Chapter 5 for more details on public scoping, consultation, and coordination.

1.3.1 Issues Selected for Detailed Analysis

Based on scoping, the NPS identified the following issues for evaluation in this EA.

1.3.1.1 Aquatic Resources and Fish

Invasive plant species could have negative effects on native aquatic biota and fish habitat and populations. Invasive plant expansion or use of herbicides may have detrimental effects on aquatic species such as salmon, including eggs, fry, migrations, adult tissues, reproductive capacity, and essential fish habitat.

Improper applications of herbicides could result in negative impacts to fish and other aquatic life forms. The accumulation and contamination of streams, rivers, wells, and sediments from EPA approved herbicides may adversely affect aquatic resources.

1.3.1.2 Cultural Resources

Archeological resources could be adversely impacted from the various invasive plant control methods. Digging, some chemicals, steam, and fire could adversely affect archeological or historical resources.

Some nonnative plants were introduced during the Klondike Gold Rush era and other human events with historical significance. Though some of these species may be spreading invasives, most are not and are part of the historical landscape. The assessment should address potential effects on historically important plants.

1.3.1.3 Floodplain Management and Wetlands Protection

Invasive plant infestations and various control methods could adversely affect floodplain and wetland functions such as: obstruction of natural flows, changes in water retention, changes in availability of water to organisms other than the invasive plants, changes in erosion rates, or displacement of vegetation used by wildlife or fish.

1.3.1.4 Human Health and Safety

General public and employee health and safety could be adversely affected from exposure to chemical herbicides and the use of other control methods, such as fire, steam, cutting, and mowing.

1.3.1.5 Soils

Invasive plant infestations can alter natural soil chemistry, soil physics, and productivity. Conversely, single or repeated applications of herbicides could alter soil chemistry and adversely affect soil invertebrates and soil productivity. Soil moisture, particle sizes, and soil temperatures may affect herbicide movement through soil, so soil moisture regimes, particle sizes, and temperatures need to be considered.

1.3.1.6 Subsistence Resources/Uses

Uncontrolled invasive plant infestations may lure pollinators away from native plants resulting in reduced berry crops and otherwise adversely affect habitat for fish and wildlife used for subsistence, thereby changing subsistence use patterns.

Herbicide uses could adversely affect food safety, palatability, and perceptions of foods used in subsistence activities. Appendix A contains the ANILCA Section 810 summary evaluation and finding of effects to subsistence.

1.3.1.7 Vegetation

Invasive plant infestations could result in reduced biodiversity of natural plant communities and the displacement or replacement of native species and natural plant communities. Invasive plant

infestations could adversely affect the natural evolution of plant communities, increase land disturbances, and accelerate with climate change effects.

Herbicides could adversely affect non-target species of native vegetation in treatment areas.

1.3.1.8 Wilderness Resources/Scenic Quality

Invasive plant infestations and some control methods in Alaska National Park System units could affect the scenic quality of the parks and the wilderness resources of the areas. Appropriate methods are needed to detect and manage invasive plants in the vast, remote wilderness areas in Alaska National Park System units.

1.3.1.9 Wildlife/Habitat

Invasive plant infestations could result in adverse and toxic effects on wildlife and their habitat in Alaskan NPS units.

The use of herbicides or uncontrolled expansion of invasive plants could result in damaging effects on insect life used by birds, small mammals, and larger animals. Herbicides and bioaccumulation in tissues of higher trophic level animals could result in sub-lethal effects to wildlife. Using low toxicity herbicides with short residence times and keeping wildlife from feeding in chemically treated areas or avoiding chemical treatments in sensitive wildlife habitat are important considerations.

1.3.2 Issues Dismissed From Detailed Analysis

Issues dismissed from detailed analysis will not be addressed further in the EA.

1.3.2.1 Air Quality

The proposed invasive plant control alternatives would not consider aerial spraying or otherwise measurably affect air quality in national parks in Alaska.

1.3.2.2 Climate Change

None of the invasive plant control alternatives would result in greenhouse gas emissions or any other effect on the ground that could influence climate change. The climate change effects on resources potentially affected by any of the alternatives are addressed under cumulative effects.

1.3.2.3 Environmental Justice

None of the invasive plant control alternatives are expected to have a disproportionate adverse effect on any economically disadvantaged human populations in or near the Alaska National Park areas, including subsistence communities.

1.3.2.4 Noise

No measurable change in human-caused noises would occur as a result of any of the invasive plant control alternatives.

1.3.2.5 Recreation and Visitor Use

The effects on park recreation and visitor use from herbicide treatment of invasive plants would be minimal. Herbicide treatment areas would be small in size and considerable acreage is available for park visitors to pursue alternate recreational venues in parks. In addition, park visitors would be displaced from treatment areas for a short period of time to protect their health and safety.

The potential for the introduction of invasive plants to NPS areas from recreational uses, equipment, and livestock would be addressed through preventative mitigating measures to 1) educate the public about invasive plants and 2) require weed-free feed, straw, and recreational equipment. See also section 2.5 on mitigating measures.

1.4 Permits and Approvals Needed to Implement Project

The NPS would follow all federal and state compliance measures when using herbicides. Since NPS lands are considered "public places," as defined by Alaska State Pesticide Control Regulations 18 AAC 90, public notification and posting requirements must be met. Permits from the Alaska Department of Environmental Conservation would be necessary under certain circumstances, such as application to water or state "rights-of-way." Additionally, prior to herbicide applications pesticide use proposals (PUPs) will be submitted to the NPS regional IPM coordinator for review and approval. Any proposal exceeding the scope of this document would need additional NEPA compliance.

Additional measures are more fully described in Appendix H – herbicide best management practices.

2.0 Description of the Alternatives

2.1 Introduction

This chapter describes a range of reasonable alternatives, namely the no action alternative (status quo - physical methods to control invasive plants) and the proposed action alternative (use a decision tree for adaptive management to supplement physical control methods with herbicide use where necessary, safe, and effective). This chapter also describes those alternatives and actions that will not be considered further (i.e., those not analyzed in Chapter 4).

Refer to Chapter 3, section 3.1 for an inventory of known invasive plant infestations in Alaska NPS units and to chapter 5 for a description of the process used and participants consulted during the development of the alternatives.

Tables 2.8 and 2.9 at the end of this chapter provide a comparative summary of the alternatives and their environmental impacts, respectively.

2.2 Elements Common to Both Alternatives

2.2.1 Survey, Monitoring, and Data Management

Surveying new areas and monitoring areas already surveyed or treated are critical for finding new infestations, measuring changes in a given infestation, and evaluating control effectiveness. Field technicians will continue to use a standard data collection protocol (Rapp 2009) for precise global positioning system (GPS) units to enable infestation size analysis, planning using distribution maps, and relocation of infestations.

