Draft Dalton Management Area Integrated Invasive Plant Strategic Plan

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BLM

Central Yukon Field Office, Alaska

EXECUTIVE SUMMARY

The Bureau of Land Management (BLM) manages over two million acres of land along the Dalton Highway north of the Yukon River and south of Slope Mountain. These lands, hereafter referred to as the Dalton Management Area (DMA), are used for camping, hiking, hunting, fishing, canoeing and rafting, wildlife viewing, sightseeing, gold panning, mining and subsistence use. The Dalton Highway is a secondary road whose original purpose was the resupply of oil fields on the North Slope for the Trans Alaskan Pipeline (TAPS). Built in 1974, the "Haul Road" was open to industrial traffic only at first, but, in 1995, it was opened for use by the general public, too. The highway has since become a gateway for arctic adventure, tourism, and recreation for many people, and its use has steadily increased (Central Yukon Field Office files). Unfortunately, the highway has also become an avenue for the northward expansion of invasive plants.

The ecosystems along the Dalton Highway change as the latitude increases northward, beginning with boreal forest communities near the Yukon River valley, followed by dry, tundra-covered hills and mountains in the Brooks Range, and finally to wet tussock-tundra on the southern reaches of the Arctic coastal plain. The BLM-managed lands along the highway include nine Areas of Critical Environmental Concern (ACECs), as well as the Toolik Lake Research Natural Area. Several conservation units lie adjacent to BLM-managed lands along the highway, including the Arctic National Wildlife Refuge, Gates of the Arctic National Park and Preserve, Kanuti National Wildlife Refuge, and the Yukon Flats National Wildlife Refuge.

The Bureau of Land Management proposes to implement a five-year Integrated Invasive Plant Strategic Plan to manage non-native invasive plant (NIP) species within the DMA. Integrated invasive plant management is a comprehensive approach to weed management. It employs multiple methods of control and eradication (e.g., manual, mechanical, and chemical), and utilizes a cooperative, interagency approach to monitoring, early detection and rapid response, and public outreach and education. The purpose of this strategic plan is to provide a strategy for the control, monitoring, prevention, and management of NIP in the DMA in cooperation with state and federal agencies, private industry, and the public.

This strategy outlines the current status of NIP on BLM lands within the DMA, describes past control efforts, and recommends a combination of treatment strategies to suppress or eradicate existing and future invasive plant populations. It will serve as an initial step towards addressing outreach and partnership opportunities regarding control and management of invasive plants along the Dalton Highway. Since this is a strategic plan, this document does not make decisions regarding weed management and is not considered to constitute a decision related to the National Environmental Policy Act (NEPA). After developing partnerships and exploring strategies for invasive plant control and management, the Bureau of Land Management will analyze potential decisions and alternatives in compliance with NEPA. The goals of this plan include:

1. Present Integrated Invasive Plant Management strategies to control invasive plants according to their invasiveness risk, size of infestation, and their susceptibility to control.
2. Present a monitoring program based on Early Detection and Rapid Response (EDRR).
3. Work with partners to establish a Cooperative Weed Management Area in the DMA.
4. Increase public awareness of non-native invasive species, the environmental problems they cause, as well as building advocates for and encourage investment to manage NIP.

This strategic plan is based on the goals and strategies outlined in *Partners Against Weeds*, an action plan developed by the BLM in 1996 to prevent and control the spread of NIP on public lands. It is in compliance with the *Utility Corridor Resource Management Plan*, and the Bureau's 2007 *Programmatic Environmental Impact Statement (EIS) on Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States* (FES-07-21). The programmatic EIS on Vegetation Treatments Using Herbicides provides a broad, comprehensive source of information to which subsequent environmental analyses can be tiered and allows the use of 14 herbicides in Alaska after careful, case-by-case evaluation (listed in Table 1 on page 2-3 of the Record of Decision). All of the herbicides proposed for potential use in this strategic plan are approved in this EIS and by Alaska Department of Environmental Conservation (ADEC).

OVERVIEW

Existing Conditions

Twenty-eight non-native invasive plant species have been documented within the DMA. Of these plants:

- Eleven species are considered highly invasive, exist only in a few isolated places, and are potentially eradicable;
- Eight species are highly to moderately invasive, are relatively well established, and must be controlled to prevent movement into native ecosystems;
- Nine species, though relatively well established on the roadside, are not considered a threat to native ecosystems.

The nineteen species that are identified for eradication or control represent a wide variety of plant types (grasses or forbs), life cycles (annuals, biennials, and perennials), reproductive strategies (seeds and/or stolons), and life forms (prostrate or erect).

Serious negative economic and ecological impacts are predicted if these species are left to expand. For example, six of these species are nitrogen-fixing: sweetclover (*Melilotus officinalis*), alfalfa (*Medicago sativa*), alsike clover (*Trifolium hybridum*), birdsfoot trefoil (*Lotus corniculatus*), and bird vetch (*Vicia cracca*). Boreal forest and tundra communities are naturally nitrogen-poor ecosystems; additions of nitrogen could change ecosystem processes (e.g., by accelerating microbial decomposition, altering plant communities, and changing plant succession) in fundamental and unpredictable ways. Generally, nitrogen-fixing plants do not grow well on acidic soils. Soils along the Dalton Highway are basic, and as a result, nitrogen-fixing NIP species are spreading rapidly along the Dalton Highway. In fact, recent

greenhouse research has indicated that white sweetclover plants grown on native soils from the Dalton Highway are more vigorous when compared to those grown on soils collected along the Steese and Parks Highways. Furthermore, at least ten of the NIP species that have been found in the DMA are capable of out-competing native plants, several may increase erosion rates, and many could impact native fauna from bees to moose. (Villano and Mulder, 2008)

NIP have spread rapidly throughout disturbed areas in the Dalton Highway Management Area in past years and some have recently moved off the highway right-of-way into native, undisturbed habitats (Tim Craig, BLM Wildlife Biologist, pers. com.). In the past decade, roughly 2 million acres have burned in the Dalton Highway Corridor, and NIP have also been found in areas that were burned in these recent wildfires (Skip Theisen, BLM Fire Management Specialist, pers. com.). Research indicates that many of these burned areas are susceptible to invasion by NIP for up to 20 years after the fire (CNIPM, 2007).

