Chokecherry and Sierra Madre Wind Energy Project
Weed Management Plan

Phase I Wind Turbine Development

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TABLE OF CONTENTS

Section **Page**
1.0 Introduction 1
2.0 Current Weed Distribution and Management 2
3.0 Weed Management Approach 3
3.1 Weed Management Goals 3
3.1.1 Priorities for Weed Management 3
3.2 Inventory of Weed Species 4
3.3 Weed Management Actions 4
3.3.1 Prevention 4
3.3.2 Treatment Methods 5
3.4 Monitoring 7
3.5 Recordkeeping 7
4.0 References 9

LIST OF TABLES

Table **Page**
Table 1. Noxious Weed List for the State of Wyoming and Other Noxious and Invasive Species of Concern 1
Table 2. Record of Noxious Weed Treatments 8

LIST OF ATTACHMENTS

Attachment
A. Noxious Weed Survey Report
B. Noxious Weed Distribution and Control
C. Pesticide Use Proposal Form

1.0 INTRODUCTION

The purpose of this Weed Management Plan ("Plan") is to prescribe methods to prevent, mitigate, and control the spread of noxious and invasive weeds during construction and operation of the Phase I Wind Turbine Development (the "Project") proposed by Power Company of Wyoming LLC ("PCW"). Federal Invasive Species Executive Order 13112 defines an invasive plant as an alien, non-native, species whose introduction causes or is likely to cause economic or environmental damage or harm to human health (U.S. Federal Register 1999). A noxious weed is any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife or property. Designated noxious weeds in the state of Wyoming and other noxious and invasive species of concern are listed in Table 1.

Table 1. Noxious Weed List for the State of Wyoming and Other Noxious and Invasive Species of Concern.

Common Name	Scientific Name
State of Wyoming[1]	
Field bindweed	*Convolvulus arvensis*
Canada thistle	*Cirsium arvense*
Leafy spurge	*Euphorbia esula*
Perennial sowthistle	*Sonchus arvensis*
Quackgrass	*Agropyron repens*
Hoary cress (whitetop)	*Cardaria draba* and *C. pubescens*
Perennial pepperweed (giant whitetop)	*Lepidium latifolium*
Ox-eye daisy	*Chrysanthemum leucanthemum*
Skeletonleaf bursage	*Franseria discolor*
Russian knapweed	*Centaurea repens*
Yellow toadflax	*Linaria vulgaris*
Dalmatian toadflax	*Linaria dalmatica*
Scotch thistle	*Onopordum acanthium*
Musk thistle	*Carduus nutans*
Common burdock	*Arctium minus*
Plumeless thistle	*Carduus acanthoides*
Dyers woad	*Isatis tinctoria*
Houndstongue	*Cynoglossum officinale*
Spotted knapweed	*Centaurea maculosa*
Diffuse knapweed	*Centaurea diffusa*
Purple loosestrife	*Lythrum salicaria*
Saltcedar (tamarisk)	*Tamarix* spp.
Common St. Johnswort	*Hypericum perforatum*
Common tansy	*Tanacetum vulgare*
Russian olive	*Elaeagnus angustifolia*
Other Noxious and Invasive Species of Concern	
Larkspur	*Delphinium* spp.
Halogeton	*Halogeton glomeratus*
Wyeth's Lupine	*Lupinus wyethii*
Pricklypear	*Opuntia* spp.
Black henbane	*Hyoscyamus niger*
Common cocklebur	*Xanthium strumarium*

Sources: [1]Wyoming Weed and Pest Council 2011

Noxious and invasive weeds can move into disturbed areas and dominate or disrupt natural communities or restoration projects. Noxious weeds compete with native species for soil, water, and other limiting resources. Noxious weeds are often able to out-compete native vegetation and can form monocultures. This degrades the value of agricultural and natural resources, including wildlife habitat. Management of noxious and invasive weeds is a reclamation requirement in the Wyoming Bureau of Land Management (BLM) Reclamation Policy (BLM 2009). The Rawlins Field Office of the BLM has zero tolerance for state-listed noxious weed species. Therefore, weed management is an important part of the reclamation procedures outlined in the master and site-specific reclamation plans for the CCSM Project.

2.0 CURRENT WEED DISTRIBUTION AND MANAGEMENT

Weed management in the Project Site is a cooperative effort between the surface landowner and the BLM. Noxious and invasive weeds are controlled annually using herbicides. The Overland Trail Cattle Company LLC ("TOTCO"), which owns the vast majority of private lands within the Project Site, and BLM have cooperatively participated in weed control since 1999. An experimental weed burn was jointly conducted in June 2003 (Newberry 2010). The weed burn occurred on Little Sage Creek to remove thick overstory vegetation to better locate and treat perennial pepperweed and Russian knapweed. Weed management in the Project Site will continue in a manner consistent with past efforts and will include coordination between PCW, the surface landowner, and the BLM.

In 2012 and 2013, SWCA biologists completed biological resource surveys of the Project Site. Surveys were conducted within all planned disturbance areas as well as a 100 foot minimum buffer surrounding all limits of disturbance. During survey efforts, biologists recorded any occurrences of noxious and invasive species and identified areas that could serve as potential vectors for noxious and invasive species (Attachment A). Prior to the surveys, previously known noxious weed occurrences were reviewed to inform survey efforts and an assessment was completed to identify areas that could be potential vectors for noxious weeds. Most of the identified weed occurrences are associated with drainages, water features, and disturbed areas.

The most common noxious weed species on the CCSM Project Site occur within the Sage Creek Basin and Bolten sub-regions and include halogeton (*Halogeton glomeratus*), whitetop (*Cardaria draba*), perennial pepperweed (*Lepidium latifolium*), Russian knapweed (*Acroptilon repens*), cheatgrass (*Bromus tectorum*), leafy spurge (*Euphorbia esula*), and Canada thistle (*Cirsium arvense*). Cheatgrass is found locally throughout the CCSM Project Site but does have a tendency to be found in the sandier soils. Less common weeds include perennial sowthistle (*Sonchus arvensis*), black henbane (*Hyoscyamus niger*), Russian thistle (*Salsola kali*), poverty weed (*Iva axillaris*), and saltcedar (*Tamarix* spp.). Detailed weed mapping of areas to be disturbed will be performed immediately prior to construction when weeds can be treated, avoided, and/or weedy topsoil can be segregated during construction.

3.0 WEED MANAGEMENT APPROACH

Noxious and invasive weed control will occur for the life of the Project. Noxious weed occurrences within the Project right of way and areas where invasive weeds are problematic and may potentially contribute to a significant proportion of the vegetation community have been identified and delineated and will be updated as needed throughout the life of the Project. Weed management will be in accordance with the procedures established in this Plan and the control options described in Attachment B. Weed management will be implemented prior to surface-disturbing activities and during reclamation stage as described in the master and site-specific reclamation plans. The efficiency of the prescribed control measures will be evaluated throughout the Project and the reclamation process.

Weed management for the Project will be dynamic. This approach will be successful by implementing the following actions (Tu and Meyers-Rice 2001):

1. Establish and record weed management goals, while identifying noxious and invasive species that prevent these goals from being reached and prioritize those species based on the severity of their effects.
2. Identify the presence, distribution, and density of noxious and invasive species throughout the Project Site.
3. Develop and implement weed control plans to prevent, control, and/or eliminate the effects of priority weed species and, if necessary, re-order priorities based on likely effects on target and/or non-target species.
4. Evaluate the effectiveness of the weed control plans through monitoring, and use this information to modify and improve weed management goals, control priorities, methods, and plans.

3.1 WEED MANAGEMENT GOALS

The goal of weed management in the Project Site is to minimize the spread of noxious and/or invasive plant species during the construction and operation of the Project. PCW will assist federal, state, and local agencies' weed control efforts; comply with requirements designed to prevent the spread of noxious and/or invasive plant species; and implement weed control measures on areas of the Project that are identified to be of special concern. Success standards, as defined in the master and site-specific reclamation plans, will be used to assess whether revegetation requirements for the Project are being met (BLM 2011a). Part of successful revegetation includes maintaining native plant communities with minimal undesirable plant species. Success standards and management goals are designed to be site-specific to each surface-disturbing activity and the surrounding vegetation.

3.1.1 Priorities for Weed Management

PCW will coordinate with the BLM Authorized Officer (AO) to determine priorities for weed management on federal lands in the Project Site. Private landowners, and the State Board of Land

Commissioners or the Wyoming Game and Fish Commission will be consulted as appropriate for weed management activities on private and state lands, respectively. Weed species that present the greatest threat to achieving the management goals and that need to be controlled immediately are the highest priority. Factors to consider when establishing priorities and suggested rankings (Tu and Meyers-Rice 2001; Colorado Natural Areas Program [CNAP] 2000) are as follows:

- Current extent and expansion potential of the species/population in or near the Project Site.
- Current and potential effects of the species.
- Value of the habitats/areas that the species infests or may potentially infest.
- Difficulty of control.

Once identified, a specific control plan for each priority species will be developed using the appropriate control options described in Attachment B. The specific control plan will identify species in need of controlling, treatment locations, period of control, methods to use, and monitoring.

3.2 INVENTORY OF WEED SPECIES

The presence, distribution, and cover of noxious and invasive weeds in areas to be disturbed by the Project were assessed in 2012 and 2013. Weed surveys of areas to be disturbed were conducted during the growing season to determine occurrence and abundance within the Project Site. Surveys were conducted within all planned disturbance areas as well as a 100 foot minimum buffer surrounding all limits of disturbance. Surveys focused on resources within areas planned for development, including access roads, work areas, and transmission line corridors. Data was collected using handheld data-logger units and geo-referenced using global positioning system (GPS) locations and delineated shapefiles. Results from these surveys will be used to develop the specific control plan for each priority species and assist in monitoring efforts.

3.3 WEED MANAGEMENT ACTIONS

The spread of noxious and invasive weeds is a significant concern in projects that involve any surface-disturbing activities. Measures must be taken to prevent, control, and/or eliminate the effects of these species; and in areas where prevention is not possible, active management and/or control measures must be put in place. Best management practices (BMPs) are necessary to ensure that existing weed occurrences are appropriately identified and controlled, subsequent spread is prevented, and new populations of noxious weeds do not emerge.

3.3.1 Prevention

Prevention is the most cost-effective approach to noxious and invasive weed management. PCW will assist federal, state, and local agency noxious and invasive weed control efforts; comply with preventative requirements; and implement weed control measures on areas of the Project identified to be of special concern. The following preventive measures will be implemented to prevent the spread of noxious and invasive weeds:

- Prior to construction, provide contractors with information and training regarding noxious weed management, weed identification, and the effects of such weeds on agriculture, livestock, and wildlife. The contractors will be informed of the importance of preventing the spread of noxious and invasive weeds in areas not infested and of controlling the proliferation of weeds already present.
- Prior to construction, noxious and invasive weed infestation areas of concern will be identified and flagged in the field by qualified personnel. The flagging will alert construction personnel to the infestation so that appropriate BMPs may be applied.
- In areas where infestations were identified and flagged in the field, the construction contractor will stockpile cleared vegetation and salvaged topsoil adjacent to the area from which they were stripped to eliminate the transport of soil-borne noxious and invasive weed propagules. These weed-infested stockpiles will be marked with clearly visible signage until reclamation. Soil and vegetative matter will not be moved outside of the identified and marked noxious and invasive weed infestation areas.
- Vehicles and earth moving equipment will be washed when entering the Project Site for the first time and will be rewashed after any off road travel through identified and flagged noxious and invasive weed infestation areas.
- Ensure that straw or hay bales used for sediment barrier installations or mulch distribution are weed-free. If weed-free bales are unavailable, use alternative weed-free sediment barrier installations.
- Implement stabilization and/or reclamation of disturbed lands immediately following construction, as outlined in the master and site-specific reclamation plan.
- Reseeding areas following site disturbance is important. Reseeding will occur as set forth in the site-specific reclamation plans. Continuing revegetation efforts with native seed mixes provides soil stabilization, promotes the establishment of native plant communities, and potentially prevents the spread of noxious and invasive weeds from competition of native plants.
- Disturbed ground may require chemical or mechanical weed control before weeds go to seed.

3.3.2 Treatment Methods

PCW will implement noxious and invasive weed control measures and BMPs in accordance with existing regulations and jurisdictional land management agency or landowner agreements. PCW will continue coordinating with appropriate agencies to determine which weed species will require treatment and/or site-specific mitigation approaches. Within the Project Site, noxious and invasive weed control will be conducted using herbicide treatment methods. Treatment methods other than herbicide application, such as cultural, mechanical, biological, and enhancement measures, will be considered during the reclamation process to facilitate noxious weed control (Attachment B).

Herbicide

Herbicide application will be used to treat any identified noxious and/or potentially problematic invasive plant population in an effort to reduce infestations prior to soil disturbance caused by construction. Post-reclamation strategies will entail either herbicide application or mechanical treatment to noxious weeds in infestation areas depending on the phenology of the weed species. Herbicide application will occur either following seedbed establishment or after allowing two seasons of growth. Mechanical controls will be used between herbicide treatments to provide short-term control and minimize weed establishment (see below). For most noxious weeds, herbicide spraying is most effective in early spring. On all BLM-administered lands, a pesticide use permit (PUP) will be required prior to any herbicide application (BLM 2011b) (Attachment C).

Only herbicides that are approved for use by the land management agency or landowner will be used. Treatments will not be conducted during precipitation events or when precipitation is expected within 24 hours. If weeds targeted for herbicide treatments are found in the vicinity of limited reclamation potential (LRP) areas or sensitive sites (as outlined in the site-specific reclamation plans), proper buffers established in coordination with the BLM and local agencies will be used to prevent the spread of herbicides to these areas. If weeds are found in LRP areas or sensitive sites, cultural and/or mechanical controls will be implemented. In areas where noxious and invasive weeds may be interspersed with native vegetation, the herbicide application method will be adapted to target only weeds and therefore preserve and retain native plants.