Data management is important because it is only through proper maintenance of the data that the existing knowledge base will be valuable for years to come. All data collected will be stored in a geographic information system (GIS) database that contains data collected since 2003. This database is accessible to all NPS employees, is provided to others on request, and would serve as the information source for the decision tree process under Alternative 2. Data are collected in accordance with North America Weed Management Association standards (http://www.nawma.org/documents/Mapping%20Standards/Invasive%20Plant%20Mapping%20Standards.pdf).

The current inventories cover a relatively small percentage of the parks; however, the inventory has targeted the areas most likely to have invasive plants – disturbance zones (e.g. roadsides, trails, riparian areas, campsites, near buildings, etc.). Through 2008, NPS has documented 1,572 infestations (mapped areas aggregated if within 500 meters of another area of the same species) that occupy 5,250 acres of invasive plant infestations in and near Alaska National Parks.

Comprehensive treatment of all known infestations is not proposed with either alternative. Not all infestations are prioritized for treatment due to the high cost, perceived risk, and logistics. An examination of the existing data reveals full treatments of 21 infestations are outside the scope of this EA because each infestation exceeds 20 acres in area (Table 2.1).

Table 2.1 Weed Infestations Larger than 20 Acres

Park Unit	Location	Species	Mapped acres aggregated by 500 m
GLBA	Bartlett Cove	Cerastium fontanum	86.035
GLBA	Dry Bay	Cerastium fontanum	108.008
GLBA	Dry Bay	Cerastium fontanum	94.529
GLBA	Dry Bay	Lupinus polyphyllus	385.418
GLBA	Dry Bay	Matricaria discoidea	24.945
WRST	Nabesna Road	Matricaria discoidea	142.859
GLBA	Bartlett Cove	Plantago major	95.704
GLBA	Dry Bay	Plantago major	189.549
WRST	May Creek	Plantago major	26.814
WRST	Nabesna Road	Plantago major	142.892
YUCH	Coal Creek	Plantago major	33.406
GLBA	Bartlett Cove	Taraxacum officinale ssp. officinal	195.257
GLBA	East Arm	Taraxacum officinale ssp. officinal	72.058
KLGO	White Pass	Taraxacum officinale ssp. officinal	25.534
KLGO	White Pass	Taraxacum officinale ssp. officinal	25.829
WRST	May Creek	Taraxacum officinale ssp. officinal	32.64
WRST	McCarthy	Taraxacum officinale ssp. officinal	67.823
WRST	Kennicott	Taraxacum officinale ssp. officinal	117.08
DENA	Mi 1 Park Road	Taraxacum officinale ssp. officinal	43.168
GLBA	Bartlett Cove	Trifolium repens	143.395
WRST	McCarthy	Trifolium repens	203.076

2.2.2 Physical Control Methods

Physical control methods would continue in Alaska NPS units, including manual, mechanical, and thermal methods.

Manual and mechanical techniques, including pulling, digging, cutting, or otherwise damaging plants, are effective for controlling some invasive plant species, particularly small infestations of species without substantial root reserves and lacking the capacity for vegetative reproduction. These methods are labor and time intensive, and treatments must generally be administered multiple times each growing season for multiple years.

All Alaska parks with documented invasive plant infestations currently use manual or mechanical treatments to control them and would continue to do so for the majority of infestations under either alternative. Manual treatment uses hand tools (e.g. weed diggers, weed wrenches™, shovels, clippers, and pulaskis) to complement hand-pulling, while mechanical treatment implements include, brush trimmers, mowers, and chainsaws (Rapp 2009). Both manual and mechanical treatments can remove both aboveground and belowground plant biomass and prevent dispersal by seed.

Once physically removed, plant material is disposed of properly to ensure material does not resprout. In some cases, material is double-bagged and disposed of in approved waste management systems because seeds and plant fragments can be viable and re-establish infestations. In other situations, plant material is incinerated to ensure no fragments are left to resprout.

2.2.3 Thermal Treatments

Thermal control methods, including burning, steaming, and application of hot foam, are expensive and relatively untested options in Alaska. Burning may involve open fire or use of specially designed weed burning tools often attached to propane tanks. Other specially designed equipment may be used to apply steam to target species. Hot foam refers to a method of steam-killing vegetation with hot water mixed with a surfactant (which can be biodegradable and organic) and pumped from the system. The Waipuna Hot Foam system is commercially available (review available at http://tncinvasives.ucdavis.edu/tools/hotfoam.html).

Where manual and mechanical control methods are ineffective in controlling particular infestations, thermal treatments could control larger areas, allow for thorough coverage, and control seeds and shallow roots. For plants with substantial root reserves, however, thermal treatments are unlikely to be effective in eliminating an infestation.

2.3 Alternative 1. No Action (Status Quo)

Under Alternative 1, the NPS would continue to treat invasive plant infestations in Alaska National Park System units with manual or mechanical control methods where feasible, as determined on a case-by-case basis. Table 2.2 provides the acres treated with physical control methods between 2005 and 2008 and estimates of acres to be treated with those methods until 2018. We project fewer than 1,200 acres would be treated out of about 40,000,000 acres of vegetated lands in Alaska NPS units[1]. Where multiple years of control are ineffective, alternative methods would be used experimentally, including thermal and additional mechanical treatments but not chemical and biological methods. Where all other methods fail, further NEPA analysis would be necessary for the latter methods. Increasing labor and funding would be needed under alternative 1 due to the persistence of existing infestations and the establishment of new ones.

Table 2.2 estimates the areas to be treated or retreated if the program were to be carried out in the current format. Note an influx of funding is expected in 2010 and 2011 that will generate more than normal treatment. This estimate comes from previous years of performance and knowledge of existing populations.

[1] This management plan does not address glaciated or barren ground or submerged lands, which covers approximately 10 million of the over 50 million acres.

Table 2.2 Actual and Projected Acres Treated and Retreated across Alaska NPS Units in 2005 through 2018 (* indicates projections) under Alternative 1.

Year	Acres Treated for the first time	Acres Retreated	Total Acres Treated
2005	23	6	29
2006	46	20	66
2007	31	22	53
2008	10	60	70
2009*	10	60	70
2010*[2]	48	68	116
2011*	39	53	92
2012*	28	47	75
2013*	30	55	85
2014*	32	64	96
2015*	34	74	108
2016*	36	85	121
2017*	38	97	135
2018*	40	110	150
Totals	445	821	1266

2.4 Alternative 2. Proposed Invasive Plant Management Plan with Decision Tree (*NPS Preferred Alternative)*

An annual work plan will be developed by the program lead for the Alaska Exotic Plant Management Team and posted on the AKEPMT website by the April 30 of each calendar year (http://www.nps.gov/akso/NatRes/EPMT/index.html). The annual work plan will list all sites that are scheduled for treatment and the method of treatment for each calendar year. New sites must meet the mitigation measures and constraints of the EA and be within the analysis of effects described in the EA. The project list would remain posted for full disclosure through the end of the calendar year.