Current Management

The introduction, spread, and reproduction of non-native invasive species must be prevented and/or controlled to protect native ecosystems. Efforts by the BLM and its partners to halt the spread of NIP within the Dalton Management Area have included manual and mechanical control of target species. Current partners include Friends of the Wildlife Refuges, U.S. Fish and Wildlife Service, and CNIPM (Committee for Noxious and Invasive Plant Management), as well as contacts in Alaska Department of Transportation and Public Facilities (ADOTPF) and Alyeska Pipeline Service Company (Alyeska). Management efforts within the DMA have been focused at river crossings to prevent the spread of NIP, particularly sweetclover, downstream to private lands, some of them owned by native corporations, and to public lands managed by BLM, National Park Service (NPS) and U.S Fish and Wildlife Service (FWS). BLM efforts have also been centered on halting the northward spread of target species, including sweetclover, oxeye daisy (*Leucanthemum vulgare*), yellow toadflax (*Linaria vulgaris*), bird vetch, and common tansy (*Tanacetum vulgare*). In addition, BLM inventoried NIP in the DMA in the summer of 2004. Inventory, control, and monitoring protocols adhere to recommendations of the North American Weed Management Association (NAWMA), but were adapted by BLM to the DMA. Data that were collected are stored electronically, and in hard copy, at the Fairbanks District Office, and will be incorporated into the BLM National Weed Database when the database becomes available. The data are also stored on the Alaska Exotic Plant Information Clearinghouse (AKEPIC) database, which is coordinated by the Alaska Natural Heritage Program (ANHP), University of Alaska Anchorage.

Unfortunately, the current control methods used in the past have not arrested infestations of NIP in the DMA. These infestations provide seed that move with vehicles, equipment, and through normal road maintenance. It now appears that it is not possible to effectively halt the spread of NIP within the DMA or to adjacent lands by manual and mechanical means with the limited human resources. The proposed strategic plan would include several key practices including:

- Methods of integrated invasive plant management (including manual, mechanical, and chemical measures)
- A inventory, mapping, monitoring, and reporting procedure
- An invasive plant infestation prevention program

- The creation of a Dalton Highway Cooperative Weed Management Area (CWMA)
- Public awareness
- The Best Management Practices (BMP) for land use actions (mitigation) conducted by or permitted by BLM

INTEGRATED INVASIVE PLANT MANAGEMENT

Integrated invasive plant management involve the use of several different control techniques prescribed for a target weed species in a planned, coordinated program to limit the impact and spread of the plant. These techniques usually include the following and are often used in combination to achieve desired results: manual, mechanical, chemical, prescribed fire, and biological practices. Due to the limited knowledge of the effects of prescribed fire and biological control methods in Alaska, these methods are not projected to be used, but are still an option for the future.

Manual methods incorporate the use of hand-operated tools to cut, clear, thin, or prune herbaceous and woody species as well as the use of mulch, weed barrier, cloth, and other materials to inhibit the growth of vegetation. This can include tools such as your hand, shovel, pruners, etc. **Mechanical** methods incorporate power tools such as chain saws and motorized brush cutters. The current program of weed management along the Dalton Highway combines these two methods, specifically hand-pulling and weed-cutting at river crossings and access points off the highway.

Manual methods are highly selective and have less impact on other resources. However, these techniques are so labor-intensive and expensive that at the landscape scale, such as in the DMA, the costs per acre are much higher than for alternative methods. Alternatively, mechanical methods are less labor-intensive than manual pulling and more cost-efficient, but are often less effective.

Chemicals kill plants by disrupting their physiology in a number of different ways. Some herbicides are highly selective, while others kill all of the vegetation on a site. Some herbicides only kill above-ground vegetation, while others kill underground root systems and reduce resprouting. Some are pre-emergent and inhibit germination. Many herbicides decompose shortly after use, while others remain temporarily active in the soil to reduce reinvasion of the target plants. All herbicides that are considered for use must be registered under Environmental Protection Agency (EPA) regulations. The herbicides proposed for use in this strategic plan are registered with EPA and approved for the use in Alaska (FES-07-21, page 2–3). They will be stored in compliance with Occupational Safety and Health Administration (OSHA) regulations (29 CFR). All actions and protective equipment requirements will be followed in compliance with manufacturer and product specific Material Safety Data Sheets (MSDS). Crew leader will hold a valid Alaska Pesticide Use License with the proper permission granted for pesticide use.

There are generally four different methods for applying herbicides: two mechanical (aerial or land-based via boom sprayer) and two human-powered (backpack equipment and hand application). This strategy focuses efforts on using manual control methods in conjunction with hand applications and backpack sprayers in order to target individual, unwanted plants or patches and reduce effects on non-

target organisms and other elements of the environment. These techniques will be more cost-effective than manual techniques currently used since labor costs will be greatly reduced.

Prescribed fire and management of wild fires can be used to reduce hazardous fuels, prepare sites for seeding/planting, rejuvenate forage for wildlife, maintain fire-dependent landscapes, control insects and diseases, and maintain habitat for threatened and endangered species. However, fire, both controlled and wild, disturbs the soil. These disturbances sometimes lead to increased opportunities for NIP introduction (National Invasive Species Information Center, 2008). Fire may also encourage *in situ*, non-native invasive plants to increase depending on the heat tolerance, vigor, sprouting ability, and seed sensitivity of individual plant species and the duration and intensity of the fire (Forest Pest Management, 1990). Adjacent fire-prone habitats also diminish the viability of fire as a weed control tool. There is very little information on the usage of prescribed fire to control NIP species in Alaska. Therefore, BLM does not anticipate use of this method, although it may be a tool in the future.

Biological methods of controlling vegetation include the use of insects and pathogens. Often it takes three to five different insects to control one plant species (Forest Pest Management, 1990). These introduced species usually have no natural enemies; therefore, they have the potential to become invasive themselves and attack non-targeted species. Again, due to the lack of research, this method also is not anticipated to be used, but still may be a tool in the future.

Proposed Management Strategies

The NIP that have been found in the DMA were evaluated using a decision tree and ordered to determine the best control methods for each species (Appendix II). This decision tree selects the level of response based on the plant's potential for eradication, its risk of invasiveness (high, medium or low), and the type of ground infested (altered or unaltered). A synopsis of these results with suggested goals and practices based on efficacy, critical habitat, available funding, special management areas and input from other agencies are contained in Appendix III. Recommended management strategies for each species are outlined in Appendix IV. Finally, Appendix V reviews the Standard Operating Procedures (SOPs) for applying herbicides removed directly from FES-07-21 and Appendix VI contains maps locating the various species of concern within the DMA.

