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U.S. Department of the Interior
Bureau of Land Management

Draft Environmental Assessment

Campbell Tract Administrative Facilities
Integrated Pest Management to Control Vegetation
DOI-BLM-AK-A010-2014-0020-EA

PREPARING OFFICE

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Draft Environmental Assessment

Campbell Tract Administrative Facilities Integrated Pest Management to Control Vegetation

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Case File: 14–0020

Prepared by
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Table of Contents

1. Introduction 1

1.1. Summary of Proposed Project 1
1.2. Background 1
1.3. Purpose and Need for Action 2
1.4. Decision to be Made 3
1.5. Land Use Plan Conformance 3
1.6. Other Applicable Laws, Regulations, Policies, etc. 3
1.7. Summary of Public Involvement 4
1.8. Issues Identified/Eliminated from Further Analysis 5

2. Alternatives 7

2.1. Alternative 1 — No Action Alternative 9
2.2. Alternative 2 — Proposed Action Alternative 9
2.3. Alternatives Considered but not Analyzed in Detail 14
2.4. Summary of Impacts by Alternative 14

3. Affected Environment and Environmental Consequences 15

3.1. Human Health and Safety 17
3.1.1. Affected Environment 17
3.1.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 17
3.1.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative . 18
3.2. Recreation 19
3.2.1. Affected Environment 19
3.2.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 20
3.2.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative . 21
3.3. Soils 21
3.3.1. Affected Environment 21
3.3.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 22
3.3.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative . 22
3.4. Water Quality and Wetlands 24
3.4.1. Affected Environment 24
3.4.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 25
3.4.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative . 26
3.5. Vegetation 28
3.5.1. Affected Environment 28
3.5.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 29
3.5.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative . 30
3.6. Wildlife 32
3.6.1. Affected Environment 32
3.6.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 33
3.6.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative . 33
3.7. Fisheries 35
3.7.1. Affected Environment 35

3.7.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 35
3.7.3. Direct and Indirect Effects from Alternative 2 — Proposed Alternative 35
3.8. Cultural Resources 36
3.8.1. Affected Environment 36
3.8.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative 36
3.8.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative . 37
3.9. Cumulative Effects 37

4. Consultation and Coordination 39

5. List of Preparers 43

6. References Cited 47

Appendix A. BLM Campbell Tract Administrative Facilities Integrated Pest Management Plan to Control Vegetation 53

List of Figures

Figure 1.1. Location of the Campbell Tract Facility within Anchorage, Alaska. 2
Figure 2.1. Map of vegetation management units on Campbell Tract. 11
Figure 3.1. Trails and trailheads occurring within or adjacent to the proposed project area. 20
Figure 3.2. Soil map units that occur within or adjacent to the proposed project area. 22
Figure 3.3. Wetlands, creeks, and sources of potable water near or adjacent to the proposed project area. 25
Figure 3.4. Invasive species and rare species within or near the proposed project area. 29

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List of Tables

Table 2.1. Goals and treatment methods determined to best fit each vegetation management unit within the proposed project area. 9
Table 2.2. Herbicides proposed for this area 12
Table 2.3. Methods of herbicide application and which species they have been selected to target. 13
Table 3.1. Extremely and highly invasive species recorded on or near administrative sites on Campbell Tract, listed in order of decreasing invasiveness. 29
Table 4.1. List of Persons, Agencies and Organizations Consulted 41
Table 5.1. List of Preparers 45
Table A.1. Goals and treatment methods determined to best fit each vegetation management unit within the proposed project area. 55
Table A.2. Herbicides proposed for this area 56
Table A.3. Methods of herbicide application and which species they have been selected to target. 56

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Chapter 1. Introduction

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1.1. Summary of Proposed Project

The Bureau of Land Management proposes to control all nuisance vegetation growing within aviation and administrative sites on the Campbell Tract Facility using physical, mechanical, and chemical methods.

1.2. Background

The Campbell Tract Facility (CTF), located within the city limits of Anchorage, Alaska, houses a runway, helicopter landing pads, materials storage areas, roads, administrative buildings, and other smaller administrative sites used to support this infrastructure (Figure 1.1). The BLM maintains the airstrip and uses it for field crew transportation to remote work sites that require small aircraft, both fixed wing and helicopter. The airstrip and administrative facilities also serve as an emergency deployment location for the Alaska Disaster Medical Assistance Team and Alaska Department of Interior Emergency Response Teams. In the event of fire at Anchorage's wildland-urban-interface, this airstrip can serve as a strategic staging area for small aircraft to support fire monitoring, control, and suppression efforts.

In 2003, the BLM spent 1.3 million dollars to re-construct and re-grade the airstrip. At that time, the airstrip was in poor condition and in need of extensive repair. Since the improvements, the BLM has documented a slow but persistent encroachment by vegetation. Mechanical methods of control are ineffective and costly on the approximately 20 acres occupied by the airstrip, helicopter pads, and support sites. If the BLM continues to allow uncontrolled vegetation growth, the airstrip will be severely damaged. Subsequently, the BLM (and the larger Anchorage community) would lose an important aviation asset.

Additionally, non-native invasive species have been found present at and infesting administrative sites at Campbell Tract. Forty—eight invasive plant species have been found within aviation, administrative, and roadside sites, seven of which are considered highly or extremely invasive and degrade plant community structure, composition, and ecological functions. Invasive plant control actions have occurred on Campbell Tract, but have not incorporated integrated methods shown to be most effective. Past efforts have been restricted to manual or mechanical control such as hand pulling, digging, use of weed wrenches, and laying down tarps. Although manual control works in some cases, it is both inefficient and ineffective for many infestations within Campbell Tract administrative areas.

Surveys show that invasive species abundance is high at material storage sites (gravel, top soil, and other fill materials). When these materials are moved for maintenance purposes to other destinations within Campbell Tract, invasive species are transported with them. Surveys also show a high abundance of invasive species along the airstrip and helicopter landing pads. Aircraft taking off from Campbell Tract may collect and harbor seeds and transport them to remote locations in the state. Reducing and removing invasive species from administrative areas will help protect un-infested adjacent natural areas and remote natural areas.

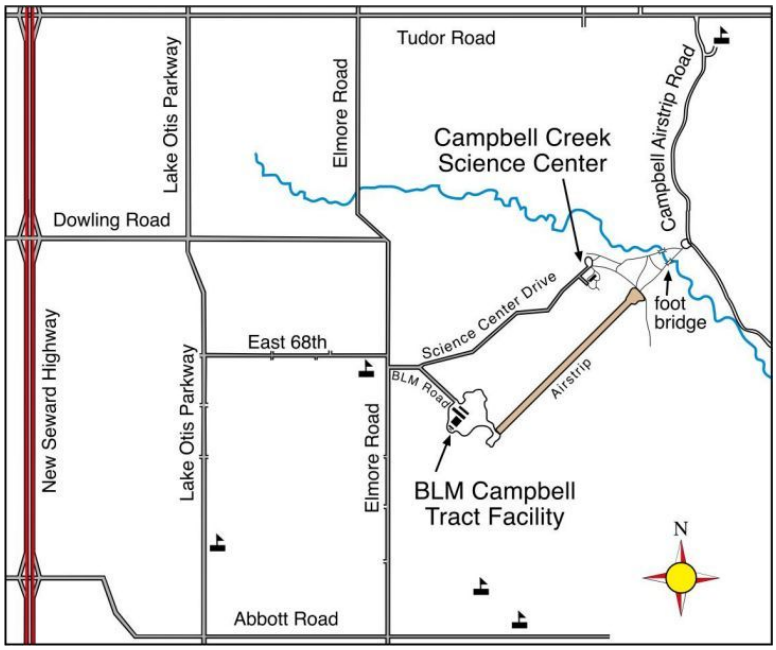

Figure 1.1. Location of the Campbell Tract Facility within Anchorage, Alaska.

1.3. Purpose and Need for Action

Purpose: The purpose of this action is to authorize another pest management tool, herbicides, as a chemical method to eradicate, control, suppress, or contain nuisance vegetation to maintain aviation and administrative sites on Campbell Tract and to implement objectives of the BLM-Alaska Invasive Species Management Policy (2010). These areas are defined as Management Zone 1 in *A Management Plan for Public Use and Resource Management on the Bureau of Land Management Campbell Tract Facility* (BLM 1987).

Need: The first need for this action is the current inability to maintain aviation and other facilities due to encroachment of woody and invasive vegetation. Alder, willow, and non-native species have infested the Campbell Tract airstrip, compromising the integrity of the compacted gravel, and resulting in conditions unacceptable for safe aviation operations. Attempts have been made by maintenance personnel to hand pull saplings, however, this destabilizes the compacted gravel and results in divots – an unsafe feature for a landing surface. Attempts to mow the vegetation temporarily alleviates the problem, but woody species are not suppressed by this method and quickly grow back. In 2011, the BLM used weed burners on a test plot and in 2012 used a salt mixture on a test plot. These methods were also found to be ineffective.

The second need for this action is indicated by current surveys showing that Alaska Land Health Standards are not being met for riparian areas, forests, and wetlands on Campbell Tract. Forty—eight invasive plant species have been found on Campbell Tract administrative sites, seven of which are considered highly or extremely invasive and degrade plant community structure, composition, and ecological functions. Addressing invasive species that occur on administrative and aviation sites will significantly improve the BLM's ability to prevent spread to other areas.

1.4. Decision to be Made

Whether to approve the use of herbicides to control nuisance native and non-native plant species within Campbell Tract administrative facility sites.

This environmental assessment is tiered to the ***Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement*** (BLM 2007), hereafter referred to as the *Herbicide PEIS*. It is tiered to this EIS because the proposed action is clearly consistent with the decision made in the *Herbicide PEIS*. The *Herbicide PEIS* analyzed the effects of 18 herbicides on BLM-managed land. The Record of Decision from that EIS approves the use of 18 herbicides on BLM-managed lands in Alaska, however, only 14 of those are approved for use by the State of Alaska Department of Environmental Conservation (DEC, 2015). The PEIS Record of Decision also provides a scientific protocol to guide the analytical methodology for consideration of the use or non-use of herbicides on BLM-managed lands.

1.5. Land Use Plan Conformance

The area within which the proposed action would take place is managed by *The Ring of Fire Record of Decision and Approved Management Plan* (BLM, 2008). This plan directs management of the Campbell Tract Facility Special Recreation Management Area to continue to be guided by *A Management Plan for Public Use and Resource Management on the Bureau of Land Management Campbell Tract Facility (CTF Management Plan)* (BLM, 2008, pg. 10).

The *CTF Management Plan* states that "the primary objective for management of the Campbell Tract Facility is to continue and facilitate its use as a BLM administrative site." Furthermore, this plan outlines, under management action OR-7, that the BLM will continue to manage the airstrip for official government use.

1.6. Other Applicable Laws, Regulations, Policies, etc.

Several federal laws, regulations, and policies guide BLM management activities on public lands. The ***Federal Land Policy and Management Act of 1976*** directs the BLM to manage public lands "in a manner that will protect the quality of scientific, scenic, historic, ecological, environmental, air and atmospheric, water resources and archeological values."

Several acts provide for management and control of invasive vegetation. Two weed control acts, the ***Carlson-Foley Act of 1968*** and the ***Plant Protection Act of 2000***, authorize the BLM to manage noxious weeds and to coordinate with other federal and state agencies in activities to eradicate, suppress, control, prevent, or retard the spread of any noxious weeds on federal lands. The ***Federal Noxious Weed Act of 1974*** established and funded an undesirable plant management program, implemented cooperative agreements with state agencies, and established integrated management systems to control undesirable plant species. Although a federally listed noxious weed has never been found on the Campbell Tract Facility, the possibility of that event occurring in the future remains high. However, multiple plants listed on the ***Alaska Prohibited and Noxious Weeds List*** (Alaska Administrative Code: Title 11, Chapter 34, Article 2) have been found growing on the Campbell Tract Facility. This State of Alaska regulation prohibits the sale or transport of species listed as "prohibited" and restricts the sale or transport of species listed as "restricted." BLM administrative sites (including recreation sites, community rock

pits, gravel stockpiles, reservoirs, maintenance shops, warehouse yards, field stations, storage complexes, and BLM owned and maintained roads) are listed as high priority for invasive species management actions.

The BLM must comply with numerous federal laws that govern activities on public lands. The ***Clean Water Act*** regulates discharge into waters of the United States, including wetlands. As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Based on a recent ruling by the USEPA (2006), an NPDES permit is not required for applications of herbicide (need to see what the current ruling is).

USEPA regulates pesticides under two major federal statues. The ***Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)*** establishes procedure for the registration, classification, and regulation of all pesticides. Before any pesticide may be sold legally, the USEPA must register it. The USEPA may classify a pesticide for general use if it determines that the pesticide is not likely to cause unreasonable adverse effects to applicators, or the environment, or for restricted use if the pesticide must be applied by a certified applicator and in accordance with other restrictions. All the herbicides evaluated in this EA are registered with the USEPA. All applicators that apply them on public lands (i.e., certified applicators or those directly supervised by a certified applicator) must comply with the application rates, uses, and handling instructions on the herbicide label, and where more restrictive, the rates, uses, and handling instructions developed by the BLM.