The effects to special status species (see BLM Manual 6840 Special Status Species) will be considered when designing herbicide treatment programs. A selective herbicide and a wick or backpack sprayer will be used to minimize risks to special status plants. Vegetation will not be treated with herbicide during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for special status species in the treatment area. Other treatment methods (i.e., cultural or mechanical treatment) will be implemented during these periods.

Herbicide application is an effective means of reducing the size of noxious weed populations. Applications will be controlled to minimize effects on surrounding vegetation. In areas of dense infestation, a broader application will be used and a follow-up seeding program implemented. Supplemental seeding will be based on criteria outlined in the site-specific reclamation plans. The timing of subsequent revegetation efforts will be based on the life of the selected herbicide.

BLM Manual 9011 (Chemical Pest Control) outlines the policies, and BLM Handbook H-9011-1 (Chemical Pest Control) outlines the procedures, for use of herbicides on public lands. An approved Pesticide Use Proposal is required to apply chemical herbicide (Attachment C). All herbicide applications on BLM-administered public lands are required to be applied by a certified commercial applicator(s) and all herbicides used must be from the current list of herbicides approved for application on BLM-administered lands (BLM 2011b).

Cultural/Mechanical

Cultural control refers to management practices that prevent weed spread and promote competition from other native plants (BLM 2011b). This may include native plant seeding, burning, flooding, and limiting livestock grazing or recreational uses in infested areas.

Mechanical control includes mowing, chopping, and discing, which are very effective short-term control. Repeating mechanical treatment weakens plants making them susceptible to disease and competition from other native plants and depletes food reserves. Mowing weeds in newly revegetated areas during the first season of establishment, prior to seed formation, could minimize weed establishment.

3.4 MONITORING

The purpose of the monitoring program is to document whether areas that have been reclaimed are progressing toward revegetation and ecosystem reconstruction. Part of successful revegetation includes maintaining native plant communities with minimal weed species. Monitoring of noxious and invasive weeds will be conducted as part of the reclamation success monitoring described in the site-specific reclamation plans. Invasive plant species should account for less than 5 percent total plant cover, and reclamation species should be outcompeting weed species within two years of reclamation initiation. State-listed noxious weeds (Table 1) should account for 0 percent of the total plant cover. The BLM Rawlins Field Office has a zero tolerance policy for state-listed noxious weed species. Noxious and invasive weeds will be monitored annually in all areas affected by Project construction.

Infestations of noxious and invasive weeds noted during monitoring activities will be treated according to the methods described in this Plan. Small infestations will likely be treated locally with herbicide applications appropriate for the specific species. When a large infestation occurs or reoccurs, an evaluation will be performed to determine what led to the infestation, a specific weed control plan will be developed or modified, and a treatment strategy will be implemented. This evaluation will be made available to relevant local noxious weed supervisory authorities.

The assessment and monitoring of revegetation efforts will take place annually. Known infestation areas and areas of special concern will be monitored, evaluated, and controlled annually and until the noxious and invasive weed occurrence is eradicated or controlled. If necessary, the monitoring schedule may become more or less frequent.

3.5 RECORDKEEPING

Treatment of known infestations will begin prior to initiation of construction activities. Any identified populations will be treated in an effort to reduce infestations prior to soil disturbance caused by construction. Site-specific treatment plans, including pesticide use proposals (PUPs), will be developed describing treatment location, materials and methods used, and approximate schedule for control and monitoring activities. Only herbicides that are approved for use by land managing

agencies or landowners will be used and all herbicides will be applied in accordance with their label requirements.

Infestations will be monitored annually to track success of treatment. The boundary of each weed population will be mapped using GPS and data will be recorded including percent cover of each species. Results of monitoring will be used to determine adaptive management strategies and how the treatment plan should be modified to ensure success. Information on each treatment will be recorded regularly to help determine the best herbicide or combination of control methods using the table below or a similar format.

Table 2. Record of Noxious Weed Treatments

Location	Treatment Date	Control Method Applied	Follow up Date	Follow up notes (how successful was treatment)

4.0 REFERENCES

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Attachment A

Phase I Wind Turbine Development
Noxious Weed Survey Report

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 2
2.0 BACKGROUND AND METHODS.....3
3.0 RESULTS AND DISCUSSION 6
4.0 REFERENCES.....6

LIST OF FIGURES

Figure **Page**

Figure 1. Area surveyed and recorded weed occurrences in the Chokecherry WDA of the Phase I Wind Turbine Site. 4
Figure 2. Area surveyed and recorded weed occurrences in the Sierra Madre WDA of the Phase I Wind Turbine Site. 5
Figure 3. Weed Occurrences in the Phase I Wind Turbine Development Site. 7
Figure 4. Weed Occurrences in the Phase I Wind Turbine Development Site. 8
Figure 5. Weed Occurrences in the Phase I Wind Turbine Development Site. 9
Figure 6. Weed Occurrences in the Phase I Wind Turbine Development Site. 10

LIST OF TABLES

Table **Page**

Table 1. Noxious and Invasive Species List for the CCSM Project 3

1.0 INTRODUCTION

Power Company of Wyoming LLC (PCW) proposes to construct, operate, maintain, and decommission the Chokecherry and Sierra Madre Wind Energy Project (CCSM Project), located in Carbon County, Wyoming. The CCSM Project consists of up to 1,000 wind turbines capable of generating approximately 2,000 to 3,000 megawatts (MW) of clean, renewable wind energy. The primary components of the CCSM Project include the wind turbine generators, an internal road network, a rail facility, a quarry, an internal electrical collection and transmission system, substations, and operations and maintenance buildings.

The CCSM Project is located south of the city of Rawlins, primarily within the bounds of the Overland Trail Ranch (Ranch). The Ranch is owned and operated by PCW affiliate, The Overland Trail Cattle Company LLC (TOTCO). The Ranch is situated within an area of alternating sections of private and federal lands commonly referred to as the "checkerboard." The vast majority of the private lands are owned by TOTCO and the federal lands are administered by the Bureau of Land Management (BLM) Rawlins Field Office (RFO). A small percentage of the land within the Ranch is owned by the State of Wyoming and is administered by the State Board of Land Commissioners. Finally, Anadarko Land Corporation owns some sections located on the periphery of the northwest boundary of the Ranch.

In 2008, PCW applied to BLM for right-of-way grants to construct, operate, maintain and decommission the CCSM Project on federal land within the CCSM Project Area. On June 29, 2012, the Notice of Availability for the Final Environmental Impact Statement (EIS) concerning the CCSM Project was published in the Federal Register (77 FR 63328). On October 9, 2012 the Secretary of the Interior signed the Record of Decision (ROD). In the ROD (BLM 2012), BLM determined that over 200,000 acres within the CCSM Project Area are suitable for wind energy development subject to the requirements described under the Selected Alternative in the ROD. The area that was determined to be suitable for wind energy development consists of two wind development areas (WDAs) in which turbines would be located. The northern WDA is known as Chokecherry and the southern WDA is known as Sierra Madre. The WDAs are located approximately 9 miles apart.

Prior to issuing right-of-way grants for the CCSM Project, BLM will conduct subsequent environmental analysis of site-specific plans of development submitted by PCW. The site-specific plans of development will be screened against the analysis conducted in the EIS and the requirements described under the Selected Alternative in the ROD. To inform the subsequent environmental analysis, BLM requested that PCW conduct surveys for noxious and invasive plant species.

SWCA Environmental Consultants (SWCA) conducted noxious and invasive species surveys for the Phase I Wind Turbine Development Site in 2012 and 2013. The Phase I Wind Turbine Development consists of the wind turbine generators, access roads, and associated transmission lines and facilities. Noxious and invasive species surveys focused on the potential occurrence of state and county listed noxious weeds as well as other non-listed invasive species. Surveys were completed for all planned disturbances associated with the Phase I Wind Turbine Development plus a minimum 100 foot buffer (Figure 1).

2.0 BACKGROUND AND METHODS

SWCA conducted biological resource surveys of the Phase I Wind Turbine Development Site in 2012 and 2013. Surveys were conducted within all planned disturbance areas associated with the Phase I Wind Turbine Development Site as well as a minimum 100 foot buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species (Figures 1 and 2).

Table 1. Noxious and Invasive Species List for the CCSM Project

Common Name	Scientific Name	USDA/NRCS Plant Codes
State of Wyoming[1]		
Canada thistle	*Cirsium arvense*	CIAR4
Diffuse knapweed	*Centaurea diffusa*	CEDI3
Leafy spurge	*Euphorbia esula*	EUES
Houndstongue	*Cynoglossum officinale*	CYOF
Perennial sowthistle	*Sonchus arvensis*	SOAR2
Perennial pepperweed	*Lepidium latifolium*	LELA2
Hoary cress (whitetop)	*Cardaria draba*	CADR
Russian knapweed	*Acroptilon repens*	ACRE3
Musk thistle	*Carduus nutans*	CANU4
Saltcedar (tamarisk)	*Tamarix* spp.	TAMAR
Spotted knapweed	*Centaurea stoebe* ssp. *micranthos*	CESTM
Other Noxious and Invasive Species of Concern		
Halogeton	*Halogeton glomeratus*	HAGL
Black henbane	*Hyoscyamus niger*	HYNI
Cheatgrass	*Bromus tectorum*	BRTE
Poverty weed	*Iva axillaris*	IVAX

Sources: [1]Wyoming Weed and Pest Council 2013

Prior to the surveys, previously known noxious weed occurrences were reviewed to inform survey efforts (BLM 2012). Cheatgrass (*Bromus tectorum*) has been identified along roadsides and in areas recently disturbed by grazing and fire. Perennial pepperweed (*Lepidium latifolium*) occurs in many wet drainages, including Little Sage Creek drainage, where the occurrence is the dominant herbaceous cover in many areas. Hoary cress (*Cardaria draba*) occurs in ephemerally wet areas, including Hugus Draw. Russian knapweed (*Salsola kali*), halogeton (*Halogeton glomeratus*), and Canada thistle (*Cirsium arvense*) occur primarily along disturbed areas including roadways, agricultural areas, along ditches and drainages, and surrounding impoundments. Locations of previously recorded weed occurrences are not included on maps in this report.

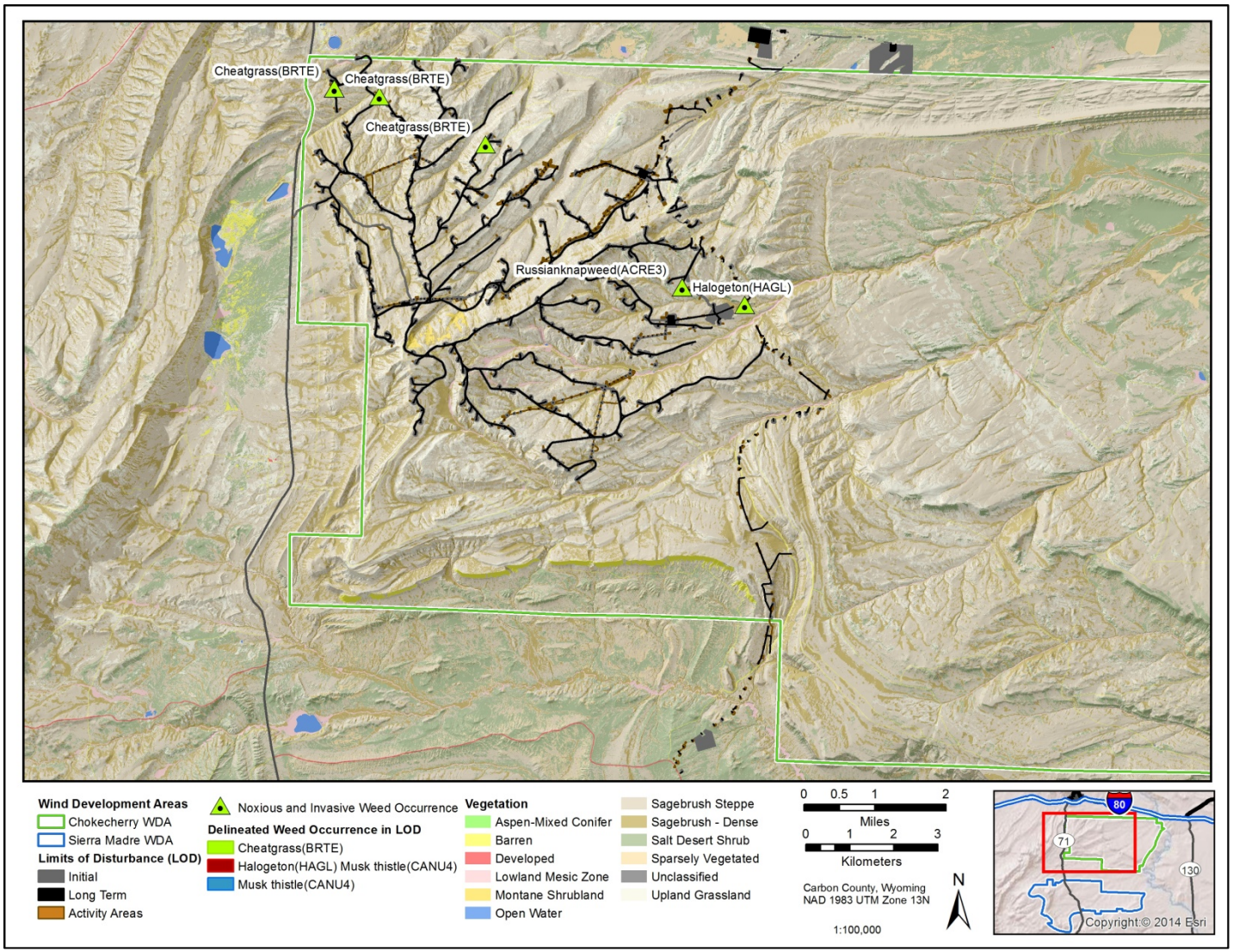

Figure 1. Area surveyed and recorded weed occurrences in the Chokecherry WDA of the Phase I Wind Turbine Site.