Inventory, Monitoring, Mapping, and Evaluation

Weed surveys identify the species present, their locations, and the severity of the infestation. Inventories in the DMA will be conducted annually. We will process observations using GPS (Global Positioning System) technology and establish photo points to visually depict changes in infestations. We will use standardized data sheets developed by BLM (Appendix I) to record data. A "Special Status Species" survey will also be conducted before any treatment is considered.

The sheet provided by AKEPIC can also be used for monitoring infestations throughout the entire growing season and from year to year. At the end of the season, the data sheets will be analyzed to

evaluate the effectiveness of the selected control efforts and help determine if modifications are needed for particular species or locations.

The following would be concluded after each growing season:

- Evaluate each infestation to determine if the control method accomplished the goals established in Appendix III for each particular species using photo point referencing.
    - Evaluate effectiveness, costs/benefits versus cost/benefit of other alternatives, and projected costs of no action.
- Evaluate and correct actions in regard to the following:
    - Were the target populations adequately suppressed?
        - Should treatment be repeated, modified?
        - Should an alternative treatment be considered?
    - Was the cost of suppression equal to, or less than, the cost of no action?
    - What was the effect on non-target organisms?
    - Was there an improvement of wildlife habitat?
    - Were the side effects included in the cost-benefit analysis?
    - Was funding and manpower available at the appropriate time?
    - Was training adequate?
    - Were there changes in the weed regime due to external factors?
    - Lessons learned?

Reporting

All treatments will follow BLM Standard Operating Procedures, and a report will be made of every treatment following BLM protocols outlined in BLM's programmatic EIS. The first year's work will be used as a baseline comparison of the success of subsequent treatments. The results of consequent evaluations will be used to guide future decisions on priorities and control methods and adjust rankings of NIP and control methods yearly.

A Weed Management Area Status Report will be completed by the CWMA Board (or as established in CWMA Memorandum of Understanding) annually to track progress. It may include:

- Charting the progress made in the Weed Management Area in achieving established objectives as well as accomplishments made by partners.
- Record of funding expended in the current year and a projected budget for out years.
- Account of the total number of acres per NIP species placed under management within the CWMA. The treatment techniques would differ by site and species.
- Measure of the acres treated or retreated by the technique outlined in the CWMA Management Plan.

MONITORING - PREVENTION, EARLY DETECTION AND RAPID RESPONSE

Annual damage from invasive species worldwide was estimated at $1.4 trillion according to CNIPM in 2007. One weed – spotted knapweed – now costs Montana over $14 million per year and covers over 5 million acres. In Alaska, this species has been found on over 10 sites from Ketchikan to Anchorage.

A strong prevention program is necessary to hinder the further spread and cost of invasive species along the Dalton Highway Corridor. EDRR allows resource managers to find and control invasive weeds before they become wide-spread and negatively affect natural ecosystems— because it is easier and more economical to control younger and smaller populations. Prevention is best accomplished by ensuring that weed seed and/or vegetative plant parts are not introduced into an area. Common methods of weed introductions include: contaminated seed, feed grain, straw, or mulch for reclamation projects; movement of unclean personal vehicles or mining equipment/machinery from weed-contaminated areas; animals (domestic and wildlife) that may have viable weed seed present in their digestive tract or attached to their hair or wool; wind or waterways dispersing seed; hunters, hikers, fishers, or pilots moving NIP parts with viable seed; gardeners planting NIP as ornamentals; landowners scattering contaminated wild bird seed or allowing NIP to produce seed along waterways and roadways; and Alaska Department of Transportation and Public Facilities / Alyeska Pipeline Service Company equipment and maintenance practices using gravel, road fill, or topsoil contaminated with noxious weed seed or vegetative reproductive plant parts.

Without the influx of funds, this strategy will rely on educational outreach and relationship building. Through initial consult with BLM cooperators, this strategy proposes the following as preventative measures that may be addressed with available funding and effectiveness:

- Develop EDRR programs and brochures for the public on new NIP, including easy-to-use EDRR reporting forms at various locations frequently visited. Forms and guides will be made available to local rural communities along the Yukon and Koyukuk Rivers, tourists, truck drivers and included with permits for land authorizations to prevent infestations from going unnoticed.
- Continue monitoring to determine if there are new invading NIP or if existing infestations are expanding. Initiate an immediate, strong eradication program if new invaders are confirmed.
- Ensure that seed, feed grains, straw, or mulch used in the CWMA is free of weed reproductive plant parts.
- Declare the area north of Coldfoot a weed-free zone to prevent northward spread, and monitor the area regularly to detect early and eradicate any outbreaks of NIP.
- Create weed-free zones within 500 feet of bridges and river crossings and monitor these areas regularly for early detection of NIP species and eradicate, as necessary, any outbreaks of NIP.
- Target non-permitted activities through public outreach by utilizing education on Best Management Practices (BMPs).
- Provide information on weed-free materials to permitted and non-permitted land use activities.
- Require permitted land use activities to incorporate weed prevention project proposals including:

- Develop Best Management Practices for road construction material sites, sand and gravel pits, mulch, and other material source sites.
    - use certified weed-free materials
- Require as a stipulation in all permits that operators clean all equipment before entering and leaving project sites when operating in areas infested with weeds, and that equipment brought from outside the area should be cleaned before it leaves the point of origin. Designate an area where equipment would be cleaned and frequently monitor the site for new NIP. Discarded seeds and plant parts be collected and incinerated. Require project proponents to communicate with BLM and local weed specialist to develop BMPs and cooperative strategies as necessary.
- To avoid weed invasion, build and maintain self-sustaining, healthy plant communities wherever possible, including along utility rights-of-way, roadsides, highway landscaping projects, rest areas, and scenic overlooks. Any seeding or planting will be with weed-free certified seed and nursery stock.
- Train/educate maintenance staff and truck operators to recognize weeds and report locations of infestations to the local weed specialist.
- Coordinate blading and/or pulling of noxious weed-infested roadsides or ditches in consultation with the local weed specialist. As a minimum, blade from least infested to most infested areas. Along the Dalton Highway, preventing NIP movement northward is vital; therefore, grading from north to south may be preferable. Also, time disturbing activities to precede seed set and ensure weed propagules are not moved to uncontaminated sites.
    - i.e., grade roads in the spring instead of later in the growing season; thus preventing spread of weed seed and the creation of a seed bed for weeds.
- Avoid acquiring water for road dust abatement where transit is through weed-infested sites.
- Conserve original weed-free topsoil where applicable.
- Treat weeds in road decommissioning and reclamation projects before roads are made impassable. Sites with moderate to high weed density should be treated for several seasons prior to decommissioning. Regardless of weed density, revegetate with certified weed-free seed to speed recovery and mitigates soil erosion. Reinspect and document response.
- BLM actions on the landscape will adhere to the same standards.