The ***Resource Conservation and Recovery Act (RCRA)*** regulates the disposal of toxic wastes, including the disposal of unused herbicides, and provides authority for toxic waste cleanup actions when there is a known operator. ***The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)*** regulates how to clean up spills of hazardous materials and when to notify agencies in case of spills.

Several laws pertain to the protection of plants and animals and their habitats. The ***Migratory Bird Conservation Act of 1929, as amended*** makes it unlawful to directly, or indirectly, harm migratory birds. ***The Endangered Species Act (ESA) of 1973*** provides for conserving endangered and threatened species of plants and animals. The ESA also requires that federal agencies consult with the Fish and Wildlife Servce and the National Marine Fisheries Service to ensure that any actions that they authorize, fund, or carry out are not likely to jeopardize the continued survival of a listed species or result in the adverse modification or destruction of its critical habitat. The ***Fish and Wildlife Conservation Act of 1980*** encourages federal agencies to conserve and promote the conservation of non-game fish and wildlife species and their habitats.

The ***BLM-Alaska Invasive Species Management Policy of 2010*** outlines details of the coordination and management of invasive species on BLM-managed lands in Alaska. The primary objective of this policy is to "integrate invasive species prevention, detection, and control activities into all on-the-ground activities conducted on BLM administered land in the Alaska."

1.7. Summary of Public Involvement

The draft EA was posted for public inspection on the Alaska BLM webpage for the 30-day posting requirement per 43 CFR 3162.3-1(g). No comments were received on the proposed project during the 30-day posting period.

1.8. Issues Identified/Eliminated from Further Analysis

Key issues identified during the scoping process for the *Herbicide PEIS* are applicable to this local analysis and are incorporated either by reference or by directly addressing specific issues of concern. At a national level, the BLM analyzed each potential issue and designated each as either "significant" or "non-significant." Issues addressed in the *Herbicide PEIS* that are relevant to the proposed action include:

- the effects of treatment on invasive plants and native vegetation.
- the effects of herbicides on soil productivity and surface/groundwater quality.

Internal scoping within the BLM Anchorage Field Office occurred with the purpose of identifying issues to be addressed and identify alternatives. Beyond those identified from the *Herbicide PEIS*, the Anchorage Field Office identified the following issues to be addressed in this environmental assessment:

- the effects of herbicide on wildlife species.
- the effects of herbicide on recreational users and their animal pets.
- the effects of herbicide on fish species.
- the effects of herbicide on historic resources.

One issue was generated within the BLM Anchorage Field Office that was eliminated from further analysis. This issue is the possibility of subsistence collections and collection of personal use special forest products by the public. This issue was eliminated from analysis because Campbell Tract is a developed recreation area. The collection of any amount of flowers, berries, nuts, seeds, cones, leave, or other forest products is not permissible in developed recreation areas (43 CFR 8365.1–5).

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Chapter 2. Alternatives

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This chapter describes and compares the alternatives considered to achieve the stated purpose and need. Since the *Herbicide PEIS*, which this document is tiered to, analyzed multiple alternatives for the use of herbicides on BLM-managed land, this EA is required only to analyze the no action alternative and the alternative that was selected by the *Herbicide PEIS* Record of Decision.

2.1. Alternative 1 — No Action Alternative

Existing maintenance on administrative areas includes mowing lawns, cutting tall vegetation growing in lawn areas, and cutting back any vegetation that might obstruct a driver's line of site (the occurrence of this activity is low). The Campbell Airstrip is currently maintained by mowing twice per summer to keep vegetation as low as possible. In 2009, weed burners were tested for their ability to manage vegetation on the airstrip and in 2010, rock salt was spread over a test area of the airstrip to assess its ability to kill vegetation. Both treatments were found to be ineffective. Additionally, weed pulling groups (hand pulling) from within BLM and on public service days visit many of the other facility sites on an annual basis. Existing maintenance activities on the Campbell Tract administrative facilities have been analyzed under the National Environmental Policy Act using a Categorical Exclusion (CX). This CX allows the BLM to use physical and mechanical means to maintain the airstrip, administrative building lawns, and roadside corridors.

This alternative is presented based on CEQ recommendation that it is retained for the purpose of comparison to other alternatives. However, the BLM is required by various laws, regulations, and policies to control invasive species as a means of maintaining ecosystem health, rendering the no action alternative an unsuitable management option for Campbell Tract. Additionally, the *CTF Management Plan* states that the BLM will continue to manage the airstrip for official government use. The no action alternative would not meet this need either.

2.2. Alternative 2 — Proposed Action Alternative

The proposed *BLM Campbell Tract Administrative Facilities Integrated Pest Management Plan to Control Vegetation* can be found in its entirety in Appendix A. The BLM proposes a plan that employs the principles of integrated pest management to ensure effective vegetation management while considering and incorporating environmental and human health concerns. The IPM plan describes control methods currently authorized for use on Campbell Tract and new methods that are being proposed in this Environmental Assessment. Areas to be managed under this plan are divided into management units, are described in Table 2.1, and can be seen in Map 1. The selection of method(s) used will depend on the desired management goal, characteristics of plant species, plant composition, and percentage cover. For treating invasive species, the IPM coordinator will research the current most effective control methods and consult with other experts in the state (University of Alaska-Fairbanks Cooperative Extension and other members of the Committee for Noxious and Invasive Plant Management in Alaska (CNIPM)).

Table 2.1. Goals and treatment methods determined to best fit each vegetation management unit within the proposed project area.

Unit	Vegetation Management Goal	Treatment Method
Unit 1: Airstrip Runway	Vegetation free.	Chemical (broadcast)
Unit 2: Runway Safety Area (vegetated corridor adjacent to the airstrip)	Non-woody species: grass and small herbaceous broadleaf plants that are not invasive species.	Physical, Mechanical, and Chemical (spot)

Unit 3: Turf and Ornamental	Landscaped grass and ornamental vegetation. No invasive species.	Physical, Mechanical, and Chemical (spot)
Unit 4: Roads and parking lot corridors (shoulder and ditches)	Any vegetation that is not an invasive species.	Physical, Mechanical, and Chemical (spot)
Unit 5: Aviation approach areas	Tree height sufficient to allow required glideslope for incoming aircraft	Mechanical

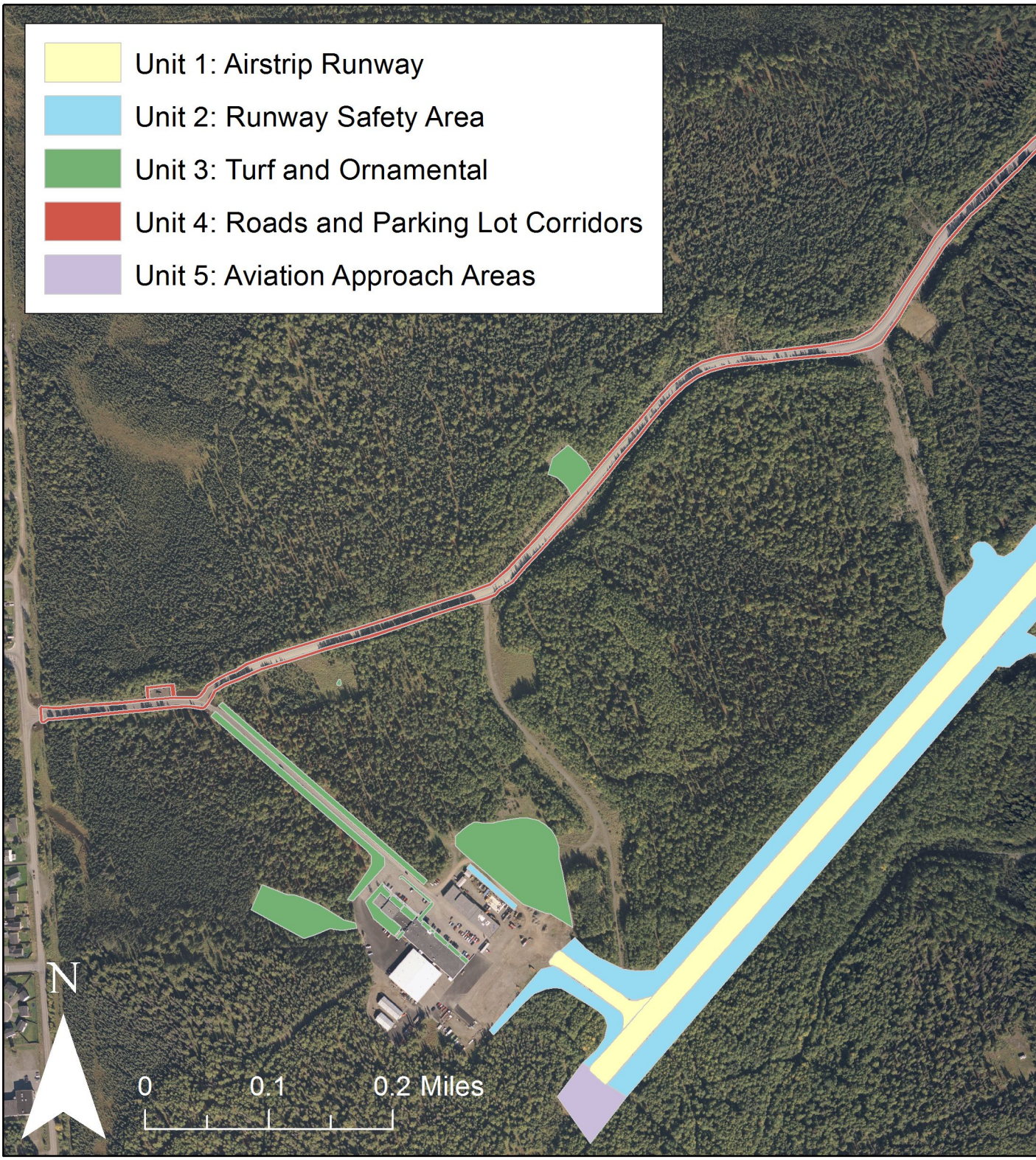

Figure 2.1. Map of vegetation management units on Campbell Tract.

The BLM proposes to add three herbicides to the list of available treatment options on Campbell Tract, described in Table 2.2. These herbicides are approved for use on BLM-managed lands by the *Herbicides PEIS*. This group of three herbicides has been recommended by the University of Alaska-Fairbanks Cooperative Extension Pest Management Program to meet the BLM's specific needs on Campbell Tract and to address two different vegetation management goals: 1) creating vegetation free zones and 2) spot treating to remove selected target species (invasive species). This selection of three herbicides will allow flexibility to select the herbicide that will produce the best result with the least damage to off-target species and other components of the environment, given daily fluctuations in environmental conditions.

Table 2.2. Herbicides proposed for this area

Herbicide Active Ingredient:	Trade Name:	Registered for use in:
Glyphosate	Roundup PRO	Terrestrial sites only
Glyphosate	Aquamaster	Aquatic, wetland, and terrestrial sites
Imazapyr	Arsenal	Aquatic, wetland, and terrestrial sites
Triclopyr	Garlon 4	Terrestrial sites only

Glyphosate is a non-selective systemic herbicide that can damage all groups or families of plants to varying degrees. Glyphosate inhibits the production of aromatic amino acids and certain phenolic compounds. This leads to a variety of toxic effects in plants, including the inhibition of photosynthesis, respiration, and nucleic acid synthesis, thereby resulting in cellular disruption, decreased growth, and death at sufficiently high levels of exposure. Two different formulations of glyphosate are being proposed, product names: Aquamaster and Roundup Pro. Aquamaster is approved for use in aquatic and riparian sites. Roundup Pro has additional surfactants added to the product, is not approved for use near aquatic, wetland, or riparian sites, and will not be used within 800 feet of wetlands or bodies of water for this project. Imazapyr inhibits an enzyme (ALS) needed to synthesize amino acids and is used in the control of a variety of grasses, broadleaf weeds, vines, brush species, and aquatic vegetation. This product will not be used within 800 feet of wetlands or bodies of water. Triclopyr is a selective, systemic herbicide effective only on broadleaf and woody species (grasses are not damaged by Triclopyr). Triclopyr mimics auxin, a plant growth hormone, thus disrupting the normal growth and viability of plants. Commercial formulations include two triclopyr derivatives: triethylamine salt and triclopyr butoxyethyl ester. Only triclopyr butoxyethyl ester is being proposed. This product is not approved for use near aquatic, wetland, or riparian sites and will not be used within 800 feet of wetlands or bodies of water for this project.

Application methods for these herbicides are summarized in Table 2.3. Vegetation management unit 1 would require a ground broadcast method (boom spray) application that uses truck-mounted equipment to apply herbicide. A selective foliar application would be employed for units 2-4 on invasive species only when physical and mechanical treatment has been shown to be ineffective or unfeasible. This method employs an herbicide sprayer carried by backpack. Herbicide is applied only to selected target vegetation (invasive species). The BLM will adhere to the typical application rate listed on the product label for each herbicide. However, the spot treatment method will usually always use less than the typical application rate since only selected plants are being treated, not an entire area.