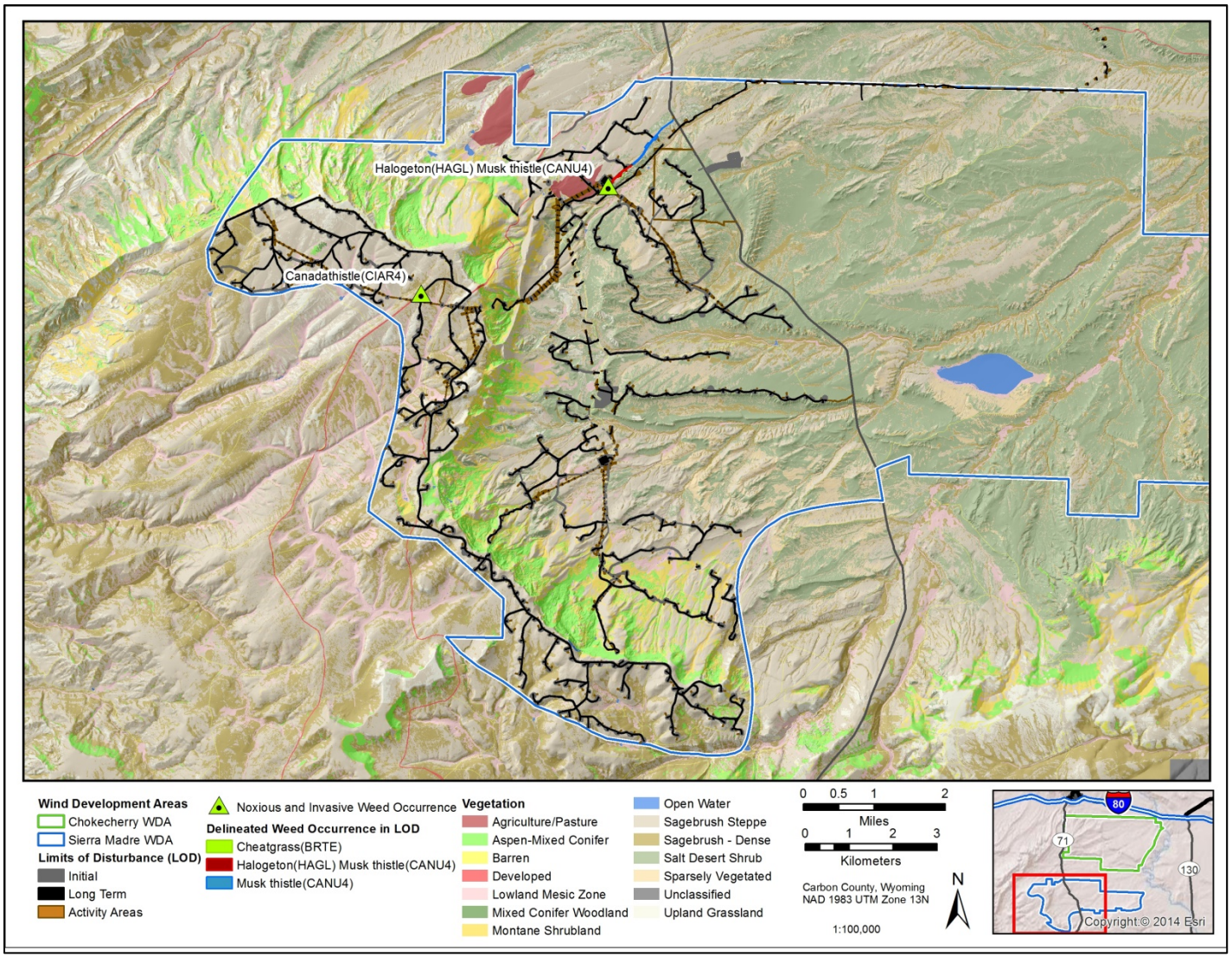

Figure 2. Area surveyed and recorded weed occurrences in the Sierra Madre WDA of the Phase I Wind Turbine Site.

3.0 RESULTS AND DISCUSSION

Surveys in the Phase I Wind Turbine Development Site for noxious weeds identified multiple occurrences as described below. Most of the weed populations are associated with existing roadways, drainages, and previously disturbed areas in the Phase I Wind Turbine Development Site. Existing locations recorded as part of BLM monitoring efforts and Phase I Haul Road and Facilities survey efforts were also noted. These previously known locations were not re-recorded for the Phase I Wind Turbine Development survey effort.

Weeds identified within the survey area for the Phase I Wind Turbine Development Site include Russian knapweed, Halogeton, and cheatgrass (Figures 1 and 2). Cheatgrass is found throughout the Chokecherry WDA in the Phase I Wind Turbine Development Site particularly on sandier soils (Figures 3 and 4). Povertyweed and Canada thistle were also observed in the Chokecherry WDA although none of the occurrences overlapped with the survey area. The majority of all weed occurrences within the Phase I Wind Turbine Development Site were associated with existing roadways, drainages, and agricultural use areas. Consistent with the known weed occurrences identified by the BLM and located during Phase I Haul Road and Facilities survey efforts, Russian knapweed, Canada thistle, and hoary cress were identified along Hugus Draw and cheatgrass and Russian knapweed were documented in several areas immediately south of Hugus Draw as the transmission line corridor descends from the Chokecherry WDA towards the Bolten Road. Several species of noxious and invasive weeds were also re-confirmed at the transmission corridor crossing of Little Sage Creek.

The Sierra Madre WDA contains halogeton, musk thistle, Canada thistle, Russian knapweed, and cheatgrass (Figures 5 and 6). Cheatgrass, halogeton, musk thistle, Canada thistle, and Russian knapweed were also observed in areas outside of the Phase I Wind Turbine Development Site primarily in roadsides, drainages, agricultural areas, and in recently disturbed areas. Consistent with the findings of the Phase I Haul Road and Facilities survey efforts, thistle locations consisted of few individual plants and were scattered in distribution.

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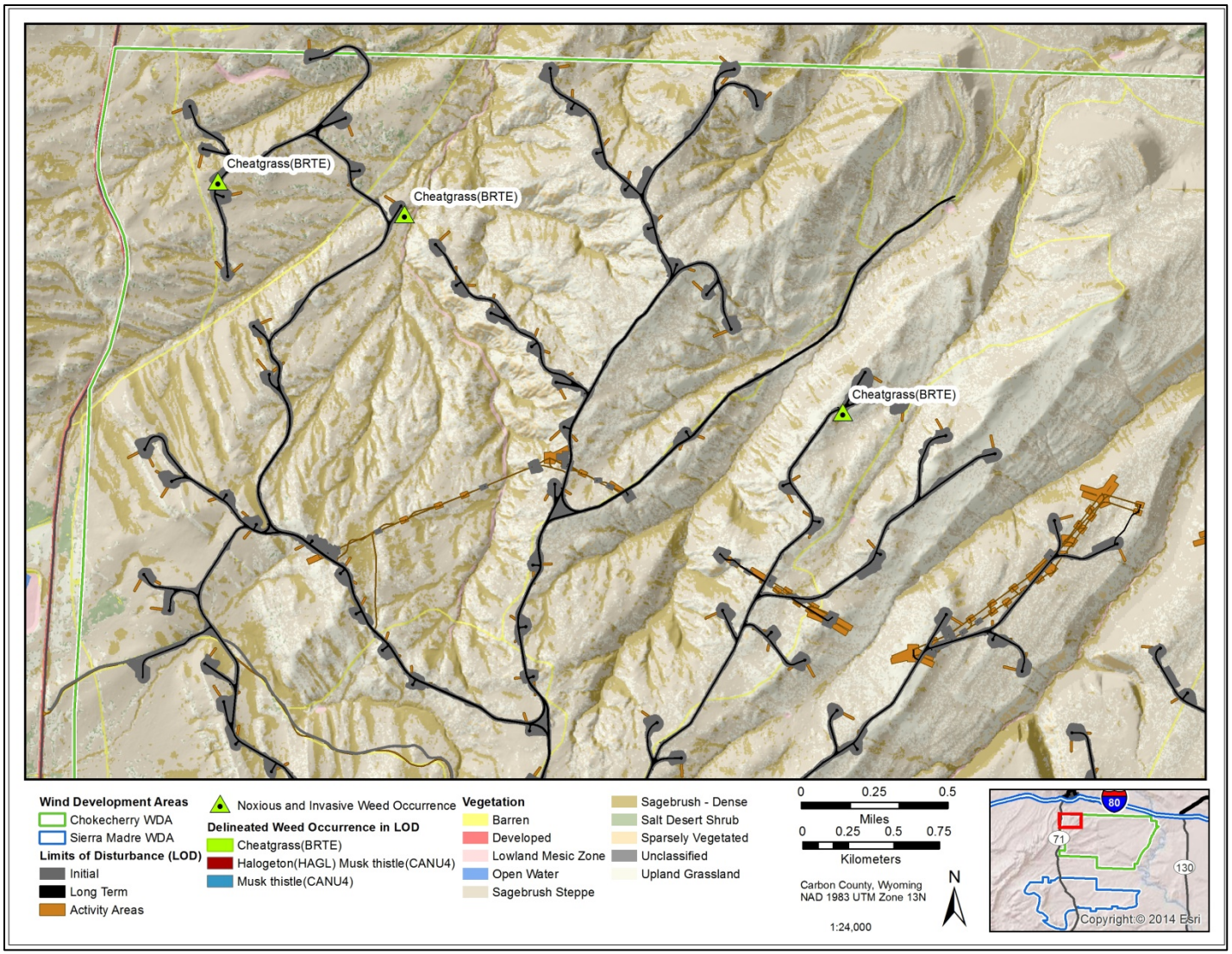

Figure 3. Weed Occurrences in the Phase I Wind Turbine Development Site.

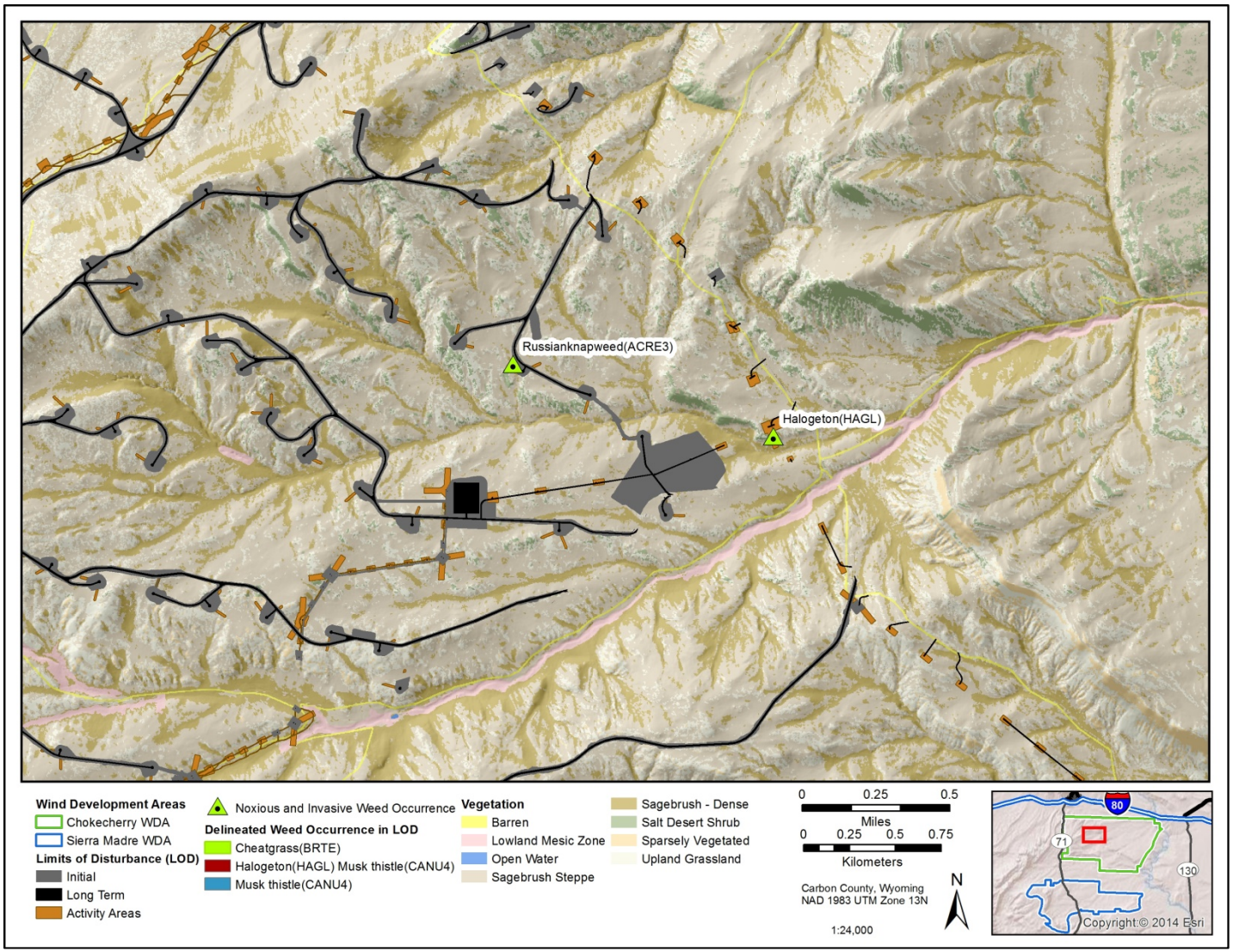

Figure 4. Weed Occurrences in the Phase I Wind Turbine Development Site.