- Weed management for burned areas
    - Restore fire lines using the same material that was removed during construction.
    - Require fire suppression personnel to develop proper cleaning techniques for their equipment before and after fire.
    - Ensure rehabilitation as part of the suppression effort.
    - Start rehabilitation immediately after the fire or as soon as possible.

WEED MANAGEMENT AREAS

The goal of a Cooperative Weed Management Area (CWMA) is a partnership with other agencies, organizations, and interests to prevent the reproduction and spread of weeds into and within the CWMA. These areas create a new (often natural) management boundary that replaces jurisdictional boundaries that weeds do not recognize. Cooperators jointly prioritize weed management efforts based on species or geographic area and work together to manage infestations. Cooperators may include those who hold easements, rights-of-way, special use permits, private property, as well as state and federal land managers adjacent to the BLM-managed lands along the Dalton Highway. Construction of such a partnership is vital to preventing the spread as well as the management of NIP species.

Potential Partners / Interested Parties: Alaska Association of Conservation Districts, Alaska Department of Transportation and Public Facilities , Alyeska Pipeline Service Company, Alaska Department of Natural Resources, Divisions of Land, Forestry and Agriculture, Alaska Department of Fish and Game, University of Alaska Fairbanks Cooperative Extension Services, Master Gardener's Program, tour companies, Gates of the Arctic National Park and Preserve, Kanuti National Wildlife Refuge, Arctic National Wildlife Refuge, Commercial Visitor Services (including Yukon River Camp, Hot Spot, Coldfoot Camp), and several rural communities (Wiseman, Bettles, Evansville, Alatna, Allakaket, Hughes, Stevens Village, Rampart, and Tanana).

PUBLIC AWARENESS AND OUTREACH

Increased awareness of non-native invasive species and the problems associated with their establishment will help the general public understand the importance of a long-term weed management program.

The following public awareness and outreach activities may be undertaken as funding becomes available:

- Develop displays and outreach programs for the general public outlining problems caused by NIP. Stress information on :
    - Damage to wildlife habitat, crop, and forage production;
    - Health problems associated with weeds, including skin irritations and allergies; and,
    - Impacts on scenic and recreational values.
- Educate BLM staff on weed identification and reporting.
- Educate land use permit holders on weed identification and reporting.
- Designate BLM Fairbanks District Office personnel to coordinate all NIP control activities, compile data, and represent the agency.
- Continue to open lines of communication entities to reduce the spread of NIP:
    - ADOTPF and Alyeska
        - Encourage development of BMPs for maintenance (road and vehicle) activities

- Commercial Visitor Services
  - Encourage control of NIP on their property.
- Rural Communities-
  - Educate and encourage land owners to control NIP on their property.
  - Set up an Early Detection and Rapid Response (EDRR) Program.
- Arctic Interagency Visitor Center
  - Develop informative displays and brochures.
- UAF Cooperative Extension Service-
  - Provide information on the status of NIP along the Dalton Highway.
- Tour Companies
  - Provide educational materials in order to limit their spread of NIP along the highway due to their activities.
  - Communicate current efforts taking place in order to incorporate information into tour.
- Alaska Department of Fish and Game-
  - Provide information to educate hunters and anglers on the threat of NIP and the benefits of EDRR to the environment.
- Local Correctional Facility, Environmental Organizations-
  - Develop community service hours to include weed control projects.

LITERATURE CONSULTED

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APPENDIX I

NON-NATIVE PLANT SURVEY AND INVENTORY REPORT

Alaska Bureau of Land Management

Survey Date: _____/_____/_____ **Observer 1:** _____ Affiliation**: BLM**

YYYY /MM / DD **Observer 2:**_____ Affiliation**: BLM**

A. SITE INFORMATION

Site Code (YYYY-INT-####): _____**Visit Type** (circle one): Inventory Monitor Control Research

Area Surveyed (Acres):_____(0.1 Ac =37 ft radius, 0.5 Ac=83 ft, 1 Ac=118ft radius or 208 ft x 208 ft)

Project Name: _____Veg Community Description:_____

Disturbance Type:_____ Estimated Age of Disturbance (years):_____

B. LOCATION INFORMATION

Latitude:_____ **Longitude:**_____

Collection Method: GPS or Map **Precision** (circle one)**:** 0-5 0-30 0-100 0-1000 1000+ feet

Map Source: _____Map scale: 1:_____Map Date:_____

Road Name:_____Milepost: _____

Location Notes:_____

_____

C. INVENTORY INFORMATION

Plant Name: _____**Species Code:**_____ **Est Infested Ac:**_____

Cover and Stems Per: total area sq meter acre other:_____ Infestation Canopy Cover:_____ %

Infestation Cover Class (circle one): Trace (< 1%) Low (1-5%) Moderate (6-25%) High (>25%)

Est. Stem Count (circle one): 1-5 6-25 26-50 51-150 151-500 500-1000 1000-10000 10000+ Actual Stems_____ Aggressiveness (circle one): None Low Medium High

Phenology: seedling rosette bolting bud flowering seed set seeding senescent woody

Notes about non-native species:_____

D. COLLECTION INFORMATION

Voucher Collection: Yes No Location: BLM ALA TNES WTU Other:_____

Photo Taken: Yes No Photo location: BLM ALA TNES WTU Other:_____

Monitoring Photo Point Established? Yes No *Record azimuth and distance from point to marker*

Marker # 1	**Azimuth**	**Distance (ft)**	Notes:
Marker # 2			
Marker # 3			
Marker # 4			

Collection Notes:_____

E. TREATMENT INFORMATION (NON-CHEMICAL) **Complete only if weed control treatment is conducted**

Control Action: None Manual: pull/dig/cut **Mechanical:** pull/mow/dig/cut **Biological:** graze