Table 2.3. Methods of herbicide application and which species they have been selected to target.

Methods of application	Target species
Ground broadcast (truck-mounted boom spray)	All vegetation growing on the gravel airstrip and gravel sections of the taxiway (Unit 1)
Handheld backpack sprayer	Non-native invasive species that are growing on administrative sites outside of the airstrip, along the perimeter of the airstrip, and along road and parking lot corridors (Units 2-4)

Key standard operating procedures applicable for this herbicide use are listed in the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement Record of Decision* (2007). They follow guidance from BLM Handbook H-9011 (Chemical Pest Control) and BLM Manuals: 1112 (Safety), 9011 (Chemical Pest Control), 9012 (Expenditure of Rangeland Insect Pest Control Funds), 9015 (Integrated Weed Management), and 9220 (Integrated Pest Management). Best management practices outlined in these manuals will be followed prior to and during implementation. The following list includes some, but not all, of the standard operating procedures that will be followed.

- Only licensed applicators will apply herbicide.
- Directions in the herbicide product label will be followed for use, storage, and personal protection.
- Herbicide products will be selected carefully to minimize additional impacts from degradates, adjuvants, inert ingredients, and tank mixtures.
- The least amount of herbicide needed to achieve the desired result will be applied.
- The effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risk will be considered for every application.
- Spraying will not occur during times of spring and early summer snowmelt runoff, or during times of typically heavy fall rainstorms. Additionally, spraying will not occur when rain is forecasted. If weather conditions change to rain during an herbicide application session, the session will be terminated and resumed when precipitation ceases.
- Herbicides will only be applied when the wind speed is less than 10 mph to minimize drift.
- Site characteristics, environmental conditions, and application equipment will be considered in order to minimize damage to non-target vegetation.

The applicator will develop a safety plan prior to herbicide use that includes an emergency spill plan, safety data sheets for each herbicide, and identification of appropriate personal protective equipment. All workers, including contractors, will receive training to carry out the safety plan and will have a copy of the plan in their possession during herbicide use.

Notifications

Prior to herbicide applications, the BLM will notify the public of the application area closure through flagging, trail closure signs, and fencing two days in advance and will remain for two days post treatment. This notification schedule is consistent with Municipality of Anchorage

Code 15.75.060 (Notice of application by commercial applicators). Signs will also comply with the information requirements detailed in Municipality of Anchorage Code 15.75.060. Treatment of these areas will impact one recreation trail and two trail heads which will be closed for the day of application and two days following herbicide application. The Municipality of Anchorage, an adjacent land owner, will be notified. The BLM will not notify the public of physical and mechanical control treatments.

2.3. Alternatives Considered but not Analyzed in Detail

All herbicides that were approved for use on BLM-managed land by the *Herbicide PEIS* were initially considered for this project area. Through discussions with the UAF-Cooperative Extension and the BLM's National Operation Center, the Anchorage Field Office decided that the proposed three herbicides would satisfactorily meet the vegetation management need. Alternative methods to chemical treatment were acknowledged during development of alternatives. However, physical and mechanical methods had been attempted in the past and were shown to be unsuccessful in meeting vegetation management goals. Additionally, appropriate biological control methods have not been developed for invasive species in Alaska.

2.4. Summary of Impacts by Alternative

Alternative 1 — No Action Alternative

- Human health, recreation, soils, water quality, fisheries, and cultural resources will not be impacted by this alternative.
- Aviation safety will be impacted because this alternative does not present a viable option for vegetation management on the Campbell Airstrip.
- Vegetation, wildlife, and wetlands will be impacted since this alternative does not present an effective and efficient methods for the removal of invasive species.

Alternative 2 — Proposed Alternative

- This alternative will have minimal impact on human health and safety, recreation, soils, and water quality under a typical scenario. Should an accidental spill or spraying occur, the possibility of impacts are higher.
- Aviation safety will be positively impacted since this alternative provides a treatment option capable of adequately managing vegetation on the airstrip.
- Vegetation, wetlands, and wildlife may experience short-term low risk due to this alternative, but will ultimately benefit from this alternative as it will effectively reduce the spread of invasive species.
- While the proposed action is taking place on a significant historic resource, it will have a positive impact on cultural resources by keeping the airstrip surface from being compromised by vegetative growth.

Chapter 3. Affected Environment and Environmental Consequences

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Approximately 12.5 acres of land are being proposed for broadcast spray herbicide treatment and 29.7 acres are proposed for spot treatment of invasive species (Figure 2.1). Much of the proposed treatment area has been converted into working surfaces (the airstrip, helicopter pads, landscaped lawns, roadside ditches) or occurs on the edge of a constructed feature and adjacent natural areas; usually disturbed in some capacity.

This section provides a summary of the affected environment in the proposed project areas and the environmental effects of each alternative. This analysis will focus primarily on issues and details specifically relevant to this action that were not analyzed in sufficient detail in the *Herbicide PEIS*. Important aspects of the analysis for issues that were sufficiently analyzed in the *Herbicide PEIS* are also summarized. The *Herbicide PEIS* provides the primary analyses for which this decision will be based upon.

The herbicide risk assessments used in the *Herbicide PEIS* were completed by Syracuse Environmental Research Associates, Inc. (SERA 2003a, SERA 2003b, SERA 2004) using peer-reviewed articles from scientific literature and EPA documents, including confidential business information. Syracuse Environmental Research Associates, Inc. was contracted by the U.S. Forest Service to conduct these assessments in order to understand the effects of herbicide on public land. Laboratory and field tests of toxicity, exposure, and environmental fate were used to estimate the risk of adverse effects to non-target organisms. The risk assessments considered multiple scenarios: typical application rates, maximum application rates, and accidental exposures. Although the risk assessments have limitations, they represent the best available science.

The following elements are not present: Prime or Unique Farmlands, Wild and Scenic Rivers, Wilderness or Wilderness Study areas, Wild Horses and Burros, and Threatened and Endangered Species.

3.1. Human Health and Safety

3.1.1. Affected Environment

The Campbell Tract Facility is situated entirely within the Municipality of Anchorage. It is surrounded by other recreational open spaces as well as medium density neighborhoods. Almost 100 federal employees are stationed at two workplace campuses housed on Campbell Tract. Multiple sporting events, public service days, educational programing, Iditarod race viewing, and a summer camp occur on Campbell Tract. Trailheads receive more than 190,000 visits per year primarily from local residents walking, running, or biking the trail system.

3.1.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

There would be no immediate effect to human health and safety if no new action is taken to reduce the spread of invasive species on Campbell Tract administrative areas. However, taking no action to remove unwanted vegetation on the airstrip poses a threat to aviation safety. Woody vegetation growing on a gravel airstrip is dangerous for aircraft take-off and landing. Beyond being a physical disruption to landing gear, it damages the compacted gravel resulting in additional take-off and landing hazards.

3.1.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative

Although some herbicides can be dangerous to human health and safety, especially when used improperly, the herbicides selected for this project have little potential to harm humans. Herbicide applicators are more likely than the general public to be exposed to herbicides. However, the herbicides proposed for use, used at the rates and methods proposed, pose a very low risk even to applicators. Proper handing of herbicides and personal protective equipment stated in the herbicide label (which is required by law for any person using the compounds) reduces worker exposure significantly. The general public would not be exposed to substantial levels of any herbicide used in this project. It is unlikely that a member of the public could be directly sprayed during this project since BLM personnel will close off the treatment area and actively patrol to prevent public access during treatment. A person could brush up against sprayed vegetation soon after herbicide is applied. However, this is unlikely since the treatment areas will be closed to public access for two days following application. Collection of special forest products (berries, vegetation, mushrooms etc.) and subsistence activities are prohibited on developed recreation sites (43 CFR 8365.1–5) and there are no sources of potable water within Campbell Tract. Should workers or members of the public be exposed, effects of that exposure are subsequently described for each herbicide.

Glyphosate

For both workers and members of the general public, there are no risks associated with nearly all exposures to glyphosate at the typical or maximum application rate (SERA 2003a). The risk assessment calculated no risk for all but one of the tested scenarios, usually at least by a factor of 5. There is low risk to children in the general public associated with accidental exposure to glyphosate consumption of contaminated water after an herbicide spill into a small pond.

Imazapyr

Most exposures to imazapyr at either the typical or the maximum application rate do not present a risk to either workers or members of the general public. Additionally, workers and the general public would generally not be at any substantial risk from longer-term exposure to imazapyr even at the upper range of the application rate considered in the risk assessment (SERA 2004). Eye irritation is likely to be the only overt effect as a consequence of mishandling imazapyr by workers. This effect can be minimized or avoided by prudent industrial hygiene practices during handling of the herbicide.

Triclopyr

Workers face low risk from spot and broadcast ground spray at the upper ranges of exposures for triclopyr butoxyethyl ester at the maximum application rate (SERA 2003b). Even at the maximum application rate, workers face low risk from accidental exposure to contaminated gloves (1 hour duration). However, it is still important for workers who may apply triclopyr repeatedly over a period of several weeks or longer to employ work practices that involve reasonably protective procedures to avoid the upper extremes of potential exposure. There is low to moderate risk to the general public from triclopyr applications under several acute or accidental scenarios: 1) direct spray to the entire body; 2) direct spray to the lower legs; 3) dermal contact with contaminated vegetation; 4) acute consumption of contaminated fruit (maximum application rate only); and

5) acute consumption of pond water contaminated by a spill. However, the likelihood of any of these scenarios occurring is extremely low.

3.2. Recreation

3.2.1. Affected Environment

The entire Campbell Tract offers more than 12 miles of year-round, non-motorized recreation trails. Common summer recreational activities that occur on the Campbell Tract include: walking, leashed dog walking, running, biking, horseback riding, orienteering, and geocaching. Two trail segment (the Campbell Airstrip trail, slightly over one mile, and Coyote trail, 250 feet) and two trailheads (Smokejumper Trailhead and Campbell Creek Science Center parking lot) occur within the proposed project area. Additionally, the unpaved roadside shoulders of the Science Center Road are included in the proposed project area. Many recreational users walk, run, and bike on this paved road. More than 175,000 people visit the Campbell Tract trails every year. The Smokejumper Trailhead is Campbell Tract's busiest trailhead. Also, the Science Center parking lot is used regularly as a trailhead for recreationists as well as the carpool area and access point to trails by the Trailside Discovery Camp. The Airstrip Trail and Coyote Trail are both regularly highly used trails within the project area.

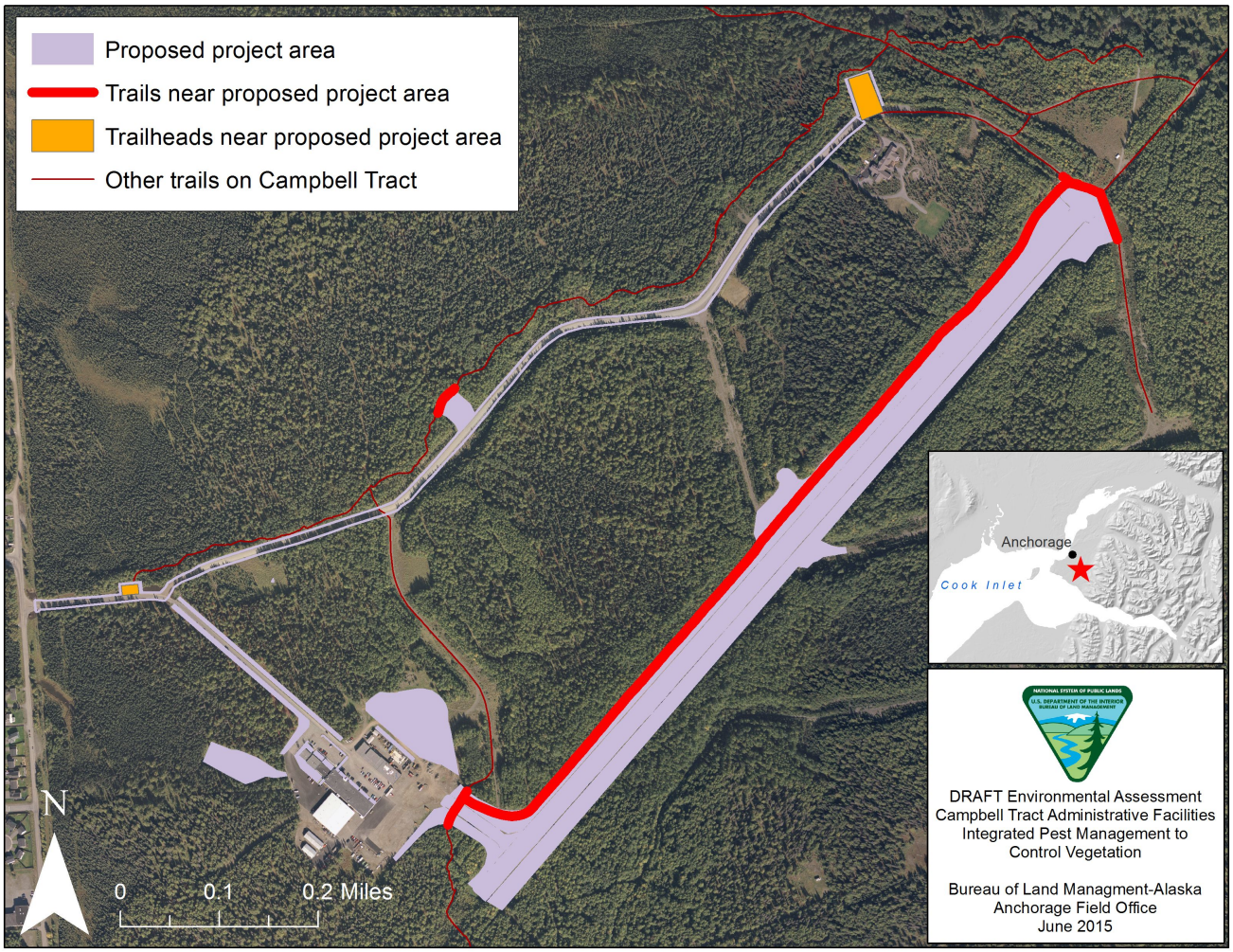

Figure 3.1. Trails and trailheads occurring within or adjacent to the proposed project area.