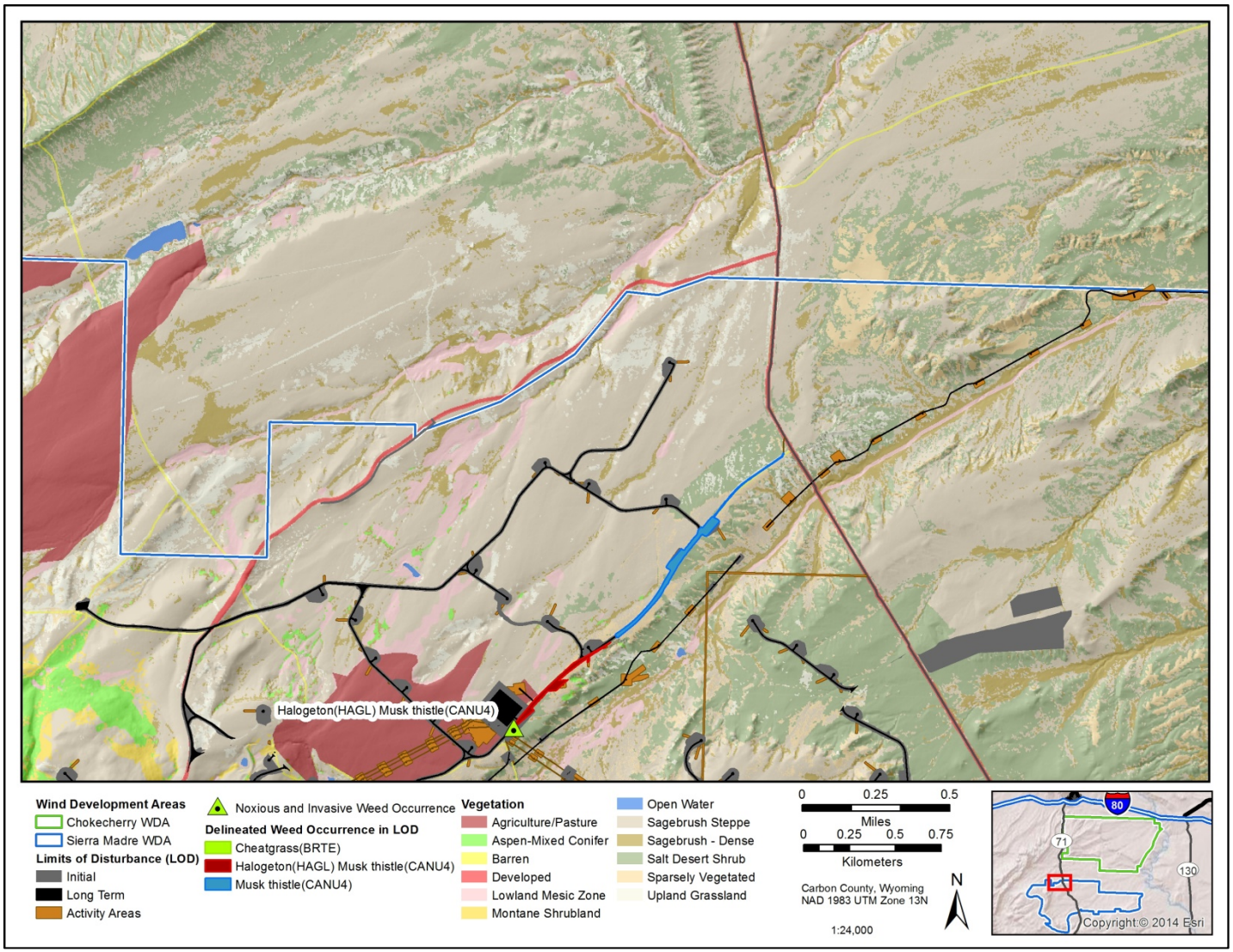

Figure 5. Weed Occurrences in the Phase I Wind Turbine Development Site.

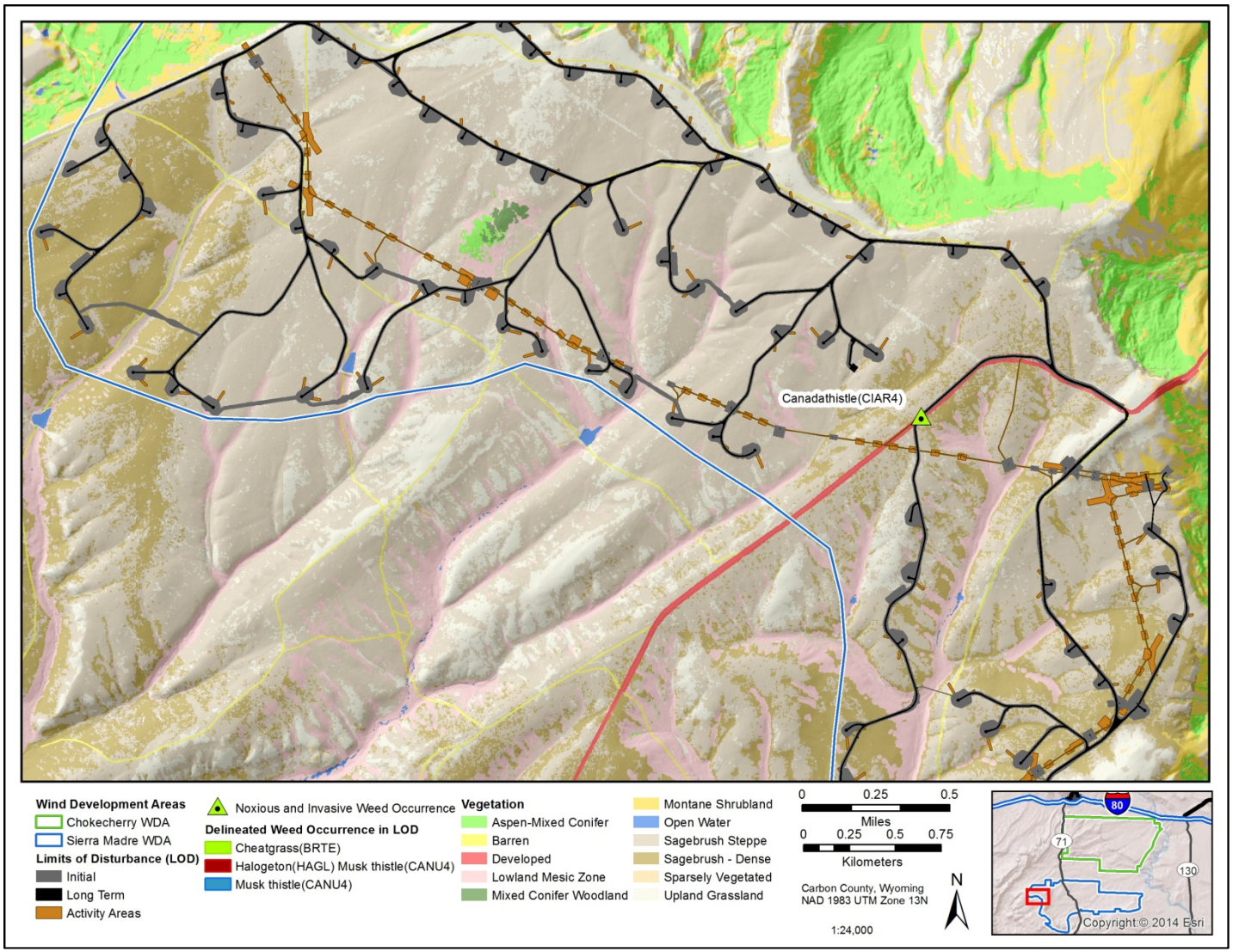

Figure 6. Weed Occurrences in the Phase I Wind Turbine Development Site.

Attachment B

Noxious Weed Distribution and Control

TABLE OF CONTENTS

Purpose....1
Canada Thistle (*Cirsium arvense*) 2
Cheatgrass or Downy Brome (*Bromus tectorum*)....7
Halogeton (*Halogeton glomeratus*) 11
Leafy Spurge (*Euphorbia esula*)....17
Musk Thistle (*Carduus nutans*) 22
Perennial Pepperweed (*Lepidium latifolium*)....26
Poverty Weed (*Iva axillaris*)....32
Russian Knapweed (*Acroptilon repens*) 38
Whitetop or Hoary Cress (*Cardaria draba*) 42
References....48

LIST OF TABLES

Table **Page**

Table 1. Canada Thistle occurrences. 3
Table 2. Herbicides Recommended to Control Canada Thistle. 4
Table 3. Cheatgrass occurrences. 8
Table 4. Herbicides Recommended to Control Cheatgrass. 9
Table 5. Halogeton occurrences. 12
Table 6. Herbicides Available to Control Halogeton 13
Table 7. Canada thistle occurrences. 18
Table 8. Herbicides Available to Control Leafy Spurge (CSU 2008; USDA 2002) 19
Table 9. Musk thistle occurrences. 23
Table 10. Herbicides Recommended to Control Musk Thistle (Beck 2008b). 24
Table 11. Perennial pepperweed occurrences. 27
Table 12. Herbicides Available to Control Perennial Pepperweed (Wilson, et.al. 2004) 28
Table 13. Poverty weed occurrences. 33
Table 14. Herbicides Recommended to Control Poverty weed. 34
Table 15. Russian knapweed occurrences. 39
Table 16. Herbicides Available to Control Russian Knapweed (Beck 2008c) 40
Table 17. Whitetop occurrences. 43
Table 18. Herbicides Available to Control Whitetop[4] 44

LIST OF FIGURES

Figure **Page**

Figure 1. Canada Thistle (*Cirsium arvense*) 2
Figure 2. Cheatgrass (*Bromus tectorum*) 7
Figure 3. Halogeton (*Halogeton glomeratus*) 11
Figure 4. Leafy Spurge (*Euphorbia esula*) 17
Figure 5. Musk thistle (*Carduus nutans*) 22
Figure 6. Perennial Pepperweed (*Lepidium latifolium*) 26
Figure 7. Poverty weed (*Iva axillaris*) 32
Figure 8. Russian Knapweed (*Acroptilon repens*) 38
Figure 9. Whitetop (*Cardaria draba*) 42

PURPOSE

The purpose of this document is to identify the current distribution of noxious weed species identified in the CCSM Project Site and to provide management options for the control of these species. Weed management will be in accordance with the site-specific weed management plans. Small infestations will likely be treated locally with herbicide applications appropriate for the specific species. When a large infestation occurs or reoccurs, an evaluation will be performed to determine what led to the infestation, a specific weed control plan will be developed or modified, and a treatment strategy will be implemented.

PCW will implement noxious and invasive weed control measures and best management practices in accordance with existing regulations and jurisdictional land management agency or landowner agreements. PCW will coordinate with appropriate agencies to determine which weed species will require treatment and/or site-specific mitigation approaches. On all BLM-administered lands, PCW will apply for a pesticide use permit (PUP) prior to any herbicide application. Within the CCSM Project Site, noxious and invasive weed control will be conducted using herbicide treatment methods. Treatment methods other than herbicide application, such as cultural, mechanical, biological, and enhancement measures, will be considered during the reclamation process to facilitate noxious weed control

CANADA THISTLE (*CIRSIUM ARVENSE*)

DESCRIPTION AND PHOTOGRAPHS

- Perennial, erect, up to 5 feet tall. Leaves are variable, but typically light to dark green, oblong, deeply cut, and spiny with serrated edge.
- Light lavender to deep purple flowers are in small, bristly clusters in in late spring to early summer.
- Infests disturbed areas in crops, pastures, rangelands, roadsides, and riparian areas.
- Most competitive in deep, well-aerated, productive, cool, moist soils; less common in light, dry soils.
- Horizontal roots may extend over 15 feet; vertical roots may grow 6 to 15 feet deep.
- Emerges from its root system in mid to late spring (late April through May).

Figure 1. Canada Thistle (*Cirsium arvense*)

DAMAGE & THREATS

Canada thistle reduces forage consumption in pastures and rangeland because cattle typically will not graze near infestations (Beck 2008). Infestations throughout the United States cost tens of millions of dollars annually in direct crop losses and control costs (PCA 2005). Canada thistle has the potential to increase fire frequency and severity as a result of its abundant and readily ignited litter (Zouhar 2001). Canada thistle crowds out and replaces native plants, which reduces plant and wildlife diversity in natural areas.

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Within the Phase I Haul Road and Facilities Site, Canada thistle occurs in Sage Creek and is primarily found in agricultural improvements, along ditches and surrounding impoundments. This species was also found in ditches, natural drainages, and also along existing roadways within the Chokecherry and Sierra Madre Wind Development Areas (WDAs) (Table 1). Canada thistle was not found to be a common species within the West Sinclair Rail Facility Site and no infestations were delineated. Within the Road Rock Quarry Site, Canada thistle occurs in association with other noxious weed species in the western end of the Road Rock Quarry Site and is primarily found along ditches, surrounding impoundments and natural drainages. Canada thistle was found to occur on Upper and Lower Miller Hill within the Phase I Wind Turbine Development Site and is primarily found in agricultural improvements, along ditches, and existing roadsides (Table 1). Specific locations and maps showing these occurrences are available in the weed survey reports for these sites.

Table 1. Canada Thistle occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	North Platte River, Sage Creek, and Lower Miller Hill
West Sinclair Rail Facility	None
Road Rock Quarry	Western end of site
Phase I Wind Turbine Development	Upper and Lower Miller Hill

MANAGEMENT OPTIONS

Combining control methods is the best form of Canada thistle management. The key is to stress the plant and force it to use stored root nutrients[7]. Canada thistle can recover from almost any stress because of its root system, so success requires a management plan implemented over several years.

Chemical

Several herbicides are effective against Canada thistle, but retreatment for three or more years may be required (Table 2). Dicamba and chlorsulfuron are more effective when combined with 2,4-D as a split-season application[7]. Apply 2,4-D in spring when Canada thistle is 10 to 15 inches tall, in pre-bud to early bud growth stages, then treat re-growth in fall with dicamba or chlorsulfuron. The tendency of this species to grow in wet areas may restrict the use of certain herbicides. Herbicides are most effective when combined with cultural and/or mechanical control.