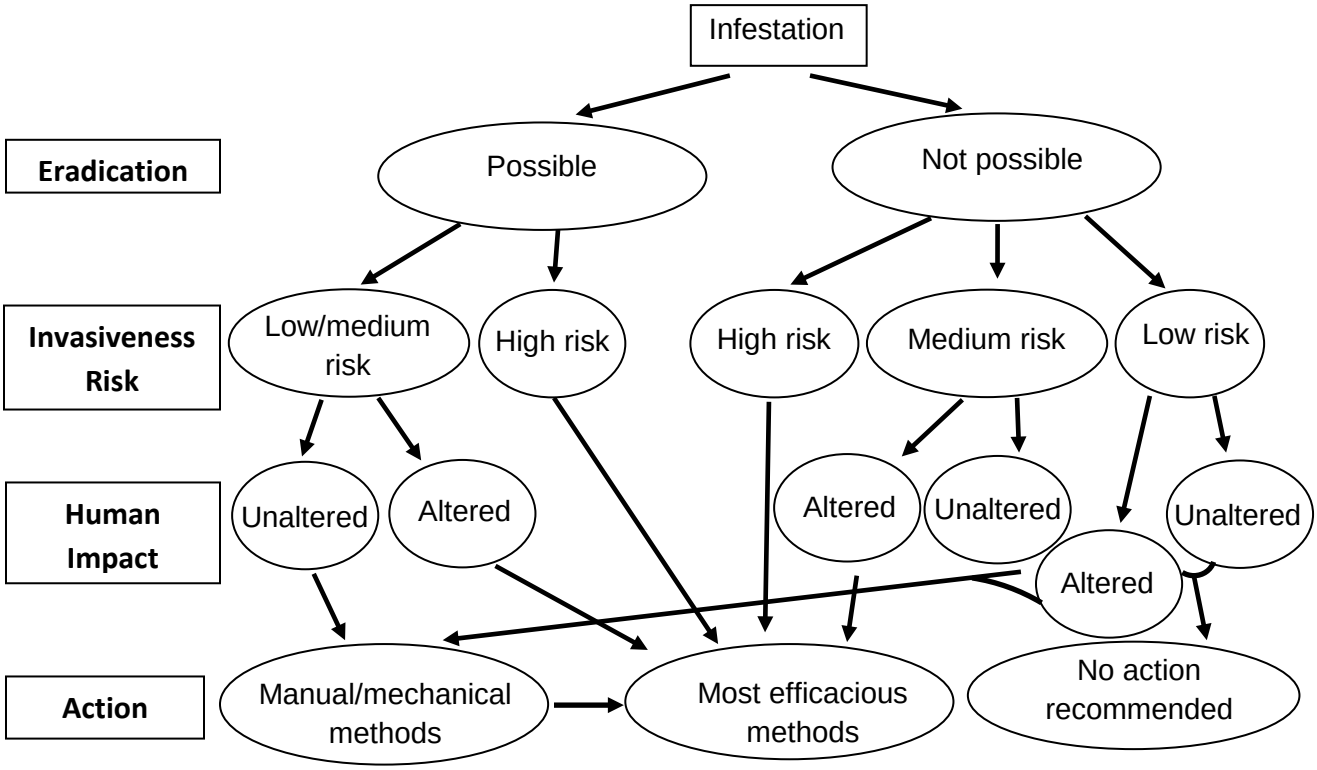
Date: (if different from above): __/__/_____ **Acres controlled:**_____

Hours spent: _____ Recommended Retreatment:(Month/Year): _____

Treatment Notes:_____

APPENDIX II

Integrated Vegetation Management Decision tree for non-indigenous plant species found in the Yukon and Interior AK BLM regions



Invasiveness risk is associated with the potential of the plant species to expand in the ecosystem and comes from research conducted by the Alaska Natural Heritage Program.

Altered ground is land that has been changed from the natural state due to human activities. Examples of altered ground include campgrounds, roadsides, pipelines, hiking trails, quarries, and lawns, but do not include fire.

Methods for control are grouped into categories based on the aggressiveness of the action. Most efficacious methods includes all methods (manual, mechanical, chemical). If manual/mechanical methods fail to achieve the desired goal, the next step would be to employ the most efficacious method including chemical.

Based on the results of the decision tree, a management goal has been determined for each species (eradication, control, or monitor) and for each NIP, optimum control methods have been selected appropriate to the management goal.

Examples of the Decision Tree Ranking for Selected Invasive Plants

Ecological Impact Score 0 to 40 with 0 = no impact

Feasibility of Control Score 0 to 10 with 0 = easy to control

Invasiveness rank <50 low, 50 to 59 medium, and >60 high invasiveness

SPECIES	IMPACT	CONTROL	ERADICATION	INVASIVENESS RANK	CONTROL METHODS (ALTERED GROUND)	CONTROL METHODS (UNALTERED GROUND)
Linaria vulgaris	22	9	possible	69	manual chemical	manual
Tanacetum vulgare	20	8	possible	56	manual chemical	manual
Leucanthemum vulgare	20	8	possible	61	manual chemical	manual chemical
Vicia cracca	27	9	possible	73	manual chemical	manual chemical
Melilotus officinalis*	29	9	not possible	80	manual chemical	manual chemical
*Crepis tectorum**	9	3	not possible	47	chemical	no action
Hordeum jubatum	18	9	not possible	63	manual chemical	no action
Taraxacum officinale	18	8	not possible	58	no action	no action

The above table illustrates how the decision tree was used for a few selected NIP species. Those species with an asterisk are species that some local experts hypothesize that are less invasive in the DMA environment. Ecological Impact infers the level of negative impact caused by the NIP.