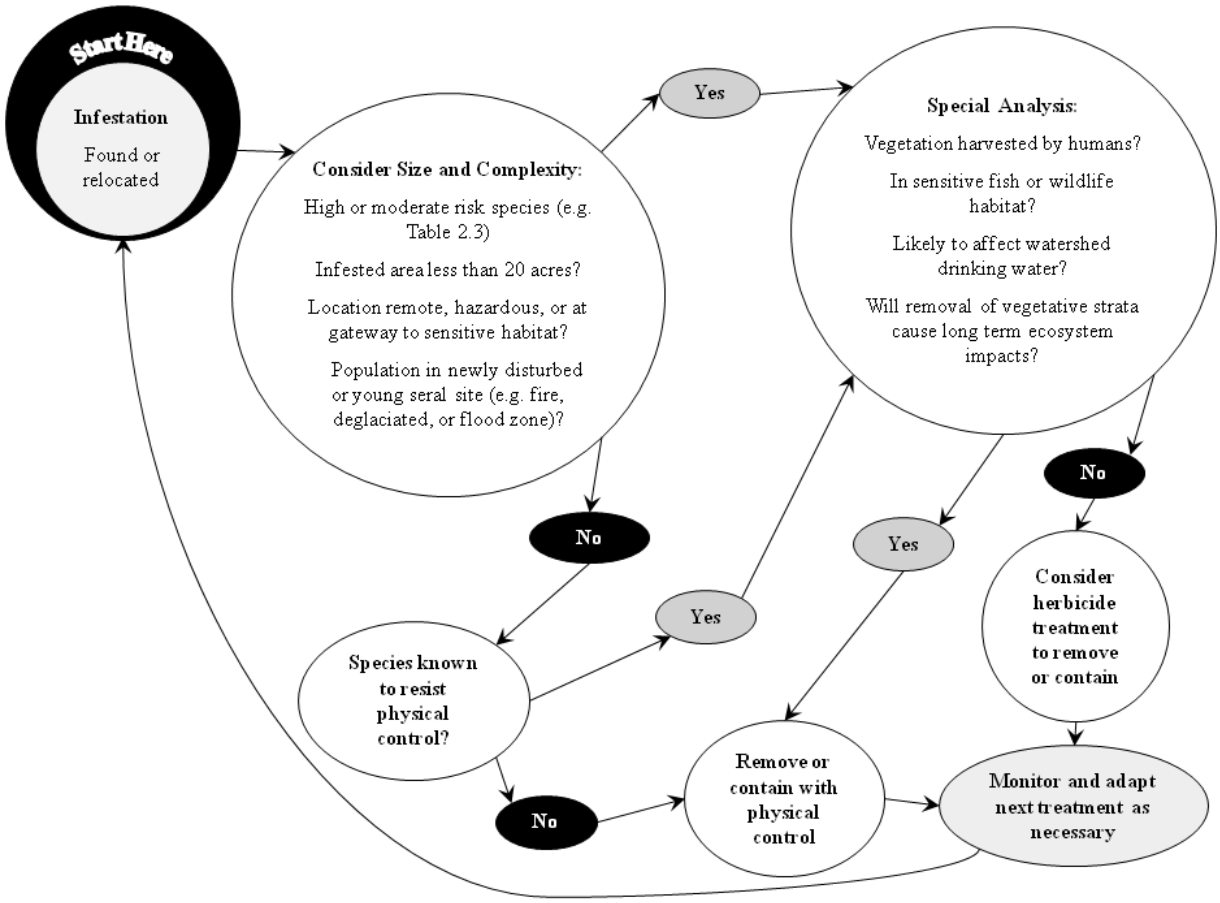
An adaptive management approach would use a decision tree (Figure 2.1) to determine how to control invasive plant infestations in Alaska National Parks most effectively while posing the least possible risk to people, resources, and the environment. Spot herbicide application would be allowed in specified circumstances using best management practices (appendix H) where physical control methods would be ineffective.

[2] A temporary, significant funding increase is anticipated. This will render greater person-hours in the field, thereby increasing the potential acres treated.

2.4.1 Integrated Pest Management Decision Tree

The decision tree (Figure 2.1) determines whether herbicide use would be necessary, safe, and effective for a given infestation. Note that it would be important to consider the "threshold" size and complexity of an infestation, such as when an infestation is larger than or beyond conditions where physical control methods are effective (Table 2.4). Also consideration would be made to use herbicides when a small infestation has been repeatedly treated using physical control methods, but the infestation persists.

Figure 2.1 Invasive Plant Management Decision Tree



Care would be made to examine the site complexity and size of the infestation as spelled out in the decision tree. The following items are listed as situations or examples to clarify the decision tree process as it relates to use of an herbicide:

1) Herbicide use would be prohibited in areas where species and/or infestations of species are being harvested in accordance with Title VIII of ANILCA – Subsistence Management and Use;
2) Herbicide would not be used if it would result in risks to human or wildlife health or water contamination.

3) Herbicide would not be used if the treatment would result in the complete loss of vegetative strata whereby reclamation on the short-term (<5 years) is not practical or feasible, and loss would cause long-term ecosystem impacts.

Note: if the decision tree leads to "Consider Herbicide Use", NPS may still select alternative treatment methods, such as hand pulling, burning, or mechanical removal.

NPS projects fewer than 900 acres would be treated out of about 40,000,000 acres of vegetated lands in Alaska NPS units. Following initial control of the larger infestations, a conservative projection of herbicide use under this alternative would be an average of 2-12 acres per year. A worst-case scenario or upper estimate of herbicide use – across Alaska NPS units under Alternative 2, would be 150-acres per year based upon updated inventories of accessible infestations. This scenario would manifest if a large number of new infestations of high-risk species were found or existing infestations were not able to be treated in a timely efficient fashion. Table 2.3 contains the actual acres treated through 2008 and projects the acres to be treated through 2018.

Table 2.3 Actual and Projected Acres Treated and Retreated across Alaska NPS Units in 2005 through 2018 (* indicates projections) under Alternative 2.

Year	Acres Treated for the first time	Acres Retreated	Acres Treated with Herbicide	Total Acres Treated
2005	17	6	0	23
2006	46	20	0	66
2007	28	22	0	50
2008	10	60	0	70
2009*	10	60	0	70
2010*[1]	65	58	12	123
2011*	60	35	10	95
2012*	55	33	8	88
2013*	50	31	7	81
2014*	30	29	4	59
2015*	25	27	4	52
2016*	20	15	4	35
2017*	15	13	2	28
2018*	10	11	2	21
Totals	441	420	53	861

[1] An infusion of funds is expected to increase control efforts and acres treated for a one-year period in 2010.

Threshold infestation sizes for effective physical control of particular invasive plant species, as shown in Table 2.4, were developed on the basis of their biology and control results in Alaska. The species listed are those currently being managed on NPS lands in Alaska or likely to arrive in the near future. Thresholds for additional species or modifications to existing designations would be developed as needed from literature for high-risk species and following multiple years of physical control for medium-risk to high risk species. Thresholds would be adapted if

consistent results demonstrate that larger infestations of a particular species can be eliminated by physical methods or that the listed threshold infestation size cannot be eliminated by physical methods.