Table 2. Herbicides Recommended to Control Canada Thistle.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
Picloram	Triumph K Triumph 22K Picloram K Picloram K Picloram 22K Picloram 22K OutPost 22K Tordon K Tordon 22K Trooper 22K Grazon PC	1 qt/acre	Anytime when weeds are rapidly growing	Restricted-use herbicide cannot be used where there is a potential for water contamination
Aminopyralid[2]	Milestone[2]	5-7 oz /acre	Spring at pre-bud growth stage; or fall	Use higher rate for older or dense stands. Can use in areas near/in aquatic sites
Chlorsulfuron[1]	Alligare Chlorsulfuron Telar DF Telar XP NuFarm Chlorsulf SPC 75 WDG Herbicide Chlorsulfuron E-Pro 75 WDG	1.0 oz a.i./acre	Spring bolting to bud growth stages; or fall	Use as follow up on regrowth after 2,4-D treatment. Residual herbicide. Selective, will not harm many grass species. Do not apply near water. Essential to use non-ionic surfactant at 0.25% v/v
Clopyralid	Spur Pyramid R&P Clopyralid 3 Cody Herbicide Reclaim Stinger Transline CleanSlate	0.67 to 1.33 pints/acre	Spring after all shoots have emerged, rosette to early bud growth stages; or fall	Apply 1 pint/acre or more in fall
2,4-D	Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4	2 qt/acre	Spring, in pre-bud to	Selectively controls broadleaf plants. Multiple applications

Active Ingredient	**Trade Names**	**Application Rate**	**Application Timing**	**Notes**
	Agrisolution 2,4-D LV4 2,4-D Amine 4 2,4-D LV 4 Solve 2,4-D 2,4-D LV 6 Five Star D-638 Alligare 2,4-D Amine 2,4-D LV6 2,4-D Amine 2,4-D Amine 4 Opti-Amine Barrage HF HardBall Unison Clean Amine Low Vol 4 Ester Weed Killer Low Vol 6 Ester Weed Killer Saber Salvo Savage DS Aqua-Kleen Aqua-Kleen Esteron 99C Weedar 64 Weedone LV-4 Weedone LV-4 Solventless Weedone LV-6 Formula 40 2,4-D LV 6 Ester Platoon WEEDstroy AM-40 Hi-Dep 2,4-D Amine Barrage LV Ester 2,4-D LV4 2,4-D LV6 Clean Crop Amine 4 Clean Crop Low Vol 6 Ester Salvo LV Ester 2,4-D 4# Amine Weed Killer Clean Crop LV-4 ES Savage DS Cornbelt 4 lb. Amine Cornbelt 4# LoVol Ester Cornbelt 6# LoVol Ester Amine 4 Lo Vol-4 Lo Vol-6 Ester Base Camp Amine 4 Broadrange 55 Agrisolution 2,4-D LV6		early bud stages	necessary because of resprout. Certain formulations available to use in areas near/in aquatic sites

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4			
Dicamba	Dicamba DMA Vision Cruise Control Banvel Clarity Vision Rifle Banvel Diablo Vanquish Herbicide Vanquish Sterling Blue	2 qts/acre	Spring rosette growth stage; or fall	Use as follow up on regrowth after 2,4-D treatment. Established grass that is growing under stress may be damaged by dicamba

[1]Use a surfactant with Telar® for adequate control (0.25% to 0.5% v/v; equivalent to 1-2 quarts of surfactant per 100 gallons of spray solution.
[2] This herbicide is not approved for use on lands managed by the Bureau of Land Management.
a.i. = active ingredient; a.e. = acid equivalent

Mechanical

Repeated mowing (every three to four weeks throughout the entire growing season) combined with herbicides is effective. Mowing alone will not eradicate an infestation but can reduce infestation density by 50%. Mowing must be repeated – a one-time mowing will stimulate plant growth and increase infestation size and density.

Cultural

Where approved for use by the landowner or land-managing agency, establishment of selected native grasses, crested wheatgrass (*Agropyron cristatum*), or alfalfa (*Medicago sativa*) has been shown to outcompete Canada thistle (CSU 2013). Effective cultural control includes herbicide treatment before seeding as most species are effective competitors only after they are established.

CHEATGRASS OR DOWNY BROME (*BROMUS TECTORUM*)

DESCRIPTION AND PHOTOGRAPHS

- Annual grass, reproduces from seed
- Grass grows up to 30 inches tall
- Soft hairs cover the plant
- Leaves are dark green with hint of purple, but turns yellow to reddish-brown
- The seed head droops, seeds from 2-6" long at maturity including awns that disperse by wind, water, or adhering to clothing or animal's fur.
- widespread in sagebrush steppe communities

Figure 2. Cheatgrass (*Bromus tectorum*)

DAMAGE & THREATS

Cheatgrass has the potential to dramatically alter the ecosystems it invades. Cheatgrass reduces desirable forage plant productivity and diversity of plant species. Cheatgrass is highly flammable. Cheatgrass-fueled wildfires in the west have converted native grasses and sagebrush to low seral cheatgrass-dominated landscapes (Smith and Enloe 2006). Cheatgrass can reduce wildlife habitat, including areas critical for sage grouse.

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Cheatgrass (*Bromus tectorum*) was not found to be a common species within the Phase I Haul Road and Facilities Site and no infestations were delineated. However, cheatgrass was observed outside the Phase I Haul Road and Facilities Site in the Haul Road survey area in a previously disturbed burn or Spike treatment area as the haul road corridor descends south of Hugus Draw off of the Chokecherry WDA area. Cheatgrass was found in the southern portions of the West Sinclair Rail Facility Site and is also known to occur in the pipeline corridor south of the Rail Facility (Table 3). Cheatgrass is found throughout drainage east of the Road Rock Quarry Site on sandier soils. Cheatgrass was delineated in this area extending downstream from a small pond outside the limits of disturbance (LOD) and southeast of the Road Rock Quarry. This species was also noted in several locations throughout the Phase I Wind Turbine Development Site particularly on sandier soils. Cheatgrass was identified along roadsides and in areas recently disturbed by grazing and fire within the Sierra Madre WDA (Table 3). Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 3. Cheatgrass occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	South of Hugus Draw as Road Descends out of Chokecherry WDS
West Sinclair Rail Facility	Southern end of site
Road Rock Quarry	Eastern edge of site
Phase I Wind Turbine Development	Northern portion of Chokecherry WDA

MANAGEMENT OPTIONS

Because cheatgrass is very persistent once it becomes established, eradication of large infestations is not usually a reasonable goal (Zouhar 2003). The extent to which cheatgrass dominates a plant community greatly determines the appropriate suppression strategy, and cheatgrass response to management options is very site specific. Reclamation activities within or adjacent to cheatgrass occurrences should occur as quickly as feasible following initial disturbance to reduce the likelihood of establishment by cheatgrass. Species used for reclamation in and adjacent to cheatgrass occurrences should be selected to maximize likelihood of immediate growth and stabilization to reduce the spread of cheatgrass and other weed species.

Chemical

Chemical control of cheatgrass generally requires a multiple year approach. There are few herbicides that provide effective control. The herbicides in Table 4 are recommended for range and pasturelands.

Mechanical

Mow before seed production (early flowering) to reduce seed numbers then repeat mowing throughout the growing season. This can be nearly as effective as glyphosate7. Summer mowing may facilitate seed dispersal.

Table 4. Herbicides Recommended to Control Cheatgrass.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
Imazapic	Panoramic 2SL Plateau	4-8 oz product/acre	Pre or post emergent	Can reseed following application. Sagebrush species display high tolerance at label rates.
Glyphosate	Aqua Star Forest Star GlyStar Gold Gly Star Original Gly Star Plus Gly Star Pro Glyphosate 4 PLUS Glyphosate 5.4 Glyfos Glyfos PRO Glyfos Aquatic ClearOut 41 Plus Accord Concentrate Accord SP Accord XRT Accord XRT II Glypro Glypro Plus Rodeo Showdown	6-12 oz/acre	Early spring for suppression	Can be used in reseeding projects

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Mirage Mirage Plus Aquamaster Roundup Original Roundup Original II Roundup Original II CA Honcho Honcho Plus Roundup PRO Roundup PRO Concentrate Roundup PRO Dry Roundup PROMAX Aqua Neat Credit Xtreme Foresters Razor Razor Pro GlyphoMate 41 AquaPro Aquatic Herbicide Rattler Buccaneer Buccaneer Plus Mirage Herbicide Mirage Plus Herbicide Gly-4 Plus Gly-4 Plus Gly-4 Glyphosate 4 Agrisolutions Cornerstone Agrisolutions Cornerstone Plus Agrisolutions Rascal Agrisolutions Rascal Plus			
Imazapic + Glyphosate	Journey	16-32 oz/acre	Spring or fall. Fall is ideal.	

Cultural

Where approved for use by the landowner or land-managing agency, drill seeding rangeland after chemical control is an effective control measure (Ponzetti 1997). Control without replacement by desirable perennials will likely result in the reestablishment of cheatgrass or some other undesirable species[4]. Studies in Wyoming have found that Luna pubescent wheatgrass (*Thinopyrum intermedium*), Hycrest crested wheatgrass (*Agropyron cristatum*), and Sodar streambank wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*) provided significant competition, effectively reducing cheatgrass (Whitson and Koch 1998). Washing of construction equipment that work within cheatgrass occurrences prior to use in other areas will reduce the likelihood of spread.

HALOGETON (*HALOGETON GLOMERATUS*)

DESCRIPTION AND PHOTOGRAPHS

- Annual herbaceous plant, typically 6 to 12 inches tall, with short, fleshy leaves less than half an inch long.
- Plants are bluish-green in spring and early summer, turning yellow, pink, purplish, or even reddish by late summer or early fall. Distinguished by the unique soft, slender spine on leaf tips and tiny, cotton-like hairs in the leaf axils.
- Infests disturbed areas in rangelands, such as livestock bedding or feeding areas, around desert watering sites, and overgrazed areas. Also along roadsides and rail lines, burn areas, and other disturbed sites.
- Found mainly on disturbed, arid sites in saltgrass, salt desert shrub, mixed desert shrub, sagebrush, or pinyon-juniper plant communities.
- Especially abundant in alkaline or saline soils
- Flowers July to September, and reproduces from seeds.

Figure 3. Halogeton (*Halogeton glomeratus*)

DAMAGE & THREATS

Halogeton can displace desirable vegetation, including Gardner saltbush (*Atriplex gardneri*). Halogeton is high in toxins (oxalates) and is a serious health threat to grazing animals, especially sheep. A sheep will be killed by 12 to 18 ounces of halogeton, depending on the amount of other forage consumed (Pavek 1992). Halogeton becomes more toxic as the growing season advances. Livestock readily graze halogeton, but cases of large scale poisoning of cattle are rare compared to sheep. Most losses occur when hungry and thirsty animals are allowed feed in heavy infestations of halogeton (USDA 2006).

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Within the Phase I Haul Road and Facilities Site, halogeton occurs along roadsides and areas of recent pipeline development in the northern portion of the site. Small occurrences of this species along roadsides intersecting saline environments were not delineated. Occurrences of halogeton were found throughout the West Sinclair Rail Facility Site associated with ROWs, drainages, roads, and disturbed areas in the site. (Table 5). Within the Road Rock Quarry Site, halogeton occurs in association with other noxious weed species along the eastern edge of the site. Halogeton was found to occur along existing roads throughout the Phase I Wind Turbine Development Site (Table 5). Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 5. Halogeton occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	Adjacent to pipeline corridors north of Chokecherry WDA and at Bolten Road crossing
West Sinclair Rail Facility	Throughout the site
Road Rock Quarry	Eastern edge of site
Phase I Wind Turbine Development	Northern Portions of Lower Miller Hill, found incidentally throughout Project site along existing roads.

MANAGEMENT OPTIONS

Plant populations can be controlled by proper use of herbicides, and very small infestations can be eradicated if treated early. Revegetating infested rangelands with more desirable species of perennial grasses is an economical and practical method of controlling the spread of halogeton.

Chemical

Research results indicate that several herbicides are effective for halogeton control (Table 6). The low volatile ester of 2,4-D will kill about 97 to 98 percent of the plants when applied in late May or early June, but is not selective[15]. If other vegetation is depleted, further invasion by halogeton could occur from seed in the soil or other pioneer invaders, such as Russian thistle (*Salsola kali*). Repeated treatments are usually necessary for control. Herbicide control of established stands on saline soils and low precipitation is not recommended.

Table 6. Herbicides Available to Control Halogeton

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
Metsulfuron methyl	MSM 60 AmTide MSM 60DF Herbicide Escort DF Escort XP MSM E-Pro 60 EG Herbicide MSM E-AG 60 EG Herbicide Patriot PureStand Metsulfuron Methyl DF	0.45oz. ai/acre	actively growing plants	Residual herbicide. Selective, will not harm many grass species. Use for extensive infestations in pastures and rangeland. Do not apply near water.
2,4-D	Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4 2,4-D Amine 4 2,4-D LV 4 Solve 2,4-D 2,4-D LV 6 Five Star D-638 Alligare 2,4-D Amine 2,4-D LV6 2,4-D Amine 2,4-D Amine 4 Opti-Amine Barrage HF HardBall Unison Clean Amine Low Vol 4 Ester Weed Killer Low Vol 6 Ester Weed Killer	1-2 lb a.e./acre	Preflowering stage, mid-summer	Selectively controls broadleaf plants. Certain formulations available to use in areas near/in aquatic sites. Can use higher rate; however, native plants are Impacted.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Saber Salvo Savage DS Aqua-Kleen Aqua-Kleen Esteron 99C Weedar 64 Weedone LV-4 Weedone LV-4 Solventless Weedone LV-6 Formula 40 2,4-D LV 6 Ester Platoon WEEDstroy AM-40 Hi-Dep 2,4-D Amine Barrage LV Ester 2,4-D LV4 2,4-D LV6 Clean Crop Amine 4 Clean Crop Low Vol 6 Ester Salvo LV Ester 2,4-D 4# Amine Weed Killer Clean Crop LV-4 ES Savage DS Cornbelt 4 lb. Amine Cornbelt 4# LoVol Ester Cornbelt 6# LoVol Ester Amine 4 Lo Vol-4 Lo Vol-6 Ester Base Camp Amine 4 Broadrange 55 Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4			
Glyphosate	Aqua Star Forest Star GlyStar Gold Gly Star Original Gly Star Plus Gly Star Pro Glyphosate 4 PLUS Glyphosate 5.4 Glyfos Glyfos PRO Glyfos Aquatic ClearOut 41 Plus Accord Concentrate Accord SP Accord XRT Accord XRT II	2 - 4 lbs a.e./acre Varies by formulation	Emerged plants before the bloom stage.	Nonselective herbicide. Certain formulations available to use in areas near/in aquatic sites. spot treatment on small infestations

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Glypro Glypro Plus Rodeo Showdown Mirage Mirage Plus Aquamaster Roundup Original Roundup Original II Roundup Original II CA Honcho Honcho Plus Roundup PRO Roundup PRO Concentrate Roundup PRO Dry Roundup PROMAX Aqua Neat Credit Xtreme Foresters Razor Razor Pro GlyphoMate 41 AquaPro Aquatic Herbicide Rattler Buccaneer Buccaneer Plus Mirage Herbicide Mirage Plus Herbicide Gly-4 Plus Gly-4 Plus Gly-4 Glyphosate 4 Agrisolutions Cornerstone Agrisolutions Cornerstone Plus Agrisolutions Rascal Agrisolutions Rascal Plus			

a.i. = active ingredient; a.e. = acid equivalent

Mechanical

Mow or till before flowering stage to prevent seeding. Periodic mowing close to the soil surface can significantly reduce but not completely prevent seed production.