APPENDIX III

Plant species found of concern within the Dalton Management Area

Common name	Scientific name	Sites	Area (Acres)	Goal	Primary Action
Yellow toadflax	*Linaria vulgaris*	2	<1	Eradicate	Hand weed
Common tansy	*Tanacetum vulgare*	2	<1	Eradicate	Hand weed/spray
Ox-eye daisy	*Leucanthemum vulgare*	5	2	Eradicate	Hand weed/spray
Birdsfoot trefoil	*Lotus corniculatus*	4	<1	Eradicate	Hand weed
Iceland poppy	*Papaver nudicaule*	1	<1	Eradicate	Hand weed
Purple sand spurry	*Spergularis rubra*	1	<1	Eradicate	Hand weed
Spreading bluegrass	*Poa pratensis* var. *irrigate*	2	0.1	Eradicate	Hand weed
Common pepperweed	*Lepidium densiflorum*	11	<1	Eradicate	Hand weed
Delphinium	*Delphinum sonnei*	2	2	Eradicate	Hand weed
Meadow foxtail	*Alopecurus pratensis*	5	<1	Eradicate	Hand weed
Bird vetch	*Vicia cracca*	28	7	Eradicate	Cut 5 yr - spray
Reed canary grass	*Phalaris arundinacea*	3	2	Control	Cut/hand weed
Smooth brome	*Bromun inermus*	7	1	Control	Cut/hand weed
Narrowleaf hawkweed	*Hieracium umbellatum*	13	12	Control	Spray
White/yellow sweetclover	*Melilotus spp.*	142	41	Control	Spray/Hand weed
Alfalfa	*Medicago sativa* ssp. *sativa*	8	1	Control	Hand weed
Alsike clover	*Trifolium hybridum*	10	10	Control	Hand weed
Narrowleaf hawksbeard	*Crepis tectorum*	27	6	Control	Possible spray
Foxtail barley	*Hordeum jubatum*	80	72	Control	Hand weed/spray
Shepherd's purse	*Capsella bursa-pastoris*	5	2	Monitor	No action
Lamb's quarters	*Chenopodium album*	7	2	Monitor	No action
Wormseed mustard	*Erysimum sheiratnthoi*	1	2	Monitor	No action
Bluegrass	*Poa pratensis* var.*pratensis*	3	4	Monitor	No action
Prostrate knotweed	*Polygonum aviculare*	32	6	Monitor	No action
Dandelion	*Taraxacum officinale*	40	11	Monitor	No action
Pineapple weed	*Matricaria matricariodes*	34	9	Monitor	No action
Common plantain	*Plantago major*	35	11	Monitor	No action
Perennial sowthistle	*Sonchus arvensis*	0	0	Monitor	Look for
European stickweed	*Lappula squarrosa*	0	0	Monitor	Look for
Silverweed	*Potentilla anserine*	0	0	Monitor	Look for
Slender wheatgrass	*Agropyron spp*	0	0	Monitor	Look for
Tansy mustard	*Descurania sophia*	0	0	Monitor	Look for

APPENDIX IV
Recommended Strategies per Species

The following strategies were recommended by a Research Agronomist, Steve Seedfeldt, in cooperation with the United States Department of Agriculture (USDA) Agricultural Research Service (ARS).

***Linaria vulgaris* – yellow toadflax**

Status – This plant species has been found in two locations (Map 1).

Goal – Due to the small size of the infestation and its potential to spread (through seeds and rhizomes), alter pollination ecology, displace native perennial species, and form dense clumps, this species should be eradicated.

Preferred management actions – Sites should be visited once a month starting one month after snow melts. All plant stems should be counted and carefully dug up to collect as much of the rhizomes as possible. Documenting the number of stems can help evaluate the success of the control prior to the next season. The area within at least a 150 foot radius of the infestation and any disturbed areas within a half mile should be scouted for new plants. Other plant species at the site should be encouraged to grow through fertilization and perennial native grasses should be seeded into the treated area in order to suppress growth of *Linaria vulgaris*.

Alternative management action – After counting stems, plants should be sprayed before flower initiation with glyphosate. This herbicide would kill most of the vegetation that it is sprayed on. As the herbicide has no residual activity, surviving *Linaria vulgaris* rhizomes would re-sprout and rains would encourage growth of seedlings from the seed bank in the soil. Therefore, the areas would have to be revisited and possibly sprayed multiple times each year until eradication is achieved.

***Tanacetum vulgare* – common tansy**

Status – This plant species has been found in small quantities at several locations associated with parked fire-fighting equipment (Map 1).

Goal – Due to the small size of the infestation, it's potential to spread (seeds and rhizomes), has an unpalatable to poisonous forage quality with the ability to alter riparian ecology and displace native perennial species, this species should be eradicated.

Preferred management actions – Sites should be visited in midsummer after plants have bolted. All plant stems should be counted and carefully dug up to collect as much of the rhizomes as possible. Care should be taken to wear gloves at all times to reduce the possibility of irritation due to plant toxins. The area within at least a 300 foot radius and any disturbed areas within a half mile should be scouted for new plants. After counting stems, spot spray plants at the bud to bloom stage with a 1 oz/acre rate

of metsulfuron methyl (i.e. Escort). In our ecosystem, this herbicide should kill these adult plants and any seedlings the following year. This herbicide would kill many native species at very low doses as well, so care should be taken to prevent drift. Do not apply these herbicides to riparian areas or to natural or manmade bodies of water. Visit the site each year when plants would be in the bud to bloom stage and repeat herbicide application or hand weed after counting the plant stems.

***Leucanthemum vulgare* – oxeye daisy**

Status – This plant species has been found in and around Coldfoot on both altered and unaltered land (Map 2).

Goal – Due to the small size of the infestation and its ability to spread through wind dispersed seeds, displace native perennial species, and out compete many native plants, this species should be eradicated.

Preferred management actions on altered sites – Sites should be visited once a month starting one month after snow melts. All plants should be counted and carefully dug up to collect as much of the roots as possible. The area within at least a 600 foot radius of the infestation and any disturbed areas within one mile should be scouted for new plants. After counting stems, spot spray plants with any of the following herbicides while following label directions: clopyralid (Transline); imazapyr (Arsenal); metsulfuron methyl (Escort); or triclopyr (Redeem). All of these herbicides are toxic to many native forbs and shrubs. In our ecosystem, metsulfuron methyl and imazapyr should kill these adult plants and any seedlings the following year. With all four herbicides, care should be taken to prevent drift. Do not apply this herbicide to riparian areas or to natural or manmade bodies of water. Visit the site each year when plants are bolting and repeat herbicide application or hand weed after counting the plant stems.

Preferred management actions on unaltered sites – Sites should be visited once a month starting one month after snow melts. All plants should be counted and carefully dug up to collect as much of the roots as possible. The area within at least a 600 foot radius and any disturbed areas within a mile of the infestation should be scouted for new plants. Other plant species at the site should be encouraged to grow (through fertilization) and perennial native grasses seeded into the treated area in order to suppress growth of *Leucanthemum vulgare*.

***Lotus corniculatus* – birdsfoot trefoil**

***Papaver nudicanle* – Iceland poppy**

***Spergularia rubra* – purple sand spurry**

***Poa pratensis var. irrigate* – spreading bluegrass**

***Lepidium densiflorum* – common pepperweed**

***Delphinium sonnei* – delphinium**

***Alopecurus pratensis* – meadow foxtail**

Status – These plant species have been found in only a few locations (Map 3) and only in small patches on altered land. Many were hand weeded when discovered.

Goal – Due to the size of the infestations, ease with which they can be controlled, and potential to displace native plants, these species should be eradicated.