3.2.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

There would be no immediate direct effect to not taking action on reducing the spread of invasive species from the proposed project area. However, as invasive species replace native species over time, the scenic and educational value of Campbell Tract is degraded. Chances to see wildlife and native flora will decrease as habitat for those species decreases. Because it is unlikely that physical and mechanical methods of invasive plant management alone will be able to prevent the spread of invasive species, this alternative will have a negative effect on recreational users of Campbell Tract. Additionally, any location visited by aircraft originating from Campbell Tract (that may harbor "stow-away" invasive plant material) will likely also experience degraded recreational value.

3.2.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative

There would be short-lived negative direct effects on recreation due to trail and trialhead closures resulting from the proposed action. However, this alternative offers the best opportunity to maintain native flora for the enjoyment of recreational users. There may also be a short-term negative effect on recreation due to public concern about chemical treatment impacts on pets or children. These impacts will be minimized with public education signs describing the need for treatment. Trailheads and affected trails will be signed before, during, and after treatment to help educate recreationists. Directly affected areas will be closed during treatment and for a period of two days following. See section on the *Propose Action* for more details on public notification.

It is unlikely that dogs being walked by members of the public could be directly sprayed during this project since BLM personnel will close off the treatment area and actively patrol to prevent public access during treatment. Since dogs are not allowed off leash in the proposed project area, it is also unlikely that a dog will walk across or against vegetation/ground that is still wet from herbicide application. Should a dog be exposed to herbicides, the effects of that exposure would be similar to those experienced by wildlife. Please see the Environmental Effects *Wildlife* section for more details. In summary, all three herbicides would pose a low risk to dogs since it is unlikely that dogs will be directly sprayed or consume contaminated vegetation.

3.3. Soils

3.3.1. Affected Environment

The proposed project area occurs adjacent to three different soil map unit types (Figure 3.1) described by the Natural Resources Conservation Service in their 2001 soil survey of the Anchorage area (NRCS, 2001). Footprints of the roads, airstrip, and facility building occur on Cryothents and urban lands soil type, with 0 to 20 percent slopes. Soils of this type are somewhat excessively drained, rarely flood or pond, and have low to medium runoff. The depth to high water table is generally more than 72 inches. The Kashwitna-Kichatna complex, with 0 to 3 percent slope, is found adjacent to the airstrip. Soils of this type are well-drained, have low levels of runoff, rarely flood or pond, and the depth to high water table is generally more than 72 inches. Pioneer Peak silt loam, with 0 to 3 percent slope, is found adjacent to Campbell Tract administrative buildings. This soil is somewhat poorly drained, but runoff, flooding, and ponding rarely occurs. The depth to high water table is generally 30 inches during the summer months. Doroshin peat, with 0 to 7 percent slope, is found adjacent to 0.25 miles of the Science Center Road, at the entrance off Elmore Road. This soil is very poorly drained, with very high levels of runoff and frequent ponding; however, it rarely floods. The depth to high water table is 0 inches, meaning high water table levels are at the soil surface.

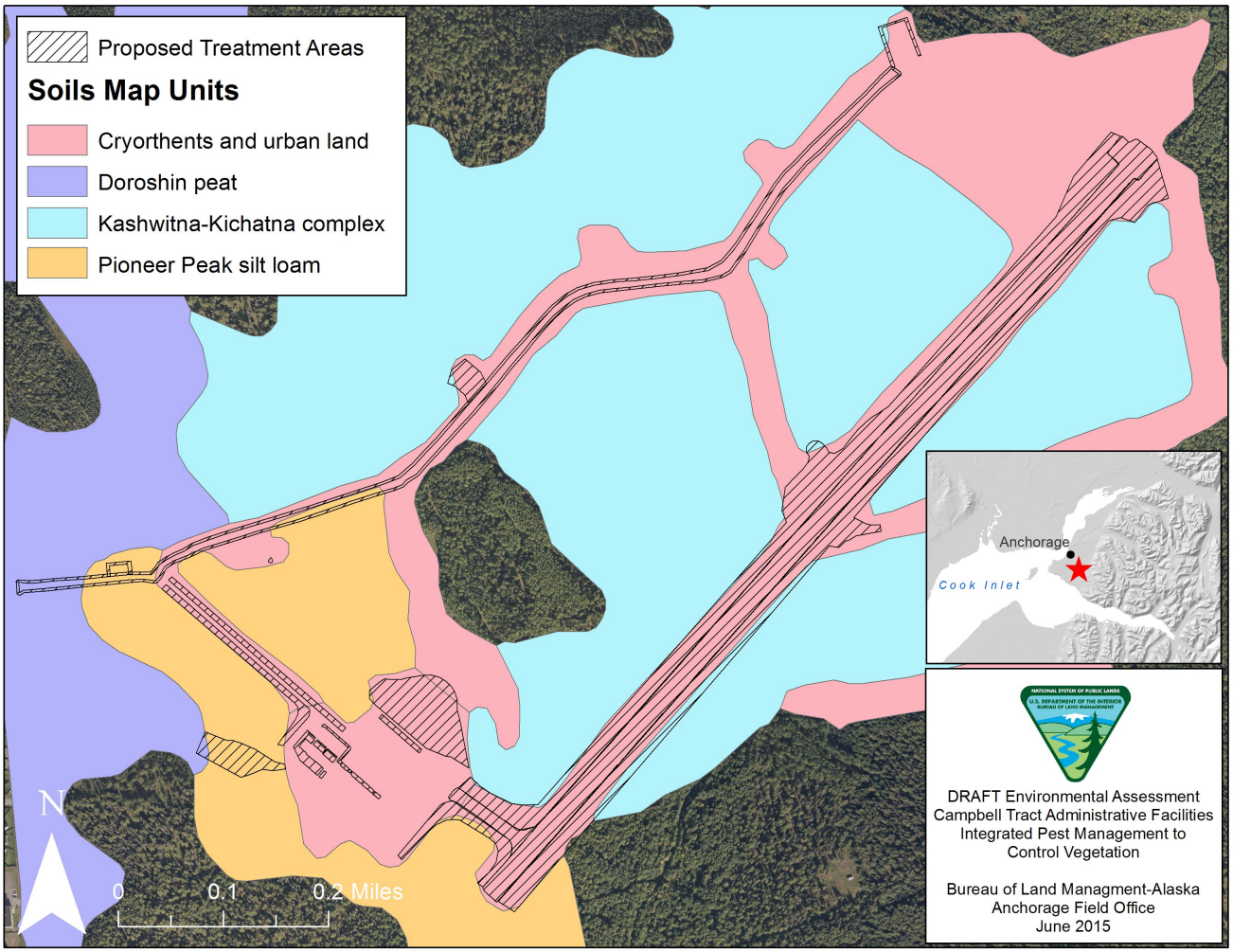

Figure 3.2. Soil map units that occur within or adjacent to the proposed project area.

3.3.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

This alternative will have no effect on soils in the project area.

3.3.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative

The majority of soils in the proposed project are well drained and unlikely to experience runoff or flooding, therefore movement of these chemicals to off-target areas is highly restricted. Additionally, the water table beneath these soils is at least six feet deep, although likely much deeper, which indicates a low potential for herbicides to enter the water table. However, there are two areas proposed for treatment that are within 100 feet of Doroshin peat, which are poorly-drained soils associated with wetlands. This occurs at the intersection of BLM Road and

Elmore Road and continues for 0.25 miles along BLM Road (see *Water Quality and Wetlands* section).

Glyphosate

Glyphosate is a polar compound that is inactivated by soil adsorption. Glyphosate is water-soluble, but it has a high affinity to bind to soil particles (SERA 2003a), and therefore has low mobility and only a slight tendency to leach (Linders et al. 1994, Franz et al. 1997). Glyphosate is biodegraded by soil organisms, and many species of soil microorganisms can use glyphosate as a carbon source (SERA 2003a). Glyphosate exposure results in the inhibition of respiration and nucleic acid synthesis in plants and in microorganisms. There is little information, however, to suggest that glyphosate is harmful to soil microorganisms under field conditions; some studies even suggest glyphosate may benefit some soil microorganisms.

In a study of the direct and indirect effects of long-term glyphosate applications in ponderosa pine plantations in California, Busse et al. (2004) determined that both direct and indirect soil microbial characteristics in the top four inches of soil were generally unchanged after 9 to 13 years of continuous vegetation control by glyphosate. Single or repeated applications of glyphosate at the recommended field concentration had little effect on microbial communities.

Imazapyr

Imazapyr is water soluble, potentially mobile, and has a long half-life (SERA 2004). Imazapyr does not readily bind to mineral soils, but is likely to bind relatively strongly to organic soil. In a study of the fate of imazapyr applied to a railroad right-of-way, most imazapyr was found in the upper 12 inches of the soil and exhibited a half-life in the range of 67 to 144 days (Borjesson et al. 2004).

Imazapyr does not bind tightly to alkaline soils with low organic matter. However, the potential for longer-term effects on soil organisms and down gradient systems exists (SERA 2004). Imazapyr can “leak” from treated plants into the soil, where it remains active and can be taken up by non-target plants (Tu et al. 2001). Effects on soil microorganisms appear to be highly species specific, with variations in sensitivity among species of up to a factor of 100 (SERA 2004). Imazapyr can affect some sensitive microorganisms and potentially shift soil microbial community composition toward imazapyr tolerant species. Due to it’s long soil persistence, Imazapyr will likely only be used on the airstrip where bare-ground is desired.

Triclopyr

Triclopyr butoxyethyl ester rapidly degrades to triclopyr acid in soil. The average half-life of triclopyr acid in soil is 30 days (Tu et al. 2001). Triclopyr can be persistent in plants. When plants containing triclopyr die and biodegrade, they may release triclopyr to the soil, where it can then be taken up by other plants. To address this, triclopyr will be selected and used carefully in order to avoid non-target plant damage.

Microbial metabolism accounts for a significant percentage of triclopyr degradation in soils (SERA 2003b). In general, warm moist soils with a high organic content will support the highest rates of herbicide metabolism (Newton et al. 1990 cited in Tu et al. 2001). Johnson et al. (1995) found that sunlight plays a role in the rate of microbial metabolism of triclopyr, as microbial metabolism slowed when soil was deprived of light.

Triclopyr inhibits growth of four types of ectomycorrhizal fungi associated with conifer roots at concentrations of 1,000 parts per million (ppm) and higher (Estok et al. 1989). Some evidence of inhibition of fungal growth was detected in bioassays with as little as 100 ppm. Typical usage in forest plantations, however, results in triclopyr residues of only 4 to 18 ppm on the forest floor. The project design features minimize this effect since triclopyr will only be used as spot treatment near conifer trees. The applicator will have the ability to carefully avoid non-target vegetation.

3.4. Water Quality and Wetlands

3.4.1. Affected Environment

The south fork of Campbell Creek and the north fork of Little Campbell Creek both run within the boundaries of the Campbell Tract. Neither creek is within the proposed project area. At the closest, the South Fork Campbell Creek is 0.15 miles from the proposed treatment area (Figure 3.1). Three public drinking water wells occur within the Campbell Tract Facility, two located at the Anchorage Field Office that are no longer in use and one located at the Campbell Creek Science Center that serves as the main water source for the Science Center. Five private drinking water wells occur near the intersection of Elmore Road and BLM Road (Figure 3.1). Four of these are drilled wells. The drilled depth is unknown for one well, and 50, 87, and 91 feet for the other wells. The fifth well is a dug well with a depth of 12 feet.