Cultural

Where approved for use by the landowner or land-managing agency, establishing and maintaining competitive perennial vegetation can dramatically slow the introduction and spread of halogeton. Native species options include thickspike wheatgrass (*Elymus lanceolatus*), streambank wheatgrass (*Elymus lanceolatus* ssp.*lanceolatus*), Sandberg bluegrass (*Poa secunda*), slender wheatgrass (*Elymus*

trachycaulus), western wheatgrass (Pascopyrum smithii), bottlebrush squirreltail (*Elymus elymoides*), sand dropseed (*Sporobolus airoides*), saltbush (*Atriplex* sp.) and globemallow species (*Sphaeralcea* sp.) (USDA, NRCS. 2013).

LEAFY SPURGE (*EUPHORBIA ESULA*)

DESCRIPTION AND PHOTOGRAPHS

- A creeping, herbaceous perennial that grows 1 to 3 feet tall. Bluish-green leaves are narrow with smooth margins, one inch to 4 inches long.
- Flowers occur in clusters at the top of stems and are surrounded by yellowish-green showy bracts. Contains white, milky latex in all plant parts.
- Extensive root system is abundant in the top foot of soil and may grow 15 feet deep.
- Shoots originate in early spring from crown tissue just below the soil surface and from buds along the root system. Bracts emerge about two weeks before flowering (primarily April or May) and give leafy spurge the appearance of flowering.
- Tolerates moist to dry soil conditions but is most aggressive under dry conditions where competition from native plants is reduced.
- Invades disturbed sites, including prairies, pastures, abandoned fields, and roadside areas.

Figure 4. Leafy Spurge (*Euphorbia esula*)

DAMAGE & THREATS

Leafy spurge overtakes native vegetation by using available water and nutrients and through plant toxins that prevent the growth of other plants underneath it. It's an aggressive invader that can completely overtake large areas of open land. This weed can reduce rangeland cattle carrying capacity by 50 to 75 percent (CSU 2008); cattle won't graze in dense stands. The latex can cause irritation, blotching, blisters, and swelling in some people.

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Within the Phase I Haul Road and Facilities Site, leafy spurge occurs along the Platte River near the water extraction facility (Table 7). Leafy spurge was not found within the West Sinclair Rail Facility, Road Rock Quarry, or Phase I Wind Turbine Development Site. Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 7. Canada thistle occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	Near the water extraction point from the Platte River
West Sinclair Rail Facility	None
Road Rock Quarry	None
Phase I Wind Turbine Development	None

MANAGEMENT OPTIONS

Since leafy spurge can recover from almost any control effort, a management strategy that combines multiple control methods over four to five years is recommended.

Chemical

Proper timing of herbicide application is imperative, typically spring with follow-up treatment in the fall (Table 8). Herbicides applied during the hot and dry weeks of summer are less effective because leafy spurge is somewhat dormant. Apply herbicides in spring when true flowers emerge (not just the bracts). Tordon 22K is the most effective herbicide for leafy spurge control (CSU 2008). Tordon 22K applied at 2 quarts per acre annually or every other year can provide good leafy spurge control. Since this treatment is expensive it is generally used to control small or isolated patches. Tordon 22K may be tank-mixed with 2,4-D to provide adequate control at a reduced cost. Multiple treatments are necessary every year for several years. Leafy spurge can re-infest rapidly if left uncontrolled for a single year.

Table 8. Herbicides Available to Control Leafy Spurge (CSU 2008; USDA 2002)

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
Picloram	Triumph K Triumph 22K Picloram K Picloram K Picloram 22K Picloram 22K OutPost 22K Tordon K Tordon 22K Trooper 22K Grazon PC	1-2 qt/acre	Spring at flowering growth stage; or to regrowth in fall.	Restricted-use herbicide cannot be used where there is a potential for water contamination.
Picloram + 2,4-D	GunSlinger Picloram + D Picloram + D Tordon 101M Tordon 101 R Forestry Tordon RTU Grazon P+D HiredHand P+D Pathway Trooper 101 Trooper P + D	1-1.5 qts Picloram + 1-1.5 qts of 2,4-D/acre	Spring at flowering growth stage.	Apply for 3-5 consecutive years. Shoot control is generally 80 to 90 percent and cattle will feed in the area again.
Dicamba	Dicamba DMA Vision Cruise Control Banvel Clarity Vision Rifle Banvel Diablo	2 qts/acre	Spring at flowering growth stage; or to regrowth in fall.	Repeat for 3 years to see best results. Established grass that is growing under stress may be damaged by dicamba.

Active Ingredient	**Trade Names**	**Application Rate**	**Application Timing**	**Notes**
	Vanquish Herbicide Vanquish Sterling Blue			
Glyphosate	Aqua Star Forest Star GlyStar Gold Gly Star Original Gly Star Plus Gly Star Pro Glyphosate 4 PLUS Glyphosate 5.4 Glyfos Glyfos PRO Glyfos Aquatic ClearOut 41 Plus Accord Concentrate Accord SP Accord XRT Accord XRT II Glypro Glypro Plus Rodeo Showdown Mirage Mirage Plus Aquamaster Roundup Original Roundup Original II Roundup Original II CA Honcho Honcho Plus Roundup PRO Roundup PRO Concentrate Roundup PRO Dry Roundup PROMAX Aqua Neat Credit Xtreme Foresters Razor Razor Pro GlyphoMate 41 AquaPro Aquatic Herbicide Rattler Buccaneer Buccaneer Plus Mirage Herbicide Mirage Plus Herbicide Gly-4 Plus Gly-4 Plus Gly-4 Glyphosate 4 Agrisolutions Cornerstone	1 qt/acre	First application first of June and second one month later.	Apply sequentially at one month intervals, coupled with fall grass seeding. Selective herbicide. Certain formulations available to use in areas near/in aquatic sites.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Agrisolutions Cornerstone Plus Agrisolutions Rascal Agrisolutions Rascal Plus			
Glyphosate + 2,4-D	Landmaster BW Campaign Landmaster BW	54 fl. oz/acre	At early seed-set.	Risk of grass injury, especially when applied in the fall. Alternate with Picloram + 2,4-D. Treated areas cannot be grazed or hayed until 8 weeks after treatment.
Imazapic	Panoramic 2SL Plateau	8-12 oz/acre + MSO at 1 quart/acre	Early fall (late-August through October)	Use higher rate for older and dense stands. Use in pastures, rangelands, safe around trees. Apply in fall when milky latex is still present.

a.i. = active ingredient; a.e. = acid equivalent; MSO = methylated seed oil

Mechanical

Mechanical treatment is not recommended for controlling leafy spurge.

Cultural

Vigorous grass growth is important for controlling leafy spurge. Over-grazing stresses grasses and makes them much less competitive with this species. Where available and approved for use by the landowner or land-managing agency, additional irrigation may favor grass growth and make it more competitive with leafy spurge.

MUSK THISTLE (*CARDUUS NUTANS*)

DESCRIPTION AND PHOTOGRAPHS

- Biennial weed that reproduces only from seed.
- Showy red-purple flowers with painful spiny stems and leaves.
- Mature plants range are 1 to 6 feet tall with multi-branched stems. Leaves are dark green coarsely lobed, with a smooth waxy surface and a yellowish to white spine at the tip.
- Large disk-shaped flower heads, 1.5-3.5 inches in length at the tips of stems. Flower heads droop to a 90-degree angle from the stem when mature (also called nodding thistle).
- Invades open natural areas, meadows, prairies, grassy bald, disturbed areas, old pastures, roadsides, waste places, ditch banks, old fields, and hay fields.

Figure 5. Musk thistle (*Carduus nutans*)

DAMAGE & THREATS

One musk thistle plant can set up to 20,000 seeds. This aggressive plant can lead to severe degradation of native grasslands and meadows.

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Within the Phase I Haul Road and Facilities Site, Musk thistle occurs in ditches and along roadways of the Sierra Madre WDA (Table 9). Musk thistle was not found to be a common species within the West Sinclair Rail Facility and Road Rock Quarry Sites and no infestations were delineated. Musk thistle was found to occur on lower miller hill within the Phase I Wind Turbine Development Site and is primarily found along existing roadsides (Table 9). Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 9. Musk thistle occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	Scattered and isolated occurrences in ditches and along roadways of the Sierra Madre WDA
West Sinclair Rail Facility	None
Road Rock Quarry	None
Phase I Wind Turbine Development	Scattered and isolated occurrences in ditches and along roadways of the Sierra Madre WDA

MANAGEMENT OPTIONS

The key for successful management is to prevent seed production. Herbicides should be applied during the rosette stage or prior to flowering. Manual control is most effective prior to the development of seeds.

Chemical

Several herbicides are registered in pasture, rangeland and noncrop areas to control musk thistle (Table 10). Apply these herbicides in spring or fall to musk thistle rosettes. Applications during the reproductive growth stages with these herbicides (bud through flowering) will not eliminate viable seed development.

Chlorsulfuron or metsulfuron methyl have been shown to prevent or dramatically reduce viable seed formation when applied in spring, up to early flower growth stages (Beck 2008b). The latest time to apply these herbicides is when developed terminal flowers have opened up to the size of a dime.

Table 10. Herbicides Recommended to Control Musk Thistle (Beck 2008b).

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
Picloram	Triumph K Triumph 22K Picloram K Picloram K Picloram 22K Picloram 22K OutPost 22K Tordon K Tordon 22K Trooper 22K Grazon PC	0.5-1 pt/acre	Spring at rosette growth stage; or in fall	Use higher rate for older or dense stands. Restricted-use herbicide cannot be used where there is a potential for water contamination
Aminopyralid[2]	Milestone[2]	3-5 fl oz /acre	Spring at rosette growth stage; or in fall	Use higher rate for older or dense stands. Can use in areas near/in aquatic sites.
Chlorsulfuron[1]	Alligare Chlorsulfuron Telar DF Telar XP NuFarm Chlorsulf SPC 75 WDG Herbicide Chlorsulfuron E-Pro 75 WDG	0.5 oz/acre	Spring at rosette growth stage; or in fall to rosettes	use non-ionic surfactant at 0.25% v/v.
Metsulfuron methyl	MSM 60 AmTide MSM 60DF Herbicide Escort DF Escort XP MSM E-Pro 60 EG Herbicide MSM E-AG 60 EG Herbicide Patriot PureStand Metsulfuron Methyl DF	0.5 oz/acre	Spring at rosette growth stage; or in fall to rosettes	use non-ionic surfactant at 0.25% v/v.
Clopyralid	Spur Pyramid R&P Clopyralid 3 Cody Herbicide Reclaim Stinger Transline CleanSlate	0.67 to 1.33 pints/acre	Spring at rosette growth stage; or in fall	Use higher rate for older or dense stands.
Dicamba	Dicamba DMA Vision Cruise Control Banvel	1-2 pts/acre	Spring at rosette growth stage; or in fall	Can add 2,4-D . Use higher rate for older or dense stands.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Clarity Vision Rifle Banvel Diablo Vanquish Herbicide Vanquish Sterling Blue			

[1]Use 1 quart of surfactant per 100 gallons of spray solution.
[2] This herbicide is not approved for use on lands managed by the Bureau of Land Management.
a.i. = active ingredient; a.e. = acid equivalent

Mechanical

Musk thistle will not tolerate tillage and can be removed easily by severing its root below ground with a shovel. Mowing can effectively reduce seed output if plants are cut when the terminal head is in the late-flowering stage, prior to development of seeds (Beck 2008, USFS 2005). Mowed debris can be gathered and burned to destroy any seed that has developed.

Cultural

Where approved for use by the landowner or land-managing agency, cultural methods can help effectively control musk thistle. Rotational grazing can favor pasture and rangeland grass growth, which can outcompete musk thistle.

PERENNIAL PEPPERWEED (*LEPIDIUM LATIFOLIUM*)

DESCRIPTION AND PHOTOGRAPHS

- Multiple stems grow in stiff, erect masses that can reach eight feet in height, but are typically 2 to 4 feet.
- Leaves are bright green to grayish-green and lance-shaped. Lower leaves can be up to 1 foot long and 3 inches wide and are toothed along the edges. Leaves get smaller and less serraded towards the top of the stem.
- Flowers are small, white, 4-petaled and borne in dense clusters near the end of the stems.
- Deep, extensive root system capable of generating new shoots.
- Flowering occurs from early summer into fall. Seeds remain on the plant throughout the winter and drop at irregular intervals.
- Common problem in flood plains, irrigation structures, pastures, hay meadows, cropland, wetlands, riparian areas, roadsides, and residential sites.