Preferred management actions – These species should be visited early in the growing season. After counting the plants, they should be hand weeded with care taken to remove as much of the roots as possible. The sites should be revisited once a month. The area within at least a 150 foot radius of the infestation and any disturbed areas within a half mile should be scouted for new plants. Infested areas should be seeded with native grasses and fertilized.

***Vicia cracca* – bird vetch**

Status – This plant species has been found in multiple locations (Map 4) on both altered and unaltered land.

Goal – Due to the size of the infestations and this species potential to spread (through seeds and rhizomes), cover short native vegetation (< 3 feet tall), fix nitrogen (altering natural nutrient status), and form dense mats, this species should be eradicated.

Preferred management actions on altered and unaltered land – The seed bank life of *Vicia cracca* is 5 years, which has positive implications for eradication. Sites should be visited before flower initiation, which can occur from early to late July. After estimating density and size of infestation, all plants should be mown or pulled and sprayed. The site should be revisited every six weeks and the treatment repeated, after infestation measures are recorded, until winter. The area within at least a 150 foot radius and any disturbed areas within a half mile should be scouted for new plants. After five years of treatment, when the seed bank should be free of *Vicia cracca* seeds, the plants should be sprayed while they are actively growing and before flowering with 1 pint/acre of clopyralid (Transline) with an approved adjuvant (0.25% v/v) to kill the adult plants.

***Phalaris arundinacea* – reed canary grass**

***Bromis inermus ssp inermis* – smooth brome**

Status – These plants species have been found on several sites in patches that are up to an acre in size (Map 5).

Goal – Due to the size of the infestation and the impact of many treatments on native vegetation, these plants cannot be eradicated. Due to the competitive ability of these plants and their ability to spread and displace native species, they should be contained, the population densities reduced, and the infestations monitored.

Preferred management actions – These perennial grass species should not be allowed to produce seed. When the plants reach the flag leaf to boot stage (floral part can be felt in the top of the elongating stem), the plants should be mown, cut, or hand weeded to remove as much vegetation as possible. The site should be revisited monthly.

***Hieracium umbellatum* – Narrowleaf hawkweed**

Status – This plant species has been found on multiple sites along the Dalton Highway, infesting up to 12 acres (Map 6).

Goal – Due to the rapid and long distance seed dispersal characteristics, competitive ability against many native species, and ease of chemical control, this plant species should be contained, the population densities reduced, and the infestations monitored.

Preferred management action – Like dandelion, this is a rosette forming plant that is difficult to hand weed. These plants have already been found 100 feet off the highway. After counting plants or estimating area and density, control of patches can be achieved with the use of chlorsulfuron (Telar) at 2 oz per acre with a 0.25% of a non-ionic surfactant. A backpack sprayer should be used to spray the entire infested area and the area within 50 feet of the patch. Spraying should take place early in the summer (late June) when rosettes are rapidly growing, but before plants begin to flower. The sites should be revisited each year. The herbicide should control seedlings for several years. The area within at least a 150 foot radius and any disturbed areas within a half mile should be scouted for new plants.

***Melilotus officinalis* – yellow and white sweetclover**

Status – This plant species has been found in numerous locations within the DMA and mostly on altered land (Map 7).

Goal – Due to the size of the infestations and the longevity of the seed bank (80 years in the contiguous 48 states), this plant cannot be eradicated. Because of the potential for these plant species to spread (seeds), fix nitrogen (altering natural nutrient status), form dense stands, and invade and dominate alluvium along glacial streams and rivers, they should be contained, the population densities reduced, and the infestations monitored.

Preferred management action on altered sites – Sites should be visited for control treatments well before flower initiation, which can occur in mid-June. Plant densities and patch sizes must be

estimated before treatment. Infested areas are numerous and sometimes widespread, they generally follow the Dalton Highway.

Although eradication is not an option, certain locations are critical for control and should be given priority with localized eradication as a long-term goal. Critical areas include roadsides within 500 feet of bridges and small isolated patches well away from larger infestations. Jeff Conn, Alaska Research Agronomist with the USDA Research Service in Fairbanks, estimates downstream movement of 20 miles per year, so it is important to eradicate this invasive weed in proximity to rivers and streams in order to prevent downstream movement. These critical areas should be visited regularly and any observed plants pulled after recording the extent of the infestation.

Non-critical areas should be treated with herbicide to reduce or eliminate seed production on a regular basis with a goal towards reducing the overall seed bank.

Cut plants rapidly flower and set seed, so physical control is limited to hand pulling. Hand pulling would disturb the soil and typically results in another flush of these plants, so once pulling is initiated, the site should be revisited every other week. Several herbicides are quite effective, providing almost complete control of growing plants. In wet land areas, spot spraying of imazapyr (Habitat) and glyphosate (Roundup/Rodeo) are quite effective. On rights-of-way, chlorsulfuron (Telar), imazapyr (Arsenal), 2,4-D, dicamba (Banvel), metsulfuron-methyl (Escort), and sulfometuron-methyl (Oust) are all effective. In Alaska, these plants are very sensitive to Telar (2 oz per acre with 0.25% non-ionic surfactant) and would provide control of seedlings for several years as it is actively taken up by the roots, as do several of the above mentioned herbicides (Habitat, Arsenal, and Oust). If herbicides are used, the area within 50 feet of the patch along the right-of-way should be treated as well to prevent any seedling success of dispersed seeds.

Grading of the roadway after the plants set seed would spread seeds up and down the highway and should be prevented. Working with DOT to grade in the spring or early summer before seed set is an excellent method for killing seedlings and second year plants.

Preferred management action on unaltered sites – This plant species is almost entirely found on altered sites. However, after recent fires, there is evidence that it is beginning to spread to land disturbed by natural processes (Villano and Mulder, 2008). It took several decades for these two species to adapt to Alaskan roadside conditions after their first introductions. It may very well be that these plants are now adapting to undisturbed Alaskan soils, particularly those soils along the Dalton Highway, which have a higher soil pH. Legumes such as *Melilotus*, do not grow well on acidic soils as it reduces nitrogen fixation. Therefore, these unaltered sites are critical for weed control. On unaltered sites, these plants should be counted and pulled and the infested area sprayed with a soil active herbicide, such as chlorsulfuron (Telar) to kill any seedlings. These sites should be revisited every year before plants go to seed and retreated if seedlings are found. An area 20 feet around the infestation should also be sprayed to control isolated individuals or any newly germinating seeds.