Wetlands that surround the proposed project have been designated by the Anchorage Wetlands Management Plan as "*A* " wetlands. The Wetlands Management plan defines *"A*" wetlands as having "...the highest wetland resource values. They perform at least two, but typically more, significant wetland function. *"A"* wetlands are considered most valuable in an undisturbed state, as most uses or activities, especially those requiring fill, negatively impact known wetland functions. "*A*" wetlands are not to be altered or otherwise disturbed in any manner, except as outlined in the AWMP and in the enforceable policies."

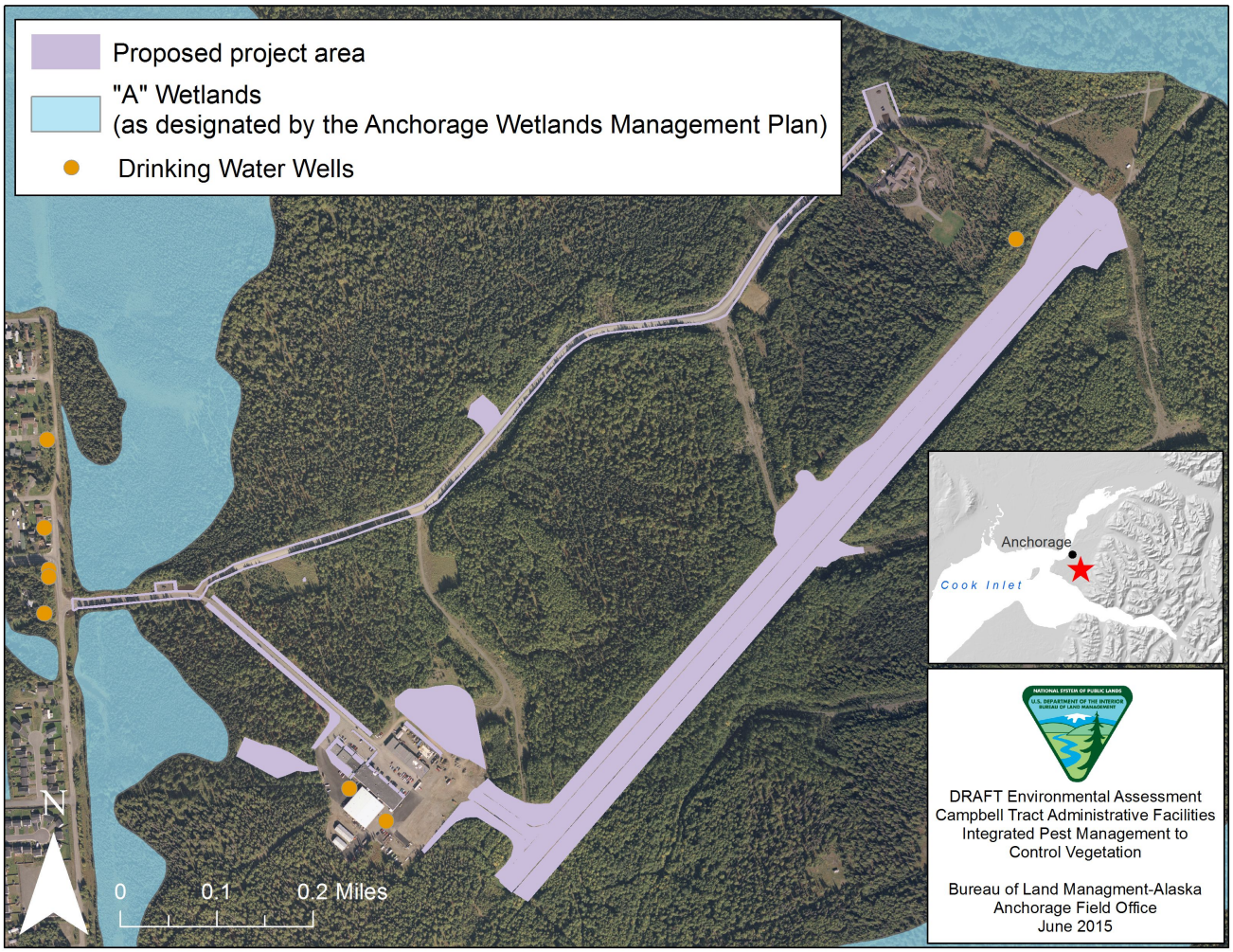

Figure 3.3. Wetlands, creeks, and sources of potable water near or adjacent to the proposed project area.

3.4.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

This alternative has no direct or indirect impact on water quality of surface or ground water. Current management actions do not occur near bodies of water and occur only on the ground surface; they have no means to affect ground water. However, this alternative does indirectly impact wetlands by allowing invasive species to continue to spread without an effective means of control. Invasive species could eventually out-compete native vegetation and result in loss of wetland function. This effect combined with the cumulative effects

3.4.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative

Since triclopyr and the terrestrial formulation of glyphosate (Roundup Pro) will not be used within 800 feet of wetlands or surface water, it is extremely unlikely that these compounds will affect surface water quality. Imazapyr and the aquatic formulation of glyphosate (Aquamaster) are registered and approved for use in and around wetlands and bodies of surface water; however, only use near wetlands is being proposed for this project. Use of these herbicides within 250 feet of Campbell Creek is not being proposed.

It is also unlikely that these compounds will percolate through the soil and contaminate groundwater since the depth to groundwater in the majority of these areas is more than 6 feet deep. Only one of the three drinking water wells on Campbell Tract is still in use. This well, at the Campbell Creek Science Center, intersects static water level at 55 feet below the ground surface and the opening of this well is between 74 and 90 feet below ground surface. The Source Water Assessment of the Campbell Creek Science Center produced by the Drinking Water Protection Program (Hammond, 2001) identifies this well as having low vulnerability to the following contaminants: bacteria and viruses, nitrates and nitrites, and volatile organic chemicals. The overall natural susceptibility of the wellhead and aquifer to contamination is low, with the wellhead susceptibility being low and the aquifer susceptibility being medium. Therefore, there is no risk of this well becoming contaminated due to the use of herbicides given the depth of this well and the characteristics of each proposed compound (see following paragraphs).

Four of the five the private drinking water wells located on Elmore Road near the intersection with BLM Road are drilled to a depth considered to be well below the potential depth for percolating contaminants to affect water being accessed. The fifth well, at the intersection of Elmore Road and BLM Road is much shallower, 12 feet, which does not meet Municipality of Anchorage code requiring 40 feet as the minimum depth of a drilled well (Chapter 15.55.060). However, it is still unlikely that the proposed action will impact this drinking water well since glyphosate will be the only compound used near it. As described in the *Soils* section, glyphosate adsorbs to soil particles and is consumed by soil microbes rapidly. The following sections address the characteristics of glyphosate in more detail.

Glyphosate

Aquamaster is approved for use on water, including estuaries, wetlands, and emergent aquatic vegetation and will be used near wetlands for this project. Roundup is not approve for use in water, wetlands, or riparian areas, and will only be use in upland locations for this project. Glyphosate dissipates rapidly from surface water by adsorption and biodegradation and may move into surface water with eroded soil particles. Freshwater aquatic macrophytes and algae are reported to be sensitive to glyphosate at concentrations as low as 20 mg/l; however, stimulation in growth of some green algae has also been reported at low concentrations (0.02 mg/l; SERA 2003a).

Glyphosate does not photodegrade, and in water has an estimated half-life of 12 days to 10 weeks. It is generally considered immobile because of its adsorption characteristics; however, it is a known groundwater contaminant. The USEPA has set a maximum concentration limit of 0.7 mg/L as a permissible level for glyphosate in potable water. Strong adsorption to particles slows microbial degradation, allowing glyphosate to persist in aquatic environments. Glyphosate can be inactivated by adsorption if mixed with muddy water (Tu et al. 2001). Residues adsorbed to suspended particles are precipitated into bottom sediments where they can persist until

biodegraded or be released into water (Goldsborough and Brown 1993, Extension Toxicology Network 1996, Tu et al. 2001).

Glyphosate is unlikely to enter waters through surface runoff or subsurface flow because it binds strongly to soils, except when the soil itself is washed away by runoff; even then, it remains bound to soil particles and generally unavailable (Rueppel et al. 1977, Malik et al. 1989, Tu et al. 2001). More recent studies found solution-phase glyphosate in 36% of 154 stream samples, while its degradation product, aminomethylphosphonic acid, was detected in 69% of the samples. The highest measured concentration of glyphosate was 8.7 µg/L, well below the USEPA's maximum concentration limit of 700 µg/L.

Imazapyr

One formulation of imazapyr (Habitat) is registered for use in wetlands and riparian areas. It is often used to control emergent and floating plants. Residual soil contamination with imazapyr could be prolonged in some areas, possibly resulting in substantial inhibition of plant growth (SERA 2004). Imazapyr is not likely to degrade in anaerobic soils or sediments, and has been shown to strongly bind to peat (SERA 2004). Imazapyr is water soluble and potentially mobile (SERA 2004). Imazapyr is rapidly degraded by sunlight in aquatic solutions, with a half-life of approximately 2 days that decreases with increasing pH (Mallipudi et al. 1991, Mangels 1991, Tu et al. 2001). Imazapyr does not appear to degrade in anaerobic systems, such as wetland soil or lake or pond sentiments, and will bind strongly to peat (Tu et al. 2001).

One study found no reports of imazapyr contamination in water despite its potential for mobility (Tu et al. 2001). It is not known to be a groundwater contaminant. Battaglin et al. (2000) stated that little is known about its occurrence, fate, or transport in surface water or groundwater. In one study, imazapyr (from terrestrial applications) was detected in 4% of the 133 samples taken from streams, but was not detected in reservoirs or groundwater.

Triclopyr

The two formulations of triclopyr, a triethylamine salt formulation and triclopyr butoxyethyl ester, behave very differently in water. Both formulations are used to control woody riparian vegetation. However, only the triethylamine salt formulation of triclopyr, is registered for use for selective control of submersed aquatic plants. Both formulations readily degrade to triclopyr acid , which is the active form in plants. Triclopyr butoxyethyl ester is not approved for use in aquatic, wetland, or other areas where immediate runoff to open water may occur. It will not be used on Campbell Tract in these areas, it will only be used in areas 800 feet or more from bodies of water or wetlands. Additionally, the potential for transport to groundwater or surface water via soils is extremely low from these areas.

The triclopyr butoxyethyl ester formulation is not water-soluble and can partition into organic materials and be transported to sediments, where it is persistent. It can degrade through hydrolysis or photolysis to triclopyr acid (Smith 1976, Tu et al. 2001), which will diffuse into the water column and continue to degrade (Tu et al. 2001). The fate and effects of triclopyr triclopyr butoxyethyl ester were investigated in a first-order forest stream (Thompson et al. 1995). Measurements of triclopyr in stream samples indicated that the ester form was rapidly converted to the acid, and that partition to organic materials occurred as chemical pulses moved downstream. Johnson et al. (1995) found triclopyr acid in water had a half-life due to photolysis of 1 to 12 hours (Tu et al. 2001). The rate of degradation in water is generally dependent on water temperature, pH, and sediment content.

3.5. Vegetation

3.5.1. Affected Environment

The proposed project area occurs in the Cook Inlet Basin ecoregion and is characterized by interior and coastal boreal forest. *Picea glauca* (white spruce), *Picea mariana* (black spruce), *Betula papyrifera* (paper birch), and *Populus balsamifera* (balsam poplar) dominate the tree canopy in areas adjacent to the project sites. The understory is often dominated by *Salix* ssp. (willow) and *Alnus crispa* (Alder), but also highbush cranberry (*Viburnum edule*), wild rose (*Rosa acicularis*), and ericaceous shrubs. The soil surface is often covered by either mosses or leaf litter and mulch (Guyer, 2000).

Unit 1 (the airstrip) is primarily bare gravel, but is also sparsely vegetated with native shrubs, non-native herbaceous plants, and a mix of native and non-native grasses. Unit 2 contains the same species as Unit 1, but with a slightly higher density. These two units are bordered by paper birch closed forest, paper birch open forest, balsam poplar closed forest, paper birch/white spruce open forest, and balsam poplar/willow scrub.

Unit 3 (turf and ornamental) contains manicured lawns composed of turf grasses and invasive species. Unit 3 is bordered by white spruce/paper birch forest, paper birch open forest, and spruce/moss forest. Unit 4 (roads and parking lot corridors) contain invasive species and native species that are well-adapted to disturbed sites. Unit 4 is bordered by paper birch open forest, paper birch/white spruce open forest, spruce/moss forest, and white spruce/paper birch forest. Unit 5 contains balsam poplar/willow scrub.

One rare plant, *Geum aleppicum ssp. strictum*, occurs in the general vicinity of the proposed project, approximately 0.15 miles from the north end of the airstrip, near the south fork of Campbell Creek (Figure 3.5). This plant is not a BLM Sensitive Species, but it is followed by the Alaska Natural Heritage Program (AKNHP, 2015) because it is rare in the state and is at a moderate risk of being extirpated due to its restricted range, small population size, and moderate number of occurrences.