Infestations greater than 20 acres in size would only be treated in a containment approach. A containment approach allows for strategic treatment of the outlying or perimeter portion of the infestation, with the intention of halting the advancement of the target infestation towards uninfested significant resource areas or high-use, vector (gateway) locations.

2.4.2 Herbicide Use

Only species considered to be moderately to highly invasive by the Invasive Plant Ranking System would be considered for herbicide use under Alternative 2. Because of the variety of these species and the nature of integrated pest management, a range of herbicides would need to be considered in order to provide effective and site-specific control. The herbicide active ingredients commonly used for invasive plant control in natural areas in other states that are registered for use in Alaska are those that would be authorized for use under Alternative 2 (Table 2.6)**.** Common trade names are listed in the table as examples; under the preferred alternative, any registered herbicide trade name that contains the active ingredients listed in Table 2.6 may be used. In addition, newly developed herbicides in the future would be authorized if they are registered by the Environmental Protection Agency and the Alaska Department of Environmental Conservation, if a risk assessment has been prepared that takes Alaska's climate into account, and if their properties (as presented in Chapter 4) fall within the range of values of herbicides specifically authorized here. Herbicide selection for a particular infestation would be based on the target species biology; presence of non-target species; soil type, depth, and distance to water; and weather. Each selection would have to be approved by the NPS Regional or National Integrated Pest Management Coordinator. A summary of proposed herbicide environmental fate and effects is presented in appendix G.

USFS Risk Assessments for the proposed herbicides are incorporated by reference: http://www.fs.fed.us/foresthealth/pesticide/risk.shtml

Under Alternative 2, herbicides would only be applied according to their labels and using spot spray via boom, backpack, or handheld spray mechanisms or direct contact via wicks, brushes, sponges, or injection. Particular infestations may require repeated herbicide applications for effective control. A wide range of best management practices would be required to ensure legal, safe, and responsible herbicide use (Appendix H).

Table 2.4. Considerations for selecting physical and herbicide control methods. [3]

Risk to NPS Lands	Low	Medium	High
Responsiveness to physical control	**Higher**	**Intermediate**	**Lower**
Typically exceeds physical control capacity	**5,000 individuals or 1.00 acre**	**1,000 individuals or 0.25 acres**	**100 individuals or 0.10 acres**
	alsike clover	common tansy	bird vetch
	black bindweed	common timothy	Canada thistle
	Johnny-jump-up violet	foxglove	creeping buttercup
	common sheep sorrel	orchard grass	European mountain-ash
	red clover	oxeye daisy	Japanese knotweed
	tall buttercup	quackgrass	orange hawkweed
	meadow foxtail	smooth brome grass	perennial sowthistle
	shepherd's purse	white clover	Siberian peashrub
	mouse-ear chickweed	white/yellow sweetclover	reed canarygrass
	common lambsquarters	yellow toadflax	bigleaf lupine
	flixweed	perennial cornflower	
	hempnettle	narrowleaf hawksbeard	
	hairy cat's ear	common eyebright	
	white deadnettle	ornamental jewelweed	
	European stickseed	common comfrey	
	common pepperweed	common dandelion	
	perennial/Italian ryegrass		
	Maltese cross		
	pineapple weed (disc mayweed)		
	black medic		
	yellow alfalfa		
	European forget-me-not		
	common plantain		
	annual and other bluegrasses		
	prostrate knotweed		
	common groundsel		
	bladder campion		
	common chickweed		
	field pennycress		
	scentless false mayweed		

[3] See appendix B for invasiveness rankings and scientific names.

Table 2.5 Clarification of terms associated with proposed actions in Chapter 2

Term	Definition
Controlled	Controlled is defined as maintaining an area free of the target invasive plant state so that annual or periodic maintenance treatment represents 1% or less of the original infestation.
Resistance	Species documented not to respond to well-timed and thoroughly executed physical treatment. Measured in number of individuals or gross acreage where efforts do not provide 50% control after 3 years of treatment of 75% control after 5 years.
General herbicide use context	The least risk and most effective herbicide for a given species and site would be allowed.
Pesticide Notification	Herbicide applications in public places will be posted with the standard notification template found on the following website: http://www.dec.state.ak.us/eh/docs/pest/docs/Public-Application-of-Pesticide.pdf
Residual control for high-risk species in a remote site	Residual control is the ability of an herbicide to continue killing weeds after the initial application. Herbicide residues in the soil would control seedlings of high-risk species likely to germinate at a site that cannot be revisited later in the growing season.
High-risk species	Ranked 60 or higher by the Alaska Natural Heritage Program (http://akweeds.uaa.alaska.edu/).
Medium-risk species	Ranked 50 to 59 by the Alaska Natural Heritage Program.
Low-risk species	Ranked less than 50 by the Alaska Natural Heritage Program.
Seral stage	The term for each successional stage of a plant community is referred to as a seral stage
Contain and monitor	Manage the infestation in a strategic fashion to halt the spread of target invasive species from its original footprint or strategically determined zone to best protect significant resources.
Herbicide risk to human or wildlife health or water contamination	Analyzed on the basis of Risk Assessments prepared for the Forest Service (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml), human or wildlife risk evaluation considers exposure and toxicity to determine if humans or animals would likely come into contact with significant quantities of a toxic substance, primarily via consumption of subsistence resources or forage. Water contamination potential considers herbicide properties and likelihood of transport into surface water or groundwater and effects therein.

In the future, additional plans to address specific invasive plant management issues may be prepared. Park-specific plans containing invasive plant treatments or having associated potential impacts that have not been considered in this analysis would require additional compliance with NEPA.

Table 2.6. Proposed herbicides and their characteristics.