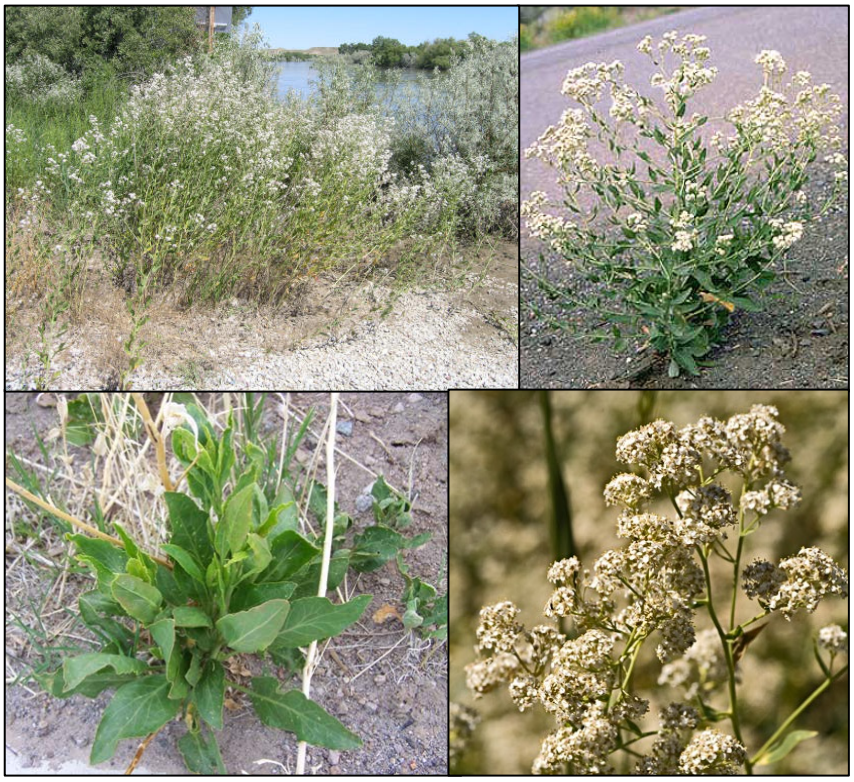

Figure 6. Perennial Pepperweed (*Lepidium latifolium*)

DAMAGE & THREATS

Perennial pepperweed rapidly forms large, dense stands that displace desirable vegetation. Populations spread along waterways and can infest entire stream corridors, riparian areas, or irrigation structures. It can inhibit growth of vital trees along waterways such as cottonwood and willow. Once established, perennial pepperweed is persistent and difficult to control in crops, natural areas, and ornamental plantings. This species reduces forage quality in hay or pasture and is toxic to livestock (MWCA 2009).

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Perennial pepperweed was not found to be a common species within the CCSM Project Site. Within the Phase I Haul Road and Facilities Site, perennial pepperweed occurs along Little Sage Creek (Table 11). Perennial pepperweed occurs in the northern end of the West Sinclair Rail Facility Site near the existing rail corridor and is primarily found scattered along ditches and natural drainages in association with other plant species. Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 11. Perennial pepperweed occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	Little Sage Creek crossing
West Sinclair Rail Facility	Northern end of site adjacent to Union Pacific rail
Road Rock Quarry	None
Phase I Wind Turbine Development	None

MANAGEMENT OPTIONS

Containment of new infestations is critical. The most effective method of containment is to spray borders of the infested areas with a herbicide (Kruger and Sheley 1999). Control is difficult once perennial pepperweed is established because the plant is so competitive and spreads rapidly by its creeping roots.

Chemical

Several post-emergent herbicides control perennial pepperweed, but applications should be repeated for several years to treat resprouting shoots and seedlings (Table 12). Chemical control can be enhanced by establishing competitive vegetation at the site. In areas with a dense thatch buildup, mow old shoots before applying herbicides. Herbicides work best when applied at the flower bud stage. If herbicide cannot be applied at the flower bud to flowering stages, mow plants and treat re-sprouting shoots. Chemical control of perennial pepperweed on non-cropland is best achieved by using chlorsulfuron or metsulfuron methyl, but cannot be used near water.

Table 12. Herbicides Available to Control Perennial Pepperweed (Wilson, et.al. 2004)

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
Chlorsulfuron[1]	Alligare Chlorsulfuron Telar DF Telar XP NuFarm Chlorsulf SPC 75 WDG Herbicide Chlorsulfuron E-Pro 75 WDG	0.75-1.5 oz a.i/acre	Flowerbud to flowering, or fall if green tissue is present.	Residual herbicide. Selective, will not harm many grass species. Do not apply near water.
Metsulfuron methyl	MSM 60 AmTide MSM 60DF Herbicide Escort DF Escort XP MSM E-Pro 60 EG Herbicide MSM E-AG 60 EG Herbicide Patriot PureStand Metsulfuron Methyl DF	0.45-0.60 oz. ai/acre	Flowerbud to flowering, or fall if green tissue is present.	Residual herbicide. Selective, will not harm many grass species. Do not apply near water.
2,4-D	Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4 2,4-D Amine 4 2,4-D LV 4 Solve 2,4-D 2,4-D LV 6 Five Star D-638 Alligare 2,4-D Amine 2,4-D LV6 2,4-D Amine 2,4-D Amine 4	1 - 2 lb a.e./acre	Anytime actively growing, best results at flowerbud to flowering.	Selectively controls broadleaf plants. Multiple applications necessary because of resprout. Certain formulations available to use in areas near/in aquatic sites.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Opti-Amine Barrage HF HardBall Unison Clean Amine Low Vol 4 Ester Weed Killer Low Vol 6 Ester Weed Killer Saber Salvo Savage DS Aqua-Kleen Aqua-Kleen Esteron 99C Weedar 64 Weedone LV-4 Weedone LV-4 Solventless Weedone LV-6 Formula 40 2,4-D LV 6 Ester Platoon WEEDstroy AM-40 Hi-Dep 2,4-D Amine Barrage LV Ester 2,4-D LV4 2,4-D LV6 Clean Crop Amine 4 Clean Crop Low Vol 6 Ester Salvo LV Ester 2,4-D 4# Amine Weed Killer Clean Crop LV-4 ES Savage DS Cornbelt 4 lb. Amine Cornbelt 4# LoVol Ester Cornbelt 6# LoVol Ester Amine 4 Lo Vol-4 Lo Vol-6 Ester Base Camp Amine 4 Broadrange 55 Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4			
Glyphosate	Aqua Star Forest Star GlyStar Gold Gly Star Original Gly Star Plus Gly Star Pro Glyphosate 4 PLUS Glyphosate 5.4 Glyfos	2 - 4 lbs a.e./acre Varies by formulation.	Mow plants when bolting and apply to resprouting foliage.	Nonselective herbicide. Certain formulations available to use in areas near/in aquatic sites.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Glyfos PRO Glyfos Aquatic ClearOut 41 Plus Accord Concentrate Accord SP Accord XRT Accord XRT II Glypro Glypro Plus Rodeo Showdown Mirage Mirage Plus Aquamaster Roundup Original Roundup Original II Roundup Original II CA Honcho Honcho Plus Roundup PRO Roundup PRO Concentrate Roundup PRO Dry Roundup PROMAX Aqua Neat Credit Xtreme Foresters Razor Razor Pro GlyphoMate 41 AquaPro Aquatic Herbicide Rattler Buccaneer Buccaneer Plus Mirage Herbicide Mirage Plus Herbicide Gly-4 Plus Gly-4 Plus Gly-4 Glyphosate 4 Agrisolutions Cornerstone Agrisolutions Cornerstone Plus Agrisolutions Rascal Agrisolutions Rascal Plus			
Imazapyr	Imazapyr 2SL Imazapyr 4SL Ecomazapyr 2SL Arsenal Railroad Herbicide Chopper Arsenal Applicators Conc. Arsenal Arsenal PowerLine	2 - 6 oz a.e./acre	Anytime actively growing, best results at flowerbud to flowering.	Residual herbicide, nonselective. Good for fence rows and highway rights-of-way. Do not use in rangeland or pasture. Use Habitat for areas near/in aquatic sites.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Stalker Habitat Polaris Polaris AC Polaris AC Polaris AQ Polaris RR Polaris SP Polaris SP Polaris Herbicide Habitat Herbicide SSI Maxim Arsenal 0.5G Ecomazapyr 2 SL Imazapyr 2 SL Imazapyr 4 SL			

a.i. = active ingredient; a.e. = acid equivalent

Mechanical

Mowing breaks old stems into small fragments and helps prevent shading of favorable species; however, mowing also stimulates plants to resprout and produce new growth. Combining mowing with herbicides has been shown to be an effective control strategy. Mow plants at the bolting or flower bud stage and apply herbicides to resprouting shoots once they have reached the flower bud stage.

Cultural

Where approved for use by the landowner or land-managing agency, establishing and maintaining competitive perennial vegetation can dramatically slow the introduction and spread of perennial pepperweed. Vigorous sod-forming grasses, alfalfa (*Medicago sativa*), or cropping systems with annual tillage can help prevent pepperweed introduction and establishment in agricultural areas.

POVERTY WEED (*IVA AXILLARIS*)

DESCRIPTION AND PHOTOGRAPHS

- Perennial, erect, with 6 inches to 2 feet tall leafy branches.
- Leaves are narrowly oblong, 0.5-2 inches long, rough, fleshy.
- Numerous greenish flower heads on stem, nodding.
- Infests cultivated crops, grain fields, meadows, and waste places
- Unpleasant odor, disliked by grazing animals
- Extensive, woody root system forms dense patches.
- Blooms May - September

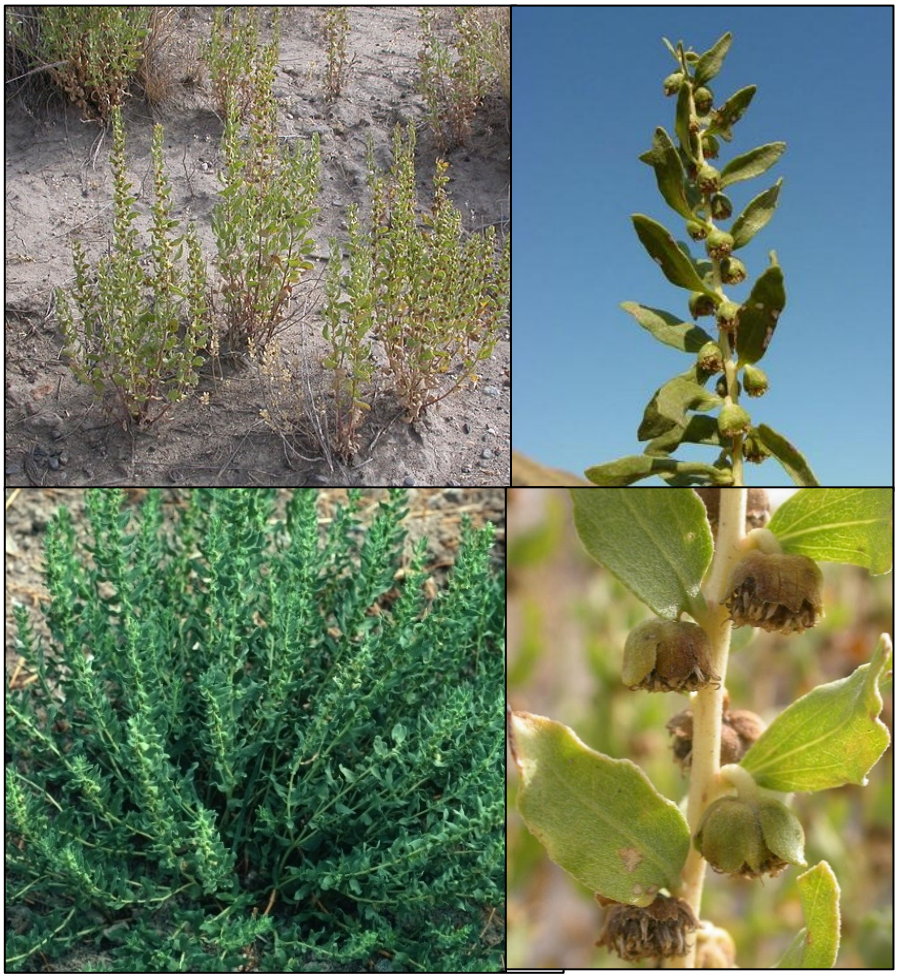

Figure 7. Poverty weed (*Iva axillaris*)

DAMAGE & THREATS

Poverty weed can become highly competitive when established in agricultural fields and may significantly reduce crop yields. Heavily infested rangeland areas have little grazing value due to the low palatability of the plant. Some report that poverty weed is a selenium accumulator and may be toxic to livestock when ingested; however, this is rare due to the unpalatable nature of the plant. Poverty weed pollen is highly allergenic and plants may cause contact dermatitis in sensitive individuals (CDFA 2014).

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Within the Phase I Haul Road and Facilities Site, poverty weed was not found to be a common species and no infestations were delineated (Table 13) although scattered occurrence of poverty weed was noted near the North Platte River water extraction site. Poverty weed was documented associated with a black greasewood (*Sarcobatus vermiculatus*)/inland saltgrass (*Distichlis spicata*) shrubland during wetland delineations within the West Sinclair Rail Facility Site. Within the Road Rock Quarry Site, poverty weed occurs in association with other noxious weed species on the southeastern corner of the site (Table 13) next to a small pond. Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 13. Poverty weed occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	None
West Sinclair Rail Facility	Associated with a black greasewood /inland saltgrass shrubland
Road Rock Quarry	Southeast of Quarry location next to small impoundment
Phase I Wind Turbine Development	None

MANAGEMENT OPTIONS

Poverty weed is generally very difficult to control due to a deep root system with high-energy reserves (CDFA 2014). Only a limited number of effective chemical options are available (Table 14).