Forty-eight invasive species occur in these units. Table 1 lists those species that rank as either extremely or highly invasive by the Alaska Natural Heritage Program invasiveness ranking system (need citation). Figure 2 shows the recorded location of these species in the proposed project area. In general, the majority of the proposed project area is disturbed to some degree. Successfully addressing invasive plants in these areas will ensure that infestations do not spread into adjacent intact ecosystems.

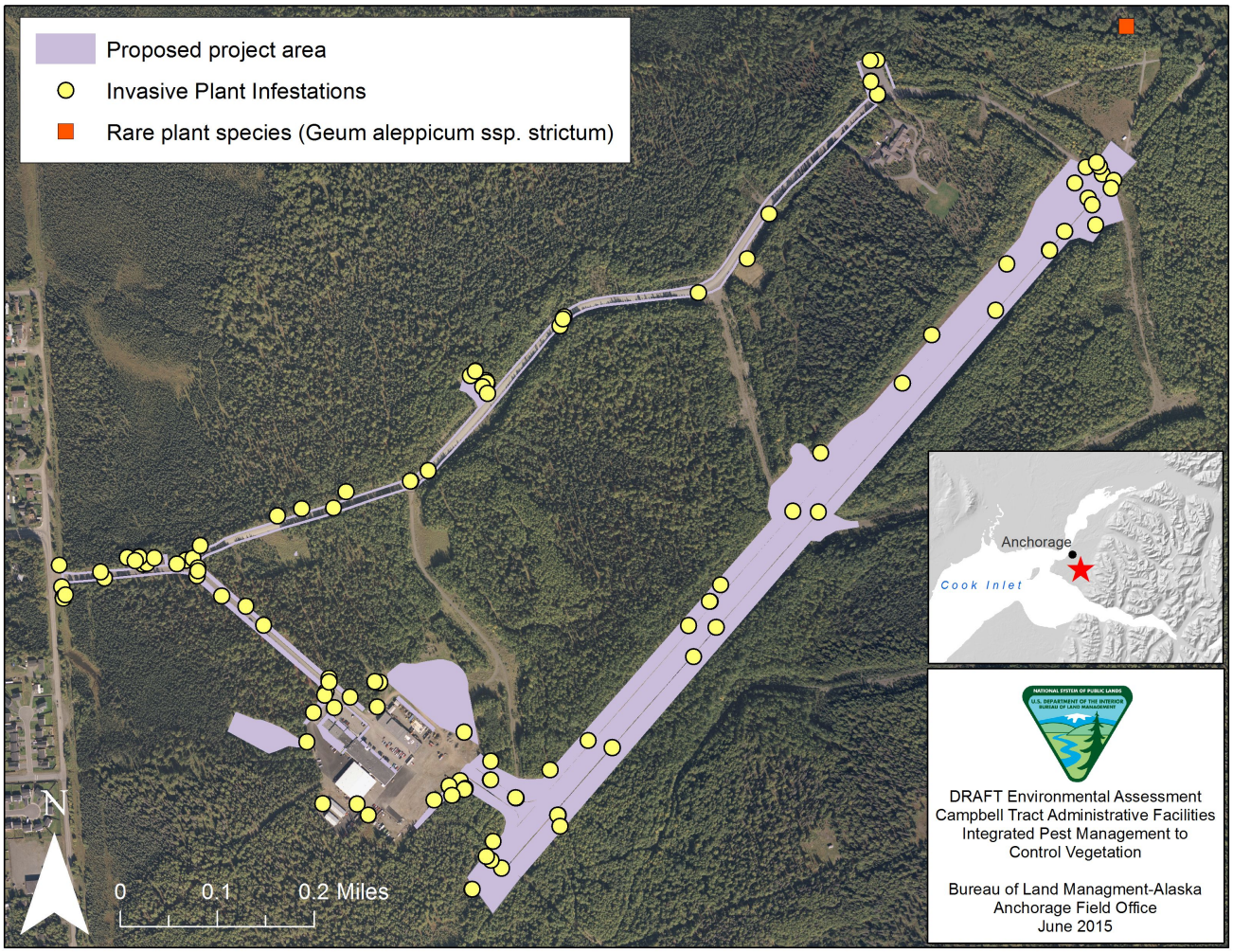

Figure 3.4. Invasive species and rare species within or near the proposed project area.

Table 3.1. Extremely and highly invasive species recorded on or near administrative sites on Campbell Tract, listed in order of decreasing invasiveness.

Scientific Name	Common Name	Invasiveness Rank (0–100)
Phalaris arundinacea	reed canarygrass	83
Melilotus albus	white sweet clover	81
Hieracium aurantiacum	orange hawkweed	79
Cirsium arvense	creeping thistle	76
Vicia cracca ssp. *cracca*	bird vetch	73
Leucanthemum vulgare	oxeye daisy	61

3.5.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

Direct and Indirect Effects

There will be no direct effects to vegetation from this alternative since no new activities are proposed. However, this alternative indirectly affects vegetation because it increases the likelihood that invasive plant species will be able to outcompete native vegetation for available light, nutrients, and space. This alternative is the least effective since it does not propose any new treatments for invasive species nor a solution to airstrip degradation.

Cumulative Effects

3.5.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative

There are possible direct effects to adjacent non-target plants resulting from accidental spray, low levels of herbicide drift in the air, and very low levels of herbicide drift in soils. However, most species in the proposed project area are widespread and common within the region, so the possibility of negatively affecting a plant species population is minimal. *Geum aleppicum ssp. strictum*, the only rare plant that occurs within this general area, has only been found in an areas not adjacent to the proposed project areas, so the impact to this species is also considered to be minimal. It usually occurs in riparian areas and is unlikely to be found within the proposed project areas. Overall, native non-target plants would be minimally affected by this alternative, however, accidental scenarios are always possible.

Wind drift: Project design features have been selected to minimize the effect of herbicide drifting in the air towards off-target species. Treatment will not occur when winds are greater than 10 mph. The backpack spray method will result in minimal wind drift since the sprayer is usually pointed low to the ground. However, it is likely that very small amounts of herbicide will drift in the air and affect non-target plants on a small scale for this method. The chances of drift are higher with the boomspray method since a large area will be treated in one session with equipment that is situation higher above the ground and dispenses at a higher rate. However, the area proposed for this method is buffered by a band of disturbed ground (vegetation management unit 2) separating it from the adjacent natural forested area. The buffer area is planned to be treated using the spot treatment method since it contains invasive species mixed with grasses and small shrubs. Unintentional damage to any species in this buffer zone will not negatively affect ecosystem health in the area since the goal for this vegetation management unit is low stature vegetation, not a natural ecosystem.

It is unlikely that herbicide drift via water run-off would occur since the project design calls for ceasing treatment if rain occurs and not treating during months of heavy snowmelt and runoff. Additionally, drift in the soils is expected to be minimal since the majority of soils in the project area are extremely well drained (see *Soils* section). Due to these project design features, it is unlikely that vegetation outside of proposed treatment areas or adjacent to target species would experience severe enough damage to cause harm to the function of these forest systems.

Glyphosate

Since glyphosate is non-selective (meaning it is toxic to all types of plant), there is potential for non-target plant damage to occur to any plant species. However, it has low residual activity, so it would not be effective for an extended period of time. Some plants are more sensitive to this compound and glyphosate exposure would pose a moderate to high risk to those plant species. Species that are less sensitive to this compound would experience a low to moderate risk to glyphosate exposure. Additionally, one field study suggests that drift from glyphosate could affect

long-term sustainability of populations of lichens and bryophytes (Newmaster et al. 1999). This negative effect will be mitigated by careful application using the backpack spray method to avoid spraying of ground dwelling lichens and other bryophytes.

The estimates for off-site drift encompass plausible exposures attributable to wind erosion. For relatively tolerant species, there is no indication that glyphosate is likely to result in damage at distances as close as 50 feet from application site. For ground broadcast at the maximum application rate, low to moderate risk to sensitive species is predicted at off-site distances of 100 feet or less. Drift from ground broadcast applications at the typical application rate would pose a low risk to sensitive species within 25 feet. If glyphosate was directly applied using a backpack sprayer, little if any damage due to drift would be anticipated.

Glyphosate absorbs strongly to soil and plant roots do not readily absorb it, therefore, it is unlikely that plant species will be affected by runoff of glyphosate under any conditions. A field study conducted using glyphosate found no effect to plant diversity in an 11-year examination of site-preparation using herbicides, though structural composition and perennial species presence were altered.

Imazapyr

Imazapyr is non-selective (meaning it is toxic to all types of plants), so there is potential for non-target plant damage to occur to any plant species exposed. The risk assessment predicts a high risk to plant species sensitive to imazapyr and a moderate risk to tolerant species under direct broadcast spray scenarios. Off-site drift of imazapyr could cause damage to sensitive plant species at distances of less than 900 feet from the application site after ground broadcast with a low boom at the typical application rate, and possibly at distances greater than 900 feet after applications at the maximum application rate (low to moderate risk for ground applications at both application rates, depending on site-specific conditions, such as wind speed and foliar interception). However, tolerant species are not likely to be affected by off-site drift of imazapyr, except under a drift scenario similar to a low boom ground application at the maximum application rate at distances of 25 feet or less. It is assumed that most of the species within 900 feet of the Campbell Airstrip project area will be fairly tolerant to imazapyr and will only experience slight damage.

When applied to areas in which runoff is favored (e.g., clay soils over a wide range of rainfall rates or loam soils at annual rainfall rates of 100 in/yr or more), damage from runoff appears to be more likely than damage from drift. For applications at the typical application rate, the risk assessment predicted low risk to plants at sites with clay soils and 15 to 20 in/yr precipitation, and with loam soils and more than 100 in/yr precipitation; moderate risk to plants at sites with clay soils and 25 to 150 in/yr precipitation; and high risk to plants at sites with clay soils and more than 200 in/yr precipitation. However, the proposed project sites occur in gravelly well drained soils and Anchorage experiences an annual rainfall of 16.57 inches, so the typical application rate is predicted to have a low risk to non-target plants. Residual soil contamination with imazapyr could be prolonged in some areas, possibly resulting in substantial growth inhibition (Rahman et al. 1993, SERA 2004). This characteristic is an important reason for the selection of this product for use on the Campbell Airstrip to establish a plant free runway surface with the least number of applications.

Triclopyr

Triclopyr is a selective herbicide. It is only toxic to broadleaf plant species and non-toxic to grasses. Therefore, there is potential for non-target plant damage to occur to broadleaf species.

The potential impact of off-site drift associated with broadcast applications varies substantially with the application rate. At the typical application rate, potentially damaging herbicide drift exposure could occur within about 300 feet of the application site.

At the typical application rate, potentially damaging runoff from triclopyr acid would be anticipated only under relatively high rainfall conditions in watersheds with clay soils (low risk was predicted for sensitive and tolerant species with rainfall of 200 in/yr or greater). While a lesser amount of triclopyr BEE will run off, low to moderate risk to plants is predicted for applications of this more toxic formulation, starting at relatively modest rainfall rates (i.e., 15 to 25 inches per year) in all modeled soil types (i.e., clay, loam, sand).

Indirectly, native vegetation will experience a beneficial effect from this alternative due to decreased competition with invasive species. Adjacent uninfested intact ecosystems will experience the greatest benefit. Additionally, remote sites visited by aircraft that have previously visited Campbell Tract will experience a lower risk of invasive plant invasion due to this alternative.

3.6. Wildlife

3.6.1. Affected Environment

Campbell Tract provides habitat for most species of birds and mammals common to Southcentral Alaska. Most of these species likely use habitat surrounding the proposed herbicide treatment sites regularly. It is assumed that bird and mammal use of the airstrip is minimal.

Mammals

Many mammal species have been observed to use the proposed project area. Moose (*Alces alces*) are common, and use the area for: calving in the spring, winter forage, and as a corridor for seasonal movements into adjacent natural areas. Black bears (*Ursus americanus*) den in forested areas on Campbell Tract (Kleckner 2001) and are found foraging, often with cubs, around Campbell Tract facility buildings and cross the airstrip often (ADF&G citation). Brown bears (*Ursus arctos*) are also found on Campbell Tract, although seen less often than black bears. Radio telemetry research has shown brown bears to be foraging, rearing young, and denning in proximity to human development and activity on Campbell Tract, with as many as 20 adult bears present on the south fork of Campbell Creek in summer (Farley, et al. 2008). Two wolf packs (*Canis lupus*) have ranges that include Campbell Tract, and move through the area while traveling the front range of the Chugach Mountains (ADF&G 2010). Coyotes (*Canis latrans incolatus*), beaver, red fox (*Vulpes vulpes*), snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), red squirrel (*Tamiasciurus hudsonicus*) and several species of microtine rodents can also be seen on Campbell Tract. Although rarely seen, it is likely that lynx (*Lynx canadensis*), muskrat (*Ondatra zibethicus*), and mink (*Mustela vison*) also use the area.