***Medicago sativa spp. sativa* – alfalfa**

***Trifolium hybridum* – alsike clover**

Status – These plant species have been found in several areas along of the Dalton Highway, infesting up to 10 acres (Map 8).

Goal – Due to their nitrogen fixing capabilities, these clovers can alter ecosystem processes due to their long lived seed (over 20 years) and their ability to grow in shade. These plants should be contained, their population densities reduced, and the infestations monitored.

Preferred management actions – Small patches and outlying infestations from larger patches should be hand weeded to keep the plant from spreading to newly disturbed areas. It is doubtful that these plants would grow well on unaltered lands. There are herbicides that would kill these plants, but the size of these infestations combined with the off-target impacts of using herbicides, make this plant species problematic for real control. Seeding of native grasses would provide adequate competition to reduce the density of these species. Infested sites should be visited annually. The area within at least a 75 foot radius of the infestation and any disturbed areas within 600 feet of the infestation should be scouted for new plants.

***Crepis tectorum* – narrowleaf hawksbeard**

Status – This plant species has been found along the Dalton Highway and Alyeska pipeline at numerous locations (Map 9).

Goal – Due to the potential of this species to spread (wind-blown seeds), its rapid indeterminate growth, its lack of competitiveness, and its small size, this plant species should be monitored and only controlled on altered ground near natural disturbances such as wildfire.

Preferred management actions – Infestations along the roadside or pipeline within one half mile of a fire should be treated to prevent seed production that could potentially spread to the burned area. The infestations should be treated as soon as possible after the fire. Hand weeding is usually not an option as seedlings are hard to find and do not pull up easily. In some substrates, however, pulling can be effective. After estimating densities and patch size the area plus a 50 foot buffer around the area on altered ground should be treated with metsulfuron-methyl (Ally) at 1 oz per acre. This herbicide would kill most of the broadleaf vegetation on which it is sprayed, but grasses would not be harmed. The sites should be revisited annually. The area within at least a 600 foot radius and any disturbed areas within a half mile should be scouted for new plants.

***Hordeum jubatum* – foxtail barley**

Status – This plant species is widespread along the Dalton Highway and has been recorded within the pipeline corridor and in previously burned areas (Map 10).

Goal – Because the plant is native to North America, has a potential to spread (wind-blown and animal carried seeds), lacks competitiveness, and is of small size this plant species should be monitored and controlled only on altered ground such as camping areas where pets can be harmed by the awns of the mature seed.

Preferred management actions – Infestations in altered areas where pets frequent should be controlled before setting seed. All plants should be counted or density and size of infestation estimated before treatments. With small infestations, hand weeding is quite effective, with care taken to remove the entire root crown. For larger infestations, spot spraying plants with glyphosate (Roundup) at 0.3 lb per acre with a 0.5% non-ionic surfactant when they are actively growing in the spring or summer would control up to 100% of the plants. The treated sites should be revisited annually. The area within at least a 150 foot radius and any disturbed areas within a half mile should be scouted for new plants.

***Capsella bursa-pastoris* – shepherd's purse**

***Chenopodium album* – lamb's quarters**

***Erysimum cheiranthoi* – wormseed mustard**

***Poa pratensis* – blue grass**

***Polygonum aviculare* – prostrate knotweed**

***Taraxacum officinale* – dandelion**

***Matricaria matricariodes* – pineapple weed**

***Plantago major* – common plantain**

***Achillea spp.* – common yarrow**

Status – These plant species has been found along the Dalton Highway at numerous locations or occupying 2 or more acres (Map 11-13).

Goal – Due to their lack of competitiveness, small size, palatability, and/or ubiquity these plant species should only be monitored.

Preferred management actions – Although some of these plants can be easily hand weeded and many can be killed with glyphosate (Roundup) or other herbicide, no action is recommended. These plants species do not have a history of surviving off of recently disturbed ground. If they do (i.e. dandelion), they do not pose a danger to ecosystem processes. Many of these plant species are problems in agricultural land where the ground is disturbed on an annual basis. Costs to control these species would be prohibitive. Control methods would possibly do more harm to the environment than the plant itself. There is no reasonable expectation that these plants could be managed on disturbed ground.

APPENDIX V

Standard Operating Procedure for Applying Herbicides

BLM Handbook H-9011-1 (*Chemical Pest Control*); and manuals 1112 (*Safety*), 9011 (*Chemical Pest Control*), 9012 (*Expenditure of Rangeland Insect Pest Control Funds*), 9015 (*Integrated Weed Management)*, and 9220 (*Integrated Pest Management*)

- Prepare spill contingency plan in advance of treatment.
- Conduct a pretreatment survey before applying herbicides.
- Select herbicide that is least damaging to environment while providing the desired results.
- Select herbicide products carefully to minimize additional impacts from degradate adjuvants, inert ingredients, and tank mixtures.
- Apply the least amount of herbicide needed to achieve the desired result.
- Follow product label for use and storage.
- Have licensed applicators apply herbicides.
- Use only USEPA-approved herbicides and follow product label directions and "advisory" statements.
- Review, understand, and conform to the "Environmental Hazards" section on the herbicide label. This section warns of known pesticide risks to the environment and provides practical ways to avoid harm to organisms or to the environment.
- Consider surrounding land use before assigning aerial spraying as a treatment method and avoid aerial spraying near agricultural or densely populated areas.
- Minimize the size of application areas, when feasible.
- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents/landowners.
- Post treated areas and specify reentry or rest times, if appropriate.
- Notify adjacent landowners prior to treatment.
- Keep copy of Material Safety Data Sheets (MSDSs) at work sites. MSDSs available for review at http://www.cdms.net/.
- Keep records of each application, including the active ingredient, formulation, application rate, date, time, and location.
- Avoid accidental direct spray and spill conditions to minimize risks to resources.
- Consider surrounding land uses before aerial spraying.
- Avoid aerial spraying during periods of adverse weather conditions (snow or rain imminent, fog, or air turbulence).
- Make helicopter applications at a target airspeed of 40 to 50 miles per hour (mph), and at about 30 to 45 feet above ground.
- Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph (>6 mph for aerial applications) or a serious rainfall event is imminent.
- Use drift control agents and low volatile formulations.
- Conduct pre-treatment surveys for sensitive habitat and special status species within or adjacent to proposed treatment areas.

- Consider site characteristics, environmental conditions, and application equipment in order to minimize damage to non-target vegetation.
- Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species.
- Turn off applied treatments at the completion of spray runs and during turns to start another spray run.
- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide.
- Clean OHVs to remove seeds.