Active Ingredients	Target Plants	Mode of Action	Method of Application
2, 4-D (Basic Solutions Lawn Weed Killer, Eliminator, Grass Roots Weed Killer, Brush Buster, Spectracide Crossbow)	Broadleaf plants, woody plants, aquatic invasive plants, and non-flowering plants	Plant-growth regulator that stimulates nucleic acid and protein synthesis and affects enzyme activity, respiration, and cell division. It is absorbed by plant leaves, stems, and roots and moves throughout the plant. It accumulates in growing tips.	Ground spraying, lawn spreaders, cut stump treatments, foliar spray, basal bark spray, injection.
Aminopyralid (Milestone VM)	Broadleaf plants	Disturbs plant growth and is absorbed by green bark, leaves and roots, and moves throughout the plant. Accumulates in the meristem (growth region) of plant.	Ground spraying, hand-held sprayer.
Chlorsulfuron (Glean XP, Telar)	Broadleaf plants and some annual grasses.	Absorbed by the leaves and roots and moves rapidly through the plant. Prevents the plant from producing an essential amino acid.	Ground spraying, hand-held sprayer.
Clopyralid (Transline, Lontrel)	Annual and perennial broadleaf herbs, especially knapweeds, thistles, & other members of sunflower, legume, and knotweed families	Absorbed by the leaves and roots of the invasive plant and moves rapidly through the plant. It affects plant cell respiration and growth.	Ground spraying.
Glyphosate (Roundup Pro & Ultra, Rodeo, GlyPro, Accord, AquaPro, Aquamaster, Touchdown)	Grasses, herbaceous plants (including deep-rooted perennials), brush, some broadleaf trees and shrubs, and some conifers. Does not control all broadleaf woody plants.	Absorbed by leaves and rapidly moves through the plant. It acts by preventing the plant from producing an essential amino acid. This reduces the production of protein in the plant, and inhibits plant growth.	Ground spraying, hand-held sprayer, wipe application, frill treatment, cut stump treatment.
Imazapyr (Arsenal, Habitat)	Annual and perennial grass, broad-leaved weeds, brush, vines, and deciduous trees.	Absorbed by leaves and roots and moves rapidly through plants. Disrupts photosynthesis and interferes with cell growth and DNA synthesis.	Ground foliage spray, basal bark and stem treatment, cut stump treatment, tree injection.
Metsulfuron methyl (Escort)	Woody plants, annual and perennial broadleaf plants, & annual grassy invasive plants.	Absorbed through the roots and foliage and moves rapidly through plants. Inhibits cell division in the roots and shoots, which stops growth.	Ground spraying, hand-held sprayer.
Triclopyr (Garlon)	Woody plants and broadleaf plants.	Disturbs plant growth and is absorbed by green bark, leaves, and roots, moves throughout plant. Accumulates in meristem (growth region) of plant.	Ground foliage spray, basal bark and stem treatment, cut surface treatment, tree injection.

2.4.3 Infestations to be Treated with Herbicides in Year One

The highest priority herbicide treatments include the following eight infestations (Table 2.7). These infestations are shown on maps in Figures 2.2 through 2.5. A single herbicide application per year is anticipated.

From the data and the knowledge of the extent of the invasive plant infestations in Alaska NPS units, it is perceived that the infestations of Japanese knotweed and the smaller infestations of reed canarygrass will need a year or two of herbicide application. It is hoped that the larger infestations will be reduced to a manageable extent within a few (~2-4) years of herbicide use.

At this point, manual control could be resumed and be effective at removing the residual plants and newly germinating seedlings. This process would continue until the seed bank is exhausted.

Table 2.7. Initial Herbicide Applications under Alternative 2.

Park	Species	Location	Size	Herbicide
GLBA	perennial sowthistle	south side of Strawberry Island	2.4 acres	Aminopyralid – when close to water an aquatically approved glyphosate and surfactant
GLBA	reed canarygrass	slope backing the maintenance building in Bartlett Cove uplands	2.0 acres	glyphosate
GLBA	reed canarygrass	four small infestations in Bartlett Cove area	0.1 acre total	glyphosate
GLBA	oxeye daisy	fish processing plant near Dry Bay main airstrip	0.9 acres	aminopyralid
SITK	Japanese knotweed	near Indian River	0.1 acres	Imazapyr (aquatically approved when close to water)

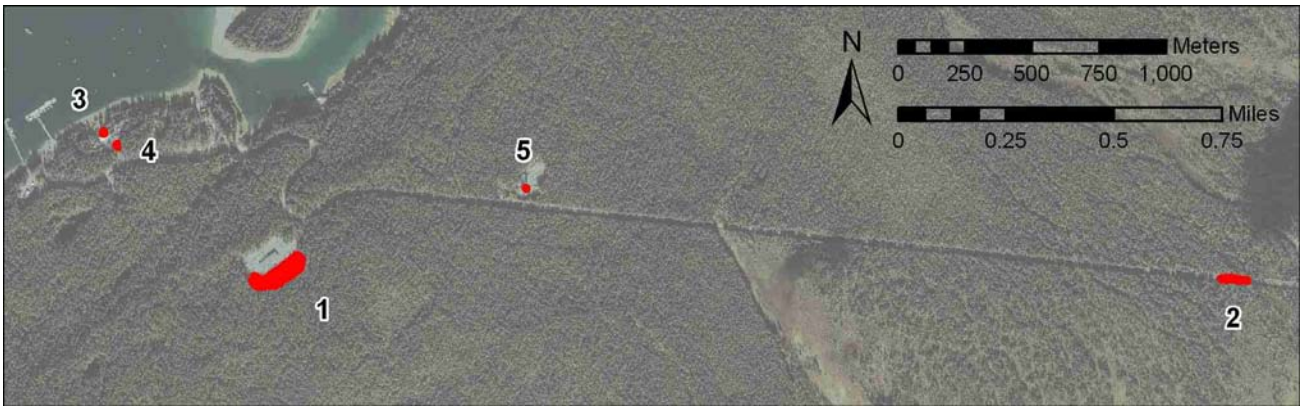


Figure 2.2. Reed canarygrass infestations warranting herbicide use in the Bartlett Cove area of GLBA. Infestation 1 is the 2.0 acre site and sites 2-5 are the smaller areas.