Birds

Bird surveys have documented 32 species of birds that breed and migrate through Campbell Tract in summer and fall (Seppi, 2010). These species likely occur within or adjacent to all vegetation management units. Included in this list are the olive-sided flycatcher (*Contopus cooperi*), blackpoll warbler (*Dendroica striata*), grey-cheeked thrush (*Catharus minimus*), and rusty blackbird (*Euphagus carolinus*). These species are ranked high to moderately high priority

for conservation by the Alaska Species Ranking System since it is known that their populations are in a declining trend and have high biological vulnerability (Gotthardt, Walton, & Fields 2012).

3.6.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

No direct or indirect effects are expected under the no-action alternative. However, the continued expansion of invasive species that would result from this alternative (due to the lack of effective control options), will cumulatively decrease the amount of native vegetation available for forage and habitat.

3.6.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative

Herbicide treatment can affect wildlife through three general exposure scenarios: (1) acute toxicity, (2) chronic toxicity, and (3) secondary effects on habitat. Wildlife might be exposed to herbicides from direct spray, ingestion of contaminated materials (vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation. All of these sources of exposure were considered in the herbicide risk assessment.

It is highly unlikely that broadcast sprayed vegetation on the airstrip will be consumed by wildlife species since this vegetation is sparse and low in stature (less than one foot). It is also unlikely that a large density of insects or other prey species occurs on the airstrip due to the sparse nature and low stature of this vegetation. Additionally, it is unlikely that this treatment will impact bodies of water being used as drinking water by wildlife species since it does not occur in close enough proximity (see sections on fisheries and water quality). However, there is the possibility of land-based wildlife species walking across the airstrip after treatment has been applied. This event is not expected to be common, considering the group of people and vehicles occupying the area would likely deter wildlife from approaching, but is a possibility.

Vegetation sprayed using the spot treatment method for invasive species are not expected to be consumed by wildlife species. Spot treatment will generally be conducted on a small scale with one or two workers treating fairly isolated infestations or infestations around buildings. It is unlikely that wildlife will visited these areas before the treatment has dried and absorbed into the plant. It is also unlikely that large numbers of insects will be contaminated given the sporadic nature of spot treatment. However, non-target plants may be damaged due to accidental spray or short-range off-target drift. These species would likely be species that are very common and adapted to road edge or disturbed areas. This injury is expected to affect parts of or whole individual plants, but not at a scale to measurably affect wildlife habitat.

Glyphosate

Glyphosate applications pose low to moderate risk to several terrestrial wildlife receptors under multiple exposure scenarios involving applications at the typical and maximum application rates (SERA 2003a). Direct spray of a small animal and an insect, both assuming 100% absorption, poses a low risk at the typical application rate and a moderate risk at the maximum application rate. Consumption of vegetation contaminated by a spill poses a low risk to small mammals for scenarios of the maximum application rate only. A large mammal consuming contaminated vegetation would face low acute risk for scenarios involving the typical application rate,

moderate acute risk, for scenarios involving the maximum application rate, and low chronic risk for scenarios involving the maximum application rate; a large bird consuming contaminated vegetation would face a low acute and chronic risk.

Consumption of contaminated insects would pose a low risk to both small mammals and small birds if the herbicide was applied at the typical application rate. The herbicide would pose a moderate risk if applied at the maximum rate. Acute risks from glyphosate exposure are low at the typical application rate under all scenarios, and there are no chronic risks. Exposure scenarios with the greatest risk are direct spray and acute consumption of contaminated vegetation and insects. Spot applications would have lower risks associated with consumption of contaminated vegetation and insects than broadcast applications, as fewer non-target areas would be impacted by direct spray or spray drift.

Imazapyr

Imazapyr does not pose substantial risks to terrestrial animal species, but there are low risks associated with several exposure scenarios, mostly involving herbicide applications at the maximum application rate (SERA 2004). The only scenario involving the typical application rate that would pose a risk (low risk) to wildlife is that of a small bird consuming contaminated insects. Therefore, application of imazapyr at the typical application rate is not likely to result in adverse effects to terrestrial animals, with the possible exception of small insectivorous bird. For the maximum application rate, however, the following scenarios pose a low risk to wildlife receptors: direct spray of small animals and insects, consumption of contaminated vegetation by large mammals and large birds, and consumption of contaminated insects by small mammals and small birds.

Triclopyr

The following scenarios pose a low risk for Triclopyr applications at the typical rate and a moderate risk for applications at the maximum rate: 100% absorption of direct spray by small mammals, 100% absorption of direct spray by insects, acute consumption of contaminated vegetation by large mammals and large birds, acute consumption of contaminated insects by small birds and small mammals, and chronic consumption of on-site contaminated vegetation by large mammals and large birds. In addition, for the maximum application rate, there would be low risk associated with acute consumption of contaminated vegetation by small mammals following an accidental spill, acute consumption of contaminated small mammals by carnivorous mammals, and chronic consumption of off-site contaminated vegetation by large mammals. No risk is predicted for small mammals as a result of acute or chronic consumption of contaminated vegetation or water, or for predatory birds as a result of consumption of contaminated fish.
In summary, acute or accidental direct spray scenarios would pose a low to moderate risk to terrestrial mammals and insects, consumption of contaminated vegetation would pose a low to moderate risk to large mammals and large birds, and consumption of contaminated insects would pose a low to moderate risk to small birds.

3.7. Fisheries

3.7.1. Affected Environment

The south fork of Campbell Creek runs for nearly one mile through the Campbell Tract and at its closest comes approximately 650 feet away from the end of the airstrip. The creek is not within the proposed project areas, but is near Units 1, 4, and 5. The Alaska Department of Fish and Game's *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* designates Campbell Creek and its associated tributaries as anadromous streams. Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), pink (*O. gorbuscha*), sockeye (*O. nerka*), and chum (*O. keta*) salmon spawn in the south fork of Campbell Creek. Rainbow trout (*O. mykiss*), Dolly Varden (*Salvelinus malma*), and slimy sculpin (*Cottus cognatus*) also inhabit the creek.

3.7.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

The proposed project does not include any areas within the riparian zone of the sorth fork of Campbell Creek. Therefore, this alternative would not affect fish species.

3.7.3. Direct and Indirect Effects from Alternative 2 — Proposed Alternative

This alternative will have no direct effect on fish species in the south fork of Campbell Creek. Fish habitat is far enough from the proposed project areas that the likelihood of fish becoming exposed to herbicides is extremely low. However, should fish become exposed to the three proposed herbicides, effects of that exposure are described.

Glyphosate

Glyphosate is very immobile in soil, being readily adsorbed by soil particles and subject to microbial degradation (Norris et al. 1991). The potential for glyphosate to enter water bodies during runoff is extremely low in well-drained soils in the project area.

Based on bioassays, technical grade glyphosate is classified as non-toxic to practically non-toxic in freshwater fishes (USEPA OPP 1993). Some formulations are more toxic to fish than technical grade glyphosate, this includes Roundup Pro, which is not being proposed for use within 800 feet of water bodies or wetlands. At the typical application rate, the less toxic formulation of glyphosate (Aquamaster), which is approved for use in aquatic sites, poses little risk to fish or aquatic invertebrates, except under accidental spill scenarios, for which there is a low to moderate risk to fish and a low risk to aquatic invertebrates. At the typical application rate, Roundup Pro poses a high risk to fish and aquatic invertebrates under accidental spill scenarios, and a low risk under routine acute exposure scenarios. At the maximum application rate, Aquamaster poses a low risk to fish and aquatic invertebrates under acute exposure scenarios. Accidental spills for the maximum application rate pose moderate to high risk to fish and low risk to aquatic invertebrates. At this same application rate, Roundup Pro poses a high risk to fish and a low risk to aquatic invertebrates under accidental spill scenarios, and moderate risk to fish and low risk to aquatic invertebrates under acute exposure scenarios. Based on these data, the USEPA

classified glyphosate formulation as practically non-toxic to moderately toxic to freshwater fishes (SERA 2003a).

Imazapyr

Imazapyr is relatively non-toxic to fish and aquatic invertebrates (SERA 2004). At the typical and maximum application rates, imazapyr poses no risk to fish or aquatic invertebrates in streams or ponds under acute and chronic exposure scenarios. For the typical application rate, moderate risk is predicted for sensitive fish species for accidental spill scenarios, and for the maximum application rate, high risk to sensitive fish and low risk to tolerant fish and aquatic invertebrates are predicted for accidental spill scenarios.

Aquatic invertebrates have similar sensitivity to imazapyr as fish. Based on two studies using Daphnia magna, no mortality was observed at 24 or 48 hours of exposure of up to 100 mg/L of imazapyr; with the second study showing no effect after 48 hours at 180 mg/L (SERA 2004). No adverse effects to fish and other aquatic organisms appear to be likely at either the typical application rate or the maximum application rate for a normal exposure.

Triclopyr

When applied at the typical rate, triclopyr butoxyethyl ester would pose a moderate risk to fish and a low risk to aquatic invertebrates under acute exposure scenarios, and a high risk to fish and a moderate risk to aquatic invertebrates under a scenario involving an accidental spill into a stream or pond. When applied at the maximum application rate, triclopyr would pose a high risk to fish and a moderate risk to aquatic invertebrates under acute exposure scenarios and high risk to fish and aquatic invertebrates as a result of an accidental spill into a stream or pond. However, Triclopyr butoxyethyl ester will rapidly hydrolyze to triclopyr acid, which when applied at the typical or maximum application rate poses no risk to fish or aquatic invertebrates in streams or ponds under acute and chronic exposure scenarios. Since triclopyr will not be used within 800 feet of an open body of water, the potential for it to be accidentally applied to water is extremely low. There is also a low chance that run-off or leaching of triclopyr would reach bodies of water

3.8. Cultural Resources

3.8.1. Affected Environment

The Alaska Heritage Resources Survey was consulted for cultural resources that could be affected by this undertaking. There are two cultural resources located within the APE. The project area is within the boundaries of ANC-01385, the collection of World War Two artifacts and features on the Campbell Tract. The project would also take place on ANC-00767, the Campbell Airstrip, which is a contributing element of ANC-01385.

3.8.2. Direct and Indirect Effects from Alternative 1 — No Action Alternative

Since there are no activities proposed under this alternative, there would be no effect on cultural resources. Invasive species is currently not an issue affecting cultural resources on Campbell Tract, so there are also no indirect effects of taking no action.

3.8.3. Direct and Indirect Effects from Alternative 2 — Proposed Action Alternative

The project area is within the boundaries of ANC-01385, the collection of World War Two artifacts and features on the Campbell Tract. The project would also take place on ANC-00767, the Campbell Airstrip, which is a contributing element of ANC-01385. This proposed action involves minimal ground disturbance, and no ground disturbance on the airstrip itself; hand pulling of weeds or other ground-disturbing activities will be limited to small dispersed areas on or adjacent to BLM facilities. Therefore, there is no potential to effect historic properties. The project will have a beneficial impact on historic properties by removing hazards to the integrity of the airstrip. Under the BLM, Alaska State Protocol Agreement, the BLM Anchorage Field Office archeologist recommends that, based on the project description and the low impact of the proposed action, this project would have no effect on historic properties. The BLM will follow standard stipulations regarding the inadvertent discovery of cultural resources.

3.9. Cumulative Effects

Cumulative impacts are the combined effect of past projects, specific present projects, and other reasonably foreseeable future actions within the proposed project area to which herbicide treatment may add incremental impacts. There are no past, present, or reasonably foreseeable future actions that closely interact with the footprint of this proposed action in a temporal or spatial context that is meaningful. All future actions are too speculative or undefined to be considered reasonably foreseeable at this point in time.

Workers and the general public may be exposed to herbicides within this project area, but also outside this project area in adjacent natural areas using herbicides to control invasive plants and on personal property. However, multiple exposures do not necessary mean there will be cumulative adverse effects. Neither imazapyr, glyphosate, nor triclopyr have been shown to have increased risk resulting from long-term exposure. Chronic exposure scenarios were evaluated by the herbicide risk assessments (SERA 2003a, SERA 2003b, SERA 2004) including all scenarios that could possibly occur from the proposed methods and situations during this project.

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Chapter 4. Consultation and Coordination

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Table 4.1. List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Dr. Richard Lee	BLM National Operations Center	Process recommendations
Steve Seefeld	UAF Cooperative Extension	Herbicide selection
Tim Stallard	Anchorage Cooperative Weed Management Area and Municipality of Anchorage Parks and Recreation Department contact	Herbicide use process and coordination with the Municipality of Anchorage

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Chapter 5. List of Preparers

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Table 5.1. List of Preparers

Name	Title	Organization
Doug Ballou	Assistant Field Manager	BLM Anchorage Field Office
Larry Beck	Environmental Protection Specialist	BLM Anchorage Field Office
Jenny Blanchard	Archaeologist	BLM Anchorage Field Office
Brad Muir	Outdoor Recreation Planner	BLM Anchorage Field Office
April Rabuck	Planing and Environmental Coordinator	BLM Anchorage Field Office
Aliza Segal	Ecologist	BLM Anchorage Field Office
Bruce Seppi	Wildlife Biologist	BLM Anchorage Field Office
Merlyn Schelske	Fish Biologist	BLM Anchorage Field Office
Laurie Thorpe	Natural Resource Specialist	BLM Anchorage Field Office

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Appendix A. BLM Campbell Tract Administrative Facilities Integrated Pest Management Plan to Control Vegetation

Introduction

This document is an integrated pest management plan for the management of vegetation within the Campbell Tract Facility's administrative sites. It has been prepared in accordance with BLM Handbook H-9011 (Chemical Pest Control) and the Department of Interior Manual 517 (Integrated Pest Management Policy). It also complies with the State of Alaska Department of Natural Resources 18 AAC 90 Pesticide Control Regulations.