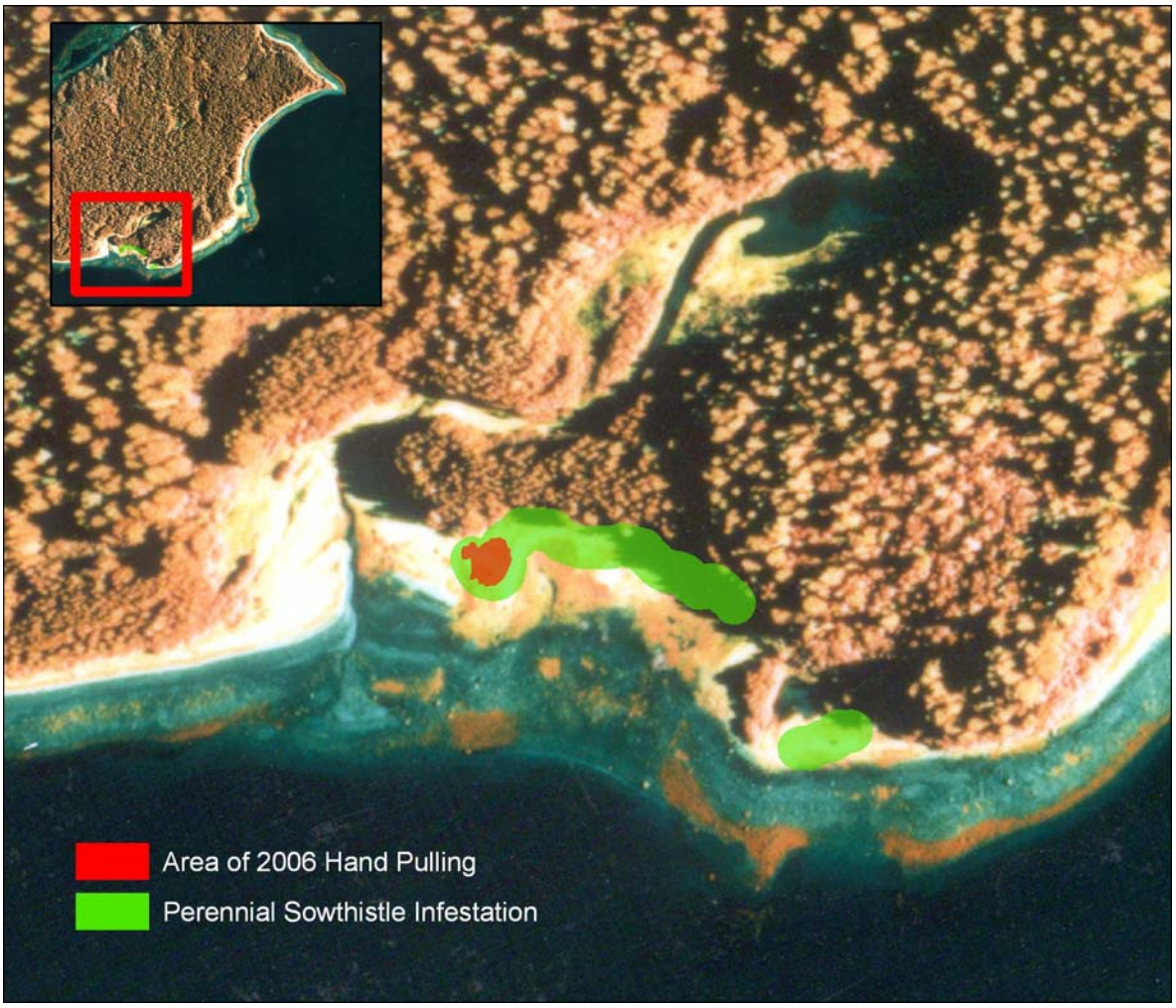


Figure 2.3. Perennial sowthistle infestation on Strawberry Island in Glacier Bay National Park and Preserve (GLBA).

2.4.4 Herbicide Use Monitoring

For each herbicide application, the NPS would monitor the efficacy (control effectiveness) of the application to remove the target invasive species and to measure damages to non-target species. These monitoring efforts would help inform the NPS if additional herbicide applications are needed or advisable in the original treatment area. Furthermore, where there may be some question or concern about the persistence of the herbicide and impacts to non-target species, the NPS would make available vegetation and soil samples for testing at agreed upon facilities.

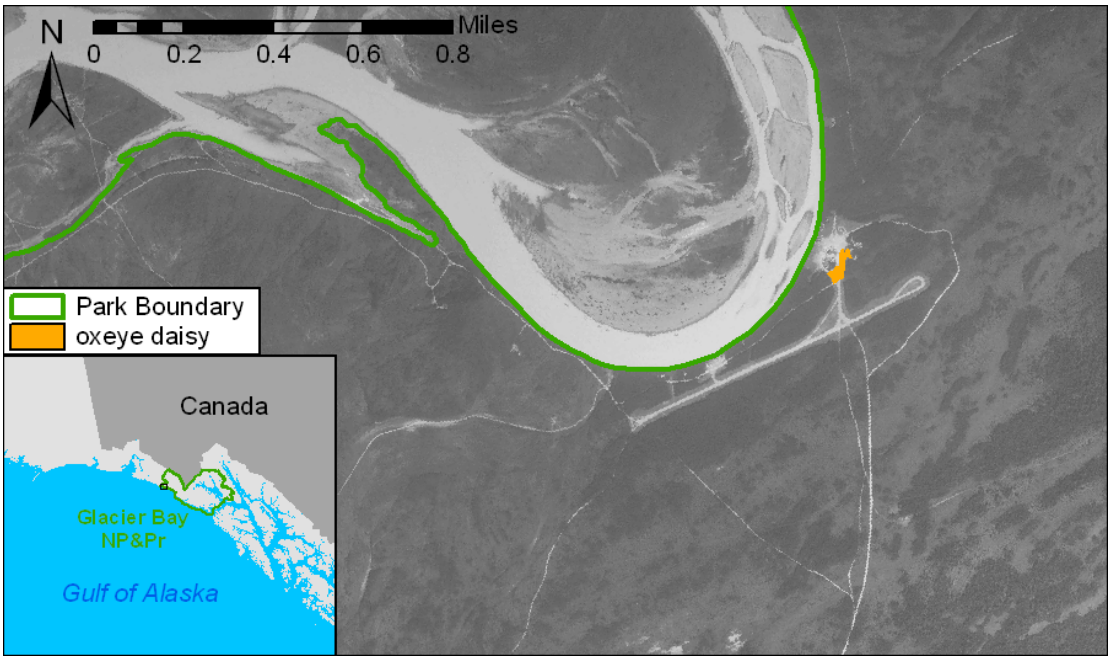


Figure 2.4. Oxeye daisy infestation warranting herbicide use in the Dry Bay area of GLBA.