The Campbell Tract Facility (CTF) houses a runway, helicopter landing pads, materials storage areas and other smaller administrative sites used to support this infrastructure. The BLM maintains the airstrip and uses it for field crew transportation to remote work sites that require small aircraft, both fixed wing and helicopters. The airstrip and administrative facilities also serve as an emergency deployment location for the Alaska Disaster Medical Assistance Team and Alaska Department of Interior Emergency Response Teams. In the event of fire at Anchorage's wildland-urban-interface, this airstrip can serve as a strategic staging area for small aircraft support fire monitoring, control, and suppression efforts.

In 2003, the BLM spent 1.3 million dollars to re-construct and re-grade the airstrip. At that time, the airstrip was in poor condition and in need of extensive repair. Since the improvements, the BLM has documented a slow but persistent encroachment by vegetation. Mechanical methods of control are ineffective and costly on the approximately 20 acres occupied by the airstrip, helicopter pads, and support sites. If the BLM continues to allow uncontrolled vegetation growth, the airstrip will be severely damaged. Subsequently, the BLM (and the larger Anchorage community) would lose an important aviation asset.

Additionally, non-native invasive species have been found present at and infesting administrative sites at the CTF. 48 invasive plant species have been found within aviation, administrative, and roadside sites. Seven of these species are considered highly or extremely invasive because they degrade plant community structure, composition, and ecological functions. Invasive plant control actions have been occurring on Campbell Tract, but have not incorporated integrated methods shown to be most effective. Past efforts have been restricted to manual or mechanical control such as hand pulling, digging, use of weed wrenches, mowing, and tarping. Although manual control works in some cases, it is both inefficient and ineffective for many infestations within Campbell Tract administrative areas.

Surveys show that invasive species abundance is high at material storage sites (gravel, top soil, other fill materials). When these materials are moved for maintenance purposes to other destinations within Campbell Tract, invasive species are transported with them. Surveys also show a high abundance of invasive species along the airstrip, helicopter landing pads, and roads. Aircraft taking-off from Campbell Tract may collect and harbor invasive species seeds and transport them to remote locations in the state. Reducing and removing invasive species from administrative areas will help protect un-infested adjacent and remote natural areas.

This operation plan describes the BLM's planning process, the principles of integrated pest management it employs, and how these approaches ensure effective vegetation management while considering and incorporating environmental and human health. The BLM and its contractors will use and conform to this plan when carrying out vegetation management activities within Campbell Tract administrative sites.

Purpose and Objectives

The purpose of controlling vegetation is to maintain safe and functional aviation, administrative and roadside areas. Alder, willow, and non-native species have infested the Campbell Airstrip, compromising the integrity of the compacted gravel, and resulting in conditions unacceptable for safe aviation operations. Attempts have been made by maintenance personnel to hand pull saplings, however, this destabilizes the compacted gravel and results in divots – an unsafe feature for a landing surface. Attempts to mow the vegetation temporarily alleviate the problem, but woody species are not killed by this method and re-grow quickly, often in a way to poses an even greater risk to aircraft tires (gnarled stumps).

Nuisance vegetation include:

- All woody native species
- Tall or robust non-woody native species
- Tall or woody non-native species

If not managed properly, nuisance vegetation can:

- Compromise the integrity of the airstrip
- Interfere with or inhibit safe take-off and landings
- Promote the spread of non-native invasive species

The principles of integrated pest management will be used for this operation plan to ensure careful consideration of all available control techniques and to manage vegetation by the most economical means and with the least possible hazard to people, property, and the environment. Currently, no methods of effective prevention have been identified to address the identified problem. However, this operation plan is dynamic and can accommodate preventive techniques should an effective technique be developed in the future.

Survey and Treatment Schedule

Areas to be managed under this plan will be surveyed annually in early June. Pre-treatment surveys will be conducted by the Anchorage Field Office (AFO) Integrated Pest Management coordinator. Species presence, abundance, and size will be identified. Monitoring results will be recorded and maintained by the AFO Integrated Pest Management coordinator. Treatments will begin by occurring annually to meet the goals outlined in Table 1. Effectiveness monitoring (described in the Post-Treatment Evaluation section) will be conducted to determine if this schedule is adequate.

Table A.1. Goals and treatment methods determined to best fit each vegetation management unit within the proposed project area.

Unit	Vegetation Management Goal	Treatment Method
Unit 1: Airstrip Runway	Vegetation free.	Chemical (broadcast)
Unit 2: Runway Safety Area (vegetated corridor adjacent to the airstrip)	Non-woody species: grass and small herbaceous broadleaf plants that are not invasive species.	Physical, Mechanical, and Chemical (spot)
Unit 3: Turf and Ornamental	Landscaped grass and ornamental vegetation. No invasive species.	Physical, Mechanical, and Chemical (spot)
Unit 4: Roads and parking lot corridors (shoulder and ditches)	Any vegetation that is not an invasive species.	Physical, Mechanical, and Chemical (spot)
Unit 5: Aviation approach areas	Tree height sufficient to allow required glideslope for incoming aircraft	Mechanical

Treatment Options and Selection Criteria

The selection of method(s) used will depend on the desired management goal, characteristics of plant species, plant composition, and percentage cover. For treating invasive species, the IPM coordinator will research the current most effective control methods and consult with other experts in the state (University of Alaska-Fairbanks Cooperative Extension and other members of the Committee for Noxious and Invasive Plant Management in Alaska (CNIPM)).

Mechanical or Physical Control Methods

Trimmers, mowers, brush cutters, and chainsaws can be useful for achieving the desired management goal for unit 2-5, depending upon the plant species. Some invasive species respond poorly to mechanical methods (e.g. white sweet clover) and are best managed through chemical methods. Physical and mechanical methods have proven to be completely ineffective for Unit 1, the airstrip runway. In 2011, the BLM attempted hand pulling and burning with weed burners. In 2012, the BLM attempted applying a salt product to a test plot. All of these methods were shown to be ineffective and unfeasible in reaching the vegetation management goal for unit 1.

When mechanical methods have been shown (by either AFO staff or other entities working toward control of that species in Alaska) to be ineffective or unfeasible in controlling an invasive species, chemical methods will then be considered.

Chemical Control (Herbicides)

The AFO has chosen three herbicides to be optional treatments available for use on Campbell Tract, described in Table 2. These herbicides are approved for use on BLM-managed lands by the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement Record of Decision* (2007). This group of three herbicides has been recommended by the University of Alaska-Fairbanks Cooperative Extension Pest Management Program to meet to the AFO's specific needs and to address two different vegetation management goals: 1) creating vegetation free zones and 2) spot treating to remove selected target species. This selection of three herbicides will allow flexibility to select the herbicide that will produce the best result with the least damage to off-target species and other components of the environment, given daily fluctuations in conditions.

Table A.2. Herbicides proposed for this area

Herbicide Active Ingredient:	Trade Name:	Registered for use in:
Glyphosate	Roundup PRO	Terrestrial sites only (800 ft. from wetlands and surface water)
Glyphosate	Aquamaster	Aquatic, wetland, and terrestrial sites
Imazapyr	Arsenol	Aquatic, wetland, and terrestrial sites
Triclopyr	Garlon 4	Terrestrial sites only (800 ft. from wetlands and surface water)

Glyphosate is a non-selective systemic herbicide that can damage all groups or families of plants to varying degrees. Glyphosate inhibits the production of aromatic amino acids and certain phenolic compounds. This leads to a variety of toxic effects in plants, including the inhibition of photosynthesis, respiration, and nucleic acid synthesis, thereby resulting in cellular disruption, decreased growth, and death at sufficiently high levels of exposure. Two different formulations of glyphosate are being proposed, product names: Aquamaster and Roundup Pro. Aquamaster is approved for use in aquatic and riparian sites. Roundup Pro has additional surfactants added to the product and is not approved for use near aquatic, wetland, or riparian sites. Imazapyr inhibits an enzyme (ALS) needed to synthesize amino acids and is used in the control of a variety of grasses, broadleaf weeds, vines, brush species, and aquatic vegetation. Triclopyr is a selective, systemic herbicide effective only on broadleaf and woody species (grasses are not damaged by Triclopyr). Triclopyr mimics auxin, a plant growth hormone, thus disrupting the normal growth and viability of plants. Commercial formulations include two triclopyr derivatives: triethylamine salt and triclopyr butoxyethyl ester. Only triclopyr butoxyethyl ester is being proposed. This product is not approved for use near aquatic, wetland, or riparian sites.

Application methods for these herbicides are summarized in Table 2.3. Vegetation management unit 1 would require a ground broadcast method (boom spray) application that uses truck-mounted equipment to apply herbicide. A selective foliar application would be employed for units 2-4 on invasive species only when physical and mechanical treatment has been shown to be ineffective or unfeasible. This method employs an herbicide sprayer carried by backpack. Herbicide is applied only to selected target vegetation (invasive species). The BLM will adhere to the typical application rate listed on the product label for each herbicide. However, the spot treatment method will usually always use less than the typical application rate since only selected plants are being treated, not an entire area.

Table A.3. Methods of herbicide application and which species they have been selected to target.

Methods of application	Target species
Ground broadcast (truck-mounted boom spray)	All vegetation growing on the gravel airstrip and gravel sections of the taxiway (Unit 1)
Handheld backpack sprayer	Non-native invasive species that are growing on administrative sites outside of the airstrip, along the perimeter of the airstrip, and along road and parking lot corridors (Units 2-4)

Key standard operating procedures applicable for this herbicide use are listed in the *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement Record of Decision* (2007). They follow guidance from BLM Handbook H-9011 (Chemical Pest Control) and BLM Manuals: 1112 (Safety), 9011 (Chemical Pest Control), 9012 (Expenditure of Rangeland Insect Pest Control Funds), 9015

(Integrated Weed Management), and 9220 (Integrated Pest Management). Best management practices outlined in these manuals will be followed prior to and during implementation. The following list includes some, but not all, of the standard operating procedures that will be followed.

- Only licensed applicators will apply herbicide.
- Directions in the herbicide product label will be followed for use, storage, and personal protection.
- Herbicide products will be selected carefully to minimize additional impacts from degradates, adjuvants, inert ingredients, and tank mixtures.
- The least amount of herbicide needed to achieve the desired result will be applied.
- The effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risk will be considered for every application.
- Spraying will not occur during times of spring and early summer snowmelt runoff, or during times of typically heavy fall rainstorms. Additionally, spraying will not occur when rain is forecasted. If weather conditions change to rain during an herbicide application session, the session will be terminated and resumed when precipitation ceases.
- Herbicides will only be applied when the wind speed is less than 10 mph to minimize drift.
- Site characteristics, environmental conditions, and application equipment will be considered in order to minimize damage to non-target vegetation.

Post Treatment Evaluation

The South Zone Aviation Manager, AFO resource specialist, and/or the AFO field manager will conduct post-treatment implementation and effectiveness monitoring at 1 week, 1 month, and 2 months after treatment. They will assess effectiveness of the control method by documenting:

1. the amount and rate of re-growth
2. evidence of off-target herbicide movement
3. occurrence of non-target vegetation damage
4. opinion of sufficient application rates of herbicides

Post-treatment evaluations are used to update baseline information for the following treatment season and to determine what adjustments, if any, are needed in subsequent years to meet compliance and control objectives.

Safety/Spill Response/Emergency Procedures

The applicator will develop a safety plan prior to herbicide use that includes an emergency spill plan, safety data sheets for each herbicide, and identification of appropriate personal protective equipment. All workers, including contractors, will receive training to carry out the safety plan and will have a copy of the plan in their possession during herbicide use.

Notifications

Prior to herbicide applications, the BLM will notify the public of the application area closure through flagging, trail closure signs, and fencing two days in advance and will remain for two days post treatment. This notification schedule is consistent with Municipality of Anchorage Code 15.75.060 (Notice of application by commercial applicators). Signs will also comply with the information requirements detailed in Municipality of Anchorage Code 15.75.060. Treatment of these areas will impact one recreation trail and two trail heads which will be closed for the day of application and two days following herbicide application. The Municipality of Anchorage, an adjacent land owner, will be notified. The BLM will not notify the public of physical and mechanical control treatments.

Reporting

The herbicide applicator will complete a Pesticide Application Record within 24 hours of completion of the application. He/she will document the actual rate of application, active ingredient used, formulation, date, time, and location as well as noting all factors identified in the Pesticide Use Proposal that were taken into account.