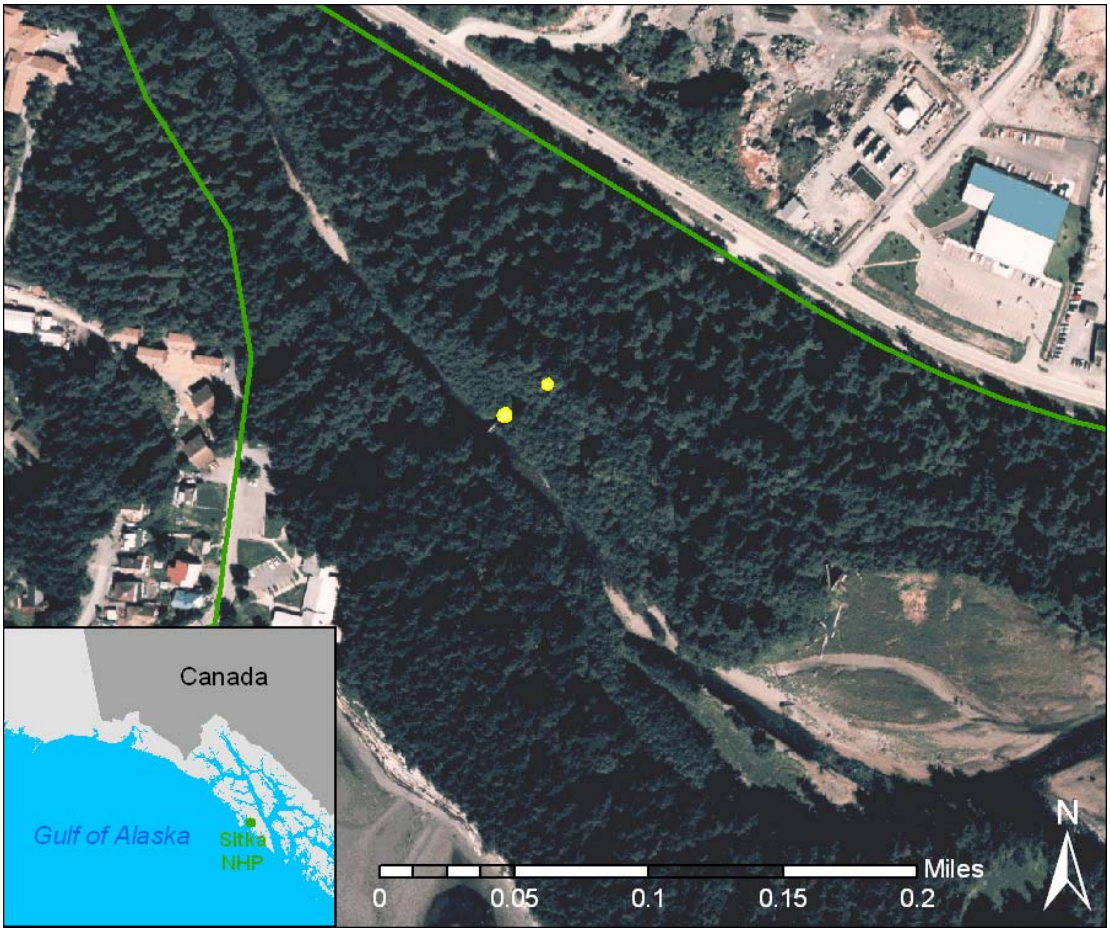


Figure 2.5. Japanese knotweed infestations in Sitka National Historical Park.

2.5 Mitigation Measures

Mitigation measures to reduce the impacts of invasive plant control efforts in Alaska NPS units include prevention measures, education, collaboration, best management practices for herbicide use, restoration, and protection of historic properties.

2.5.1 Prevention Measures

The following best management practices will be used for ground-disturbing operations conducted in Alaska parks:

- Equipment and clothing will be thoroughly cleaned of soil, mud, and debris and inspected by park personnel prior to entry into the park.
- Sources of fill materials, including gravel, crushed rock, and topsoil, and stockpiled project materials must be verified as free of invasive plants by park personnel or a reputable third party. Contaminated materials may only be used if they are thoroughly decontaminated using physical or thermal methods.
- Any hay or straw used by the NPS, visitors, or residents must be Certified Weed-free Forage based on Alaska standards.
- Care will be taken to avoid working in or moving equipment through infested areas. Where unavoidable, cleaning of equipment will be required before leaving the area.
- Ground-disturbing projects will be closely monitored for five years after project completion to ensure that colonizing invasive plants are rapidly found and addressed. See the Restoration section (2.5.5) for post-project revegetation measures to minimize colonization success.

2.5.2 Education

Educational programs are ongoing and critical for protecting the parks in the future from the threat of invasive plants. There are three general audiences to inform about the issue: park employees (including contractors, construction workers, partners, and researchers), local residents, and visitors.

Park employees are both the most likely parties to spread invasive plants during the course of their duties and also the most likely parties to assist with invasive plant management. The NPS educational program will provide educational presentations and materials to all employees annually to ensure that they remain aware of the problem, how to prevent infestations, and how to assist with the park's documentation, reporting, control, and educational efforts.

For local residents, education programs and publications will be developed and disseminated to convey that certain garden plants will spread beyond the originally planted area and eventually become a nuisance to others. In addition, the NPS will educate both local residents and other visitors about the problems caused by invasive plants and how an individual can avoid contributing to these problems and instead help with solutions.

Visitors will be advised of ways they can minimize spreading and introducing new species through the course of their visit. Venues for education may include orientation films, park websites, park newspapers/guides, and bulletin boards.

2.5.3 Collaboration

The NPS will continue to work with other agencies to promote and coordinate invasive plant management across Alaska through the Alaska Committee for Noxious and Invasive Plants Management (CNIPM) and the Alaska Invasive Species Working Group (AISWG). These organizations provides many opportunities for collaboration in the areas of information-sharing; cooperative educational, research, and management projects; and identification of needs and recommendations for adequately addressing invasive plants in Alaska. The NPS will continue to be an active participant in these organizations and will work to engage landowners and land managers adjacent to each park unit in partnerships to address local and regional problems with invasive plants. Individual park units will become or remain involved in Cooperative Weed Management Areas across the state, groups dedicated to working across boundaries to prevent the widespread establishment of invasive plants in Alaska.

The NPS has recently gained the authority to enter into cooperative agreements to assist adjacent landowners with invasive plant management, on the basis that nearby invasive plant infestations threaten park resources over the long-term. The NPS will enter into such agreements in Alaska as funding permits where high-risk plants occur near park units.

2.5.4 Herbicide Use Best Management Practices

A wide range of best management practices would be required to ensure legal, safe, and responsible herbicide use (Appendix H). These practices include specific prescriptions for applications, regulations and record-keeping, notification, and evaluation of and adaptation to groundwater vulnerability.

2.5.5 Restoration

Where large infestations (> 0.1 acre) are controlled, the NPS will restore the site with healthy native vegetation to ensure longer-term protection against repeated invasion. Smaller controlled areas would be restored on a discretionary basis where invasive plants are persistent or a substantial seedbank of the invasive species exists at the site. Seeds of pioneer native plant species will be collected in each park unit with large infestations, processed, and sown following the example of ongoing restoration work in Denali National Park and Preserve.

2.5.6 Historic Properties Protection Measures

When there is a specific site and consideration of removal methods, then the park superintendent in consultation with appropriate staff (including a cultural resource specialist) need to carefully evaluate the area of potential effect to determine if an exotic or invasive species may be a historic component of a cultural resources property. Once a specific plant eradication site has been identified and appropriate removal techniques have been determined, the park

superintendent in consultation with cultural staff needs to carefully evaluate whether or not an exotic or invasive species is a contributing historic component of a cultural resources property.

In accordance with the Advisory Council on Historic Preservation's regulations implementing section 106 (36 CFR Part 800, "Protection of Historic Properties"), impacts to cultural resources will need to be identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed on or eligible to be listed on the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed on the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

2.6 Alternatives Considered but Eliminated from Further Analysis

2.6.1 Alternative 3 - Stop all invasive plant management activities within each park.

This alternative was eliminated from detailed study because stopping all invasive plant management and control activities within parks is inconsistent with the Purpose and Need for this Environmental Assessment, the Alaska National Interest Lands Conservation Act, E.O. 13112 on Invasive Species, the Federal Noxious Weed Control Act, and NPS Management Policies.

2.6.2 Alternative 4 – Consider the full range of treatment options, including broadcast herbicide application and the release of biological control agents.

This alternative was eliminated from detailed study because these methods are not yet necessary in Alaska Region parks and the Alaska public has expressed concern over their impacts. If the State of Alaska were to develop an active biological control program for invasive plants, this treatment method would be reevaluated for use in parks.

2.7 Environmentally Preferred Alternative

As stated in Section 2.7 (D) of the NPS Director's Orders #12 Handbook, "The environmentally preferred alternative is the alternative that will best promote the national environmental policy expressed in NEPA (Section 101(b))." The environmentally preferred alternative is the alternative that not only results in the least damage to the biological and physical environment, but that also best protects, preserves, and enhances historic, cultural, and natural resources. Alternative 2 is the environmentally preferred alternative because it would result overall in the fewest adverse impacts to the physical and biological environments in Alaska NPS units from less physical disturbance to remove invasive plants and the greatest beneficial effects from more effective control of persistent invasive plants.

Table 2.8 Comparison of the Alternatives

Category	Alternative 1 – Status quo	Alternative 2 – IPMP
Acres Treated	The number of acres treated would continue to increase due to the treatment of new infestations and repeated treatments. About 1,266 acres would likely be treated between 2005 and 2018. A worse case scenario would render a four-fold increase in treatments (4,500 acres). If funding was not available to address this need, this scenario would render a number of infestations not treatable and put native ecosystems at risk.	If herbicide use is an option in the near future and the rate of introductions remain relatively stable, then the number of acres treated would increase slightly in the first few years and then decrease as existing infestations are eradicated. Less than 900 acres would likely be treated between 2005 and 2018. If delays occur, and unanticipated infestations occur, a worst-case scenario would call for the manual and herbicide treatment of up to 2,500 acres.
Control Methods	Only physical control methods, including manual, mechanical, and thermal treatments, would be used for invasive plant management.	Physical control methods would be complemented by spot herbicide application as directed by an Integrated Pest Management Decision Tree that determines where chemical use is necessary, safe, and effective. Herbicides would likely be used for less than 54 acres of control before 2018. In response to comments, a worst case scenario (as described above), would entail 1,500 acres being treated with herbicide.
Effectiveness	Effectiveness would be low for infestations of species that are difficult to control. As a result, repeated treatments are likely to total twice the acres of initial treatments over the next 10 years (Table 2.2).	Effectiveness would be relatively high for species that are difficult to control with physical control methods. Repeat treatments are likely to total about the same acres as initial treatments over the next 10 years with the percent cover of target species dropping precipitously (Table 2.3).

Table 2.9 Summary Impacts of the Alternatives

Alternatives / Resources	Alternative 1 - Status Quo Control of Invasive Plants	Alternative 2 - IPMP with Potential Targeted Use of Herbicides
Aquatic Resources & Fish	The impacts to aquatic resources, including fish and water quality, would be minor and on balance beneficial, but this alternative would not be effective in controlling the establishment of invasive plants along aquatic habitats over the long term.	The impacts to aquatic resources, including fish and water quality, would be minor and on balance beneficial, provided that appropriate measures are taken when herbicides are applied near streams and lakes.
Cultural Resources	Because of the small physical treatment areas and NHPA Section 106 compliance reviews, no more than minor effects to cultural resources would occur.	Because of the small physical and chemical treatment areas and NHPA Section 106 compliance reviews, no more than minor effects to cultural resources would occur.
Human Health & Safety	Removing exotic invasive plants by the use of manual and motorized activities and soil solarization have easily recognized hazards that can be predicted and easily controlled. The overall risk of human injury would be low and the impacts to human health and safety are judged to be overall minor.	As with alternative 1, removing exotic plants by the use of manual and motorized activities and soil solarization have easily recognized hazards that can be predicted and easily controlled. Removing exotic plants by the use of the identified herbicides and application methods have recognized hazards that can also be predicted and easily controlled. The overall risk of employee injury should be low and the impacts to human health and safety are judged to be overall minor.

Alternatives / Resources	Alternative 1 - Status Quo Control of Invasive Plants	Alternative 2 - IPMP with Potential Targeted Use of Herbicides
Soils	Small, localized adverse effects on park soils would occur where EPMTs compact soil surfaces or dig up plant infestations. At large, high-density sites with difficult to control invasive plants, attempted mechanical control could result in major long-term impacts to soil from compaction and disturbance to organic layers and the soil profile. Invasive plant species not effectively removed by physical methods may change soils for long time periods through the addition of nitrogen or allelo-chemicals, changes in microbial and mycorrhizal populations, and changes to nutrient cycling and fire frequency. The overall impacts to park soils and function would be minor over the next decade or two.	The effects of nonnative plants on soils are unknown, but suspected to be of minor to major significance depending on plant species, density, and soil susceptibility. The effects of manual control methods on soil can be considerable due to trampling and depend on the amount of trampling and soil susceptibility. The effects of compaction can last long periods. The effects of herbicides on soils should be minor and short-lived due to the small number of acres involved and the herbicides being proposed. The overall impacts to park soils and function would be minor over the next decade or two.
Subsistence	Physical control methods would result in minor impacts to subsistence resources and uses. Should these methods fail to contain infestations resulting in greater habitat losses of important subsistence resources, then the level of impact could increase to moderate.	Use of a decision tree to decide the best method to control invasive plant infestations in Alaska NPS units, including physical and chemical (herbicide) control methods where appropriate, would result in minor impacts to subsistence resources and uses. Long term beneficial effects could accrue from the prevention of rapidly spreading invasive plants and the resultant loss of subsistence resources and use areas.

Alternatives / Resources	Alternative 1 - Status Quo Control of Invasive Plants	Alternative 2 - IPMP with Potential Targeted Use of Herbicides
Vegetation	The overall success of invasive plant management under Alternative 1 would vary from park to park. The overall impacts on native vegetation resources from physical methods to control invasive plants would be beneficial, site-specific, short- to long-term and up to moderate beneficial effects. For invasive plants species difficult to control with physical methods, adverse impacts to natural vegetation would be major over the long-term.	The combination of physical and chemical control methods would help parks achieve the desired condition to maintain native vegetation as parts of their natural ecosystems. By effectively controlling invasive plants, native plant communities in Alaska national park areas would be re-established - thus benefiting native plant species and ecosystem integrity. The minor short-term adverse impacts would be outweighed by the long-term benefits to vegetation.
Wetlands & Floodplains	The impacts to wetlands and floodplains from the physical controls of invasive plants would be minor.	The impacts to wetlands and floodplains from the combination of physical and chemical control methods to control invasive plants would be minor and beneficial.
Wilderness	The impacts to wilderness would be minor and overall beneficial to the wilderness resources.	The impacts to wilderness would be minor and overall beneficial to the wilderness resources.
Wildlife & Habitat	The impacts of invasive plant management activities on wildlife habitat and infestations would be minor overall in the short term. In parks where early detection and rapid control of invasive plants are feasible and achievable, physical methods would prevent invasive establishment and spread and preserve native wildlife habitat. Some known invasive plant infestations can only be effectively controlled with herbicides. In the long term Alternative 1 methods would ultimately fail to contain current or future invasive plant infestations to protect natural wildlife habitat and their infestations.	This alternative would result in minor beneficial effects to wildlife and habitat in the short-term because physical and chemical control methods would contain the majority of current or future invasive plant infestations. Invasive plant management success and beneficial effects to wildlife habitat would vary from park to park. Where early detection and rapid control are feasible and achievable, physical methods available would be sufficient to prevent establishment and spread. Spot treatment with herbicides where needed could reduce or eliminate impacts to wildlife and habitats.