Chemical

Research from Canada has shown 2,4-D applied at 2 lb ae/acre over a five year period was highly effective at controlling poverty weed (Best 1975). Picloram applied at 0.75 lb ae/acre was also found to be effective (Best 1975). Research from Australia has shown that high volume spot applications of 0.3% v/v clopyralid, 0.2% v/v picloram + 0.8% v/v 2,4-D were effective for short-term control. Extended control for 1 or 2 years and a very high level of control for 3 years was obtained with 0.1% v/v picloram + 0.4% v/v 2,4-D, 0.8% v/v dicamba, and 0.72% v/v glyphosate applied to each plant until the leaf surface is visibly wet (spray-to-wet method).

Table 14. Herbicides Recommended to Control Poverty weed.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
2,4-D	Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4 2,4-D Amine 4 2,4-D LV 4 Solve 2,4-D 2,4-D LV 6 Five Star D-638 Alligare 2,4-D Amine 2,4-D LV6 2,4-D Amine 2,4-D Amine 4 Opti-Amine Barrage HF HardBall Unison Clean Amine Low Vol 4 Ester Weed Killer Low Vol 6 Ester Weed Killer Saber Salvo Savage DS Aqua-Kleen Aqua-Kleen Esteron 99C Weedar 64 Weedone LV-4 Weedone LV-4 Solventless Weedone LV-6 Formula 40 2,4-D LV 6 Ester	2 lb a.e/acre	Spring, in pre-bud to early bud stages.	Selectively controls broadleaf plants. Multiple applications necessary because of resprout. Certain formulations available to use in areas near/in aquatic sites.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Platoon WEEDstroy AM-40 Hi-Dep 2,4-D Amine Barrage LV Ester 2,4-D LV4 2,4-D LV6 Clean Crop Amine 4 Clean Crop Low Vol 6 Ester Salvo LV Ester 2,4-D 4# Amine Weed Killer Clean Crop LV-4 ES Savage DS Cornbelt 4 lb. Amine Cornbelt 4# LoVol Ester Cornbelt 6# LoVol Ester Amine 4 Lo Vol-4 Lo Vol-6 Ester Base Camp Amine 4 Broadrange 55 Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4			
Picloram	Triumph K Triumph 22K Picloram K Picloram K Picloram 22K OutPost 22K Tordon K Tordon 22K Trooper 22K Grazon PC	0.75 lb a.e./acre	Anytime when weeds are rapidly growing.	Restricted-use herbicide cannot be used where there is a potential for water contamination.
Picloram + 2,4-D	GunSlinger Picloram + D Picloram + D Tordon 101M Tordon 101 R Forestry Tordon RTU Grazon P+D HiredHand P+D Pathway Trooper 101 Trooper P + D	0.1% v/v picloram + 0.4% v/v 2,4-D	Spring after all shoots have emerged, rosette to early bud growth stages; or fall	Restricted-use herbicide cannot be used where there is a potential for water contamination.
Glyphosate	Aqua Star Forest Star GlyStar Gold Gly Star Original Gly Star Plus Gly Star Pro Glyphosate 4 PLUS	0.72% v/v	Early spring for suppression	Can be used in reseeding projects

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Glyphosate 5.4 Glyfos Glyfos PRO Glyfos Aquatic ClearOut 41 Plus Accord Concentrate Accord XRT Accord XRT II Glypro Glypro Plus Rodeo Showdown Mirage Mirage Plus Aquamaster Roundup Original Roundup Original II Roundup Original II CA Honcho Honcho Plus Roundup PRO Roundup PRO Concentrate Roundup PRO Dry Roundup PROMAX Aqua Neat Credit Xtreme Foresters Razor Razor Pro GlyphoMate 41 AquaPro Aquatic Herbicide Rattler Buccaneer Buccaneer Plus Mirage Herbicide Mirage Plus Herbicide Gly-4 Plus Gly-4 Glyphosate 4 Agrisolutions Cornerstone Agrisolutions Rascal Agrisolutions Rascal Plus			
Dicamba	Dicamba DMA Vision Cruise Control Banvel Clarity Vision Rifle Banvel Diablo Vanquish Herbicide	0.8% v/v	Spring growth stage; or fall	Use as follow up on regrowth after 2,4-D treatment. Established grass that is growing under stress may be damaged by dicamba.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Sterling Blue			

a.i. = active ingredient; a.e. = acid equivalent

Mechanical

Intensive tillage over a three-year period failed to effectively control poverty weed and is not recommended[3]. Hand pulling is very difficult and must be repeated as new shoots emerge. Gloves and long sleeves should be worn due to the irritating properties of the foliage. Controlled burning is not expected to be effective for management since poverty weed is a deep-rooted perennial and a natural component of many grassland communities that experience periodic fire. There is little research on mowing, but regrowth is likely to occur with no long-term damage to the plant[3].

Cultural

Where approved for use by the landowner or land-managing agency, alternating wheat with summer fallow or growing perennial hay crops such as alfalfa (*Medicago sativa*) can help suppress infestations. Managing pastures to prevent overgrazing also helps to suppress colonization of poverty weed[3].

RUSSIAN KNAPWEED (*ACROPTILON REPENS*)

DESCRIPTION AND PHOTOGRAPHS

- Stems are erect, 18 to 36 inches tall, with many branches. Lower leaves are 2-4 inches long and deeply lobed; upper leaves are smaller with smooth margins. Shoots and leaves are covered with dense gray hairs.
- Flowers are urn-shaped, solitary, and composed of pink, lavender or white disk flowers.
- Infests cultivated land, dry pastures, roadsides, and rangeland.
- Emerges in early spring, bolts in May to June (elevation dependent) and flowers through the summer into fall.

Figure 8. Russian Knapweed (*Acroptilon repens*)

DAMAGE & THREATS

Russian knapweed crowds out and replaces native plants, reduces plant and animal diversity, harmful impacts to native species and natural ecosystems. This weed is toxic to horses (Beck 2008c), reduces forage for livestock, and reduces biodiversity for wildlife habitat (Zouhar 2001b).

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Russian knapweed occurs scattered in ditches, natural drainages, and also along existing roadways throughout the Phase I Haul Road and Facilities Site (Table 15). Within the West Sinclair Rail Facility Site, Russian knapweed was found along the Union Pacific railroad corridor consistent with BLM datasets. Russian knapweed was not found to be a common species within the Road Rock Quarry Site and no infestations were identified. Russian knapweed locations elsewhere primarily occur in agricultural areas, along ditches, and existing roadsides (Table 15). Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 15. Russian knapweed occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	Scattered in small patches throughout the site in roadways and drainages
West Sinclair Rail Facility	Northern end of the site along the Union Pacific rail
Road Rock Quarry	None
Phase I Wind Turbine Development	None

MANAGEMENT OPTIONS

Combining control methods is the best form of Russian knapweed management. A single control strategy, such as mowing or an herbicide, usually is not sufficient. The key is to stress the plant and force it to use stored root nutrients . The best way to control Russian knapweed is to combine herbicide treatment with seeding competitive grasses. Treatments should be repeated for several years.

Chemical

Russian knapweed is controlled by picloram, aminopyralid, clopyralid, clopyralid + 2,4-D, and chlorsulfuron (Table 16). Russian knapweed is very susceptible to fall-applied herbicides due to active root bud growth and development (Beck 2008c; Zouhar 2001b).

Table 16. Herbicides Available to Control Russian Knapweed (Beck 2008c)

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
Picloram	Triumph K Triumph 22K Picloram K Picloram K Picloram 22K Picloram 22K OutPost 22K Tordon K Tordon 22K Trooper 22K Grazon PC	2 to 4 pints/acre	Spring at bud to mid-flowering growth stages; or late in fall.	Restricted-use herbicide cannot be used where there is a potential for water contamination.
Aminopyralid[2]	Milestone[2]	4 to 6 oz /acre	Spring and summer at bud to flowering growth stages; or late in fall.	Use higher rate for older or dense stands. Fall treatments to dormant plants are effective. Can use in areas near/in aquatic sites.
Chlorsulfuron[1]	Alligare Chlorsulfuron Telar DF Telar XP NuFarm Chlorsulf SPC 75 WDG Herbicide Chlorsulfuron E-Pro 75 WDG	1.0 oz a.i./acre	Spring bud to flowering growth stage; or late in fall.	Residual herbicide. Selective, will not harm many grass species. Do not apply near water.
Clopyralid	Spur Pyramid R&P Clopyralid 3 Cody Herbicide Reclaim Stinger Transline CleanSlate	1 to 1.33 pints	Spring after all shoot have emerged, bud to mid-flower growth stages; late in or fall.	Use higher rate for older or dense stands. Fall treatments to dormant plants are effective
Clopyralid + 2,4-D	Commando Curtail Cutback	3-4 qts/acre	Spring after all shoots have emerged, bud to mid-flower growth stages; late in or fall.	Use higher rate for older or dense; late treatments in fall to dormant plants very effective

[1]Use a surfactant with Telar® for adequate control (0.25% to 0.5% v/v; equivalent to 1-2 quarts of surfactant per 100 gallons of spray solution.
[2] This herbicide is not approved for use on lands managed by the Bureau of Land Management.
a.i. = active ingredient; a.e. = acid equivalent

Mechanical

A combination of cutting (or mowing) and herbicides can be used to control Russian knapweed; cutting alone will not eliminate new growth. Cutting several times (spring, summer, fall) stresses Russian knapweed plants and forces them to use nutrient reserves stored in the root system[4]. Follow up with an herbicide application in the fall.

Cultural

Where approved for use by the landowner or land-managing agency, sow streambank wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*), thickspike wheatgrass (*Elymus lanceolatus*), crested wheatgrass (*Agropyron cristatum*) and Russian wildrye (*Psathyrostachys juncea*) after Russian knapweed is suppressed with herbicides[3]. Sod-forming perennial grasses, like streambank or thickspike wheatgrasses, help prevent reinvasion better than bunch grasses like crested wheatgrass.

WHITETOP OR HOARY CRESS (*CARDARIA DRABA*)

DESCRIPTION AND PHOTOGRAPHS

- A creeping perennial that grows 10 to 18 inches tall. Leaves are 0.5 to 2 inches long with blunt ends. Leaves and stems have a grayish- green color and leaves are soft and covered in fine hairs.
- Numerous white flowers with four petals, give the plant a white, flat-topped appearance.
- Flowers from May to June; seed sets in mid-summer.
- Typically found on generally open, unshaded, disturbed ground. Widespread in fields, waste places, meadows, pastures, croplands, and along roadsides
- Grows well on alkaline soils that are wet in late spring, generally prefers areas with moderate amounts of rainfall.
- Commonly found in saltcedar (*Tamarix* spp.), antelope bitterbrush / rough fescue (*Purshia tridentata* / *Festuca scabrella*), antelope bitterbrush / bluebunch wheatgrass (*Pseudoroegneria spicata*), big sagebrush (*Artemisia tridentata* spp.), and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities (Colorado State Parks 2005).

Figure 9. Whitetop (*Cardaria draba*)

DAMAGE & THREATS

Whitetop is highly competitive, once established, spreading primarily by extremely persistent roots and will eventually eliminate desirable vegetation and become a monoculture. This weed invades rangelands and is generally unpalatable.

CURRENT DISTRIBUTION

Surveys were conducted within the Phase I Wind Turbine Development disturbance areas as well as a 100 foot minimum buffer surrounding all planned disturbances. During survey efforts, biologists recorded any occurrences of noxious and invasive weed species encountered. Any new infestations observed during construction or reclamation will be recorded and monitored.

Within the Phase I Haul Road and Facilities Site, whitetop occurs throughout the site and is primarily found associated with ditches natural drainages (Table 17). Whitetop was found to occur within a drainage in the central area of the West Sinclair Rail Facility Site. Within the Road Rock Quarry and Phase I Wind Turbine Development Sites, whitetop was not found to be a common species and no infestations were delineated (Table 17). Specific locations and maps showing these occurrences are available in the respective weed survey reports for these sites.

Table 17. Whitetop occurrences.

Project Site	Locations
Phase I Haul Road and Facilities	Potential in drainages throughout the site
West Sinclair Rail Facility	Areas adjacent to Sugar Creek
Road Rock Quarry	None
Phase I Wind Turbine Development	None

MANAGEMENT OPTIONS

Control of whitetop is difficult because of the perennial root system, abundant seed production, and diverse habitats invaded by the plant. Containing existing weed infestations by annual border spraying of the outside perimeter of the infestation is important to prevent spread.

Chemical

Herbicides are effective in suppressing or controlling new infestations of hoary cress (Table 18). On large, well established infestations, herbicides should be combined with management methods that increase desirable competitive vegetation to achieve long-term control. Metsulfuron methyl or chlorsulfuron provide the most effective hoary cress control on range, pasture, wildland, and rights-of-way sites (Duncan and Ranz 2010). Successful control usually depends on an aggressive reapplication program.

Table 18. Herbicides Available to Control Whitetop[4]

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
2,4-D	Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4 2,4-D Amine 4 2,4-D LV 4 Solve 2,4-D 2,4-D LV 6 Five Star D-638 Alligare 2,4-D Amine 2,4-D LV6 2,4-D Amine 2,4-D Amine 4 Opti-Amine Barrage HF HardBall Unison Clean Amine Low Vol 4 Ester Weed Killer Low Vol 6 Ester Weed Killer Saber Salvo Savage DS Aqua-Kleen Aqua-Kleen Esteron 99C Weedar 64 Weedone LV-4 Weedone LV-4 Solventless Weedone LV-6 Formula 40 2,4-D LV 6 Ester Platoon WEEDstroy AM-40 Hi-Dep 2,4-D Amine Barrage LV Ester 2,4-D LV4 2,4-D LV6	1 - 2 lb a.i./acre	Bolting to budding stages.	Selectively controls broadleaf plants, will not harm grass. Apply annually for at least 2years to reduce density.

Active Ingredient	**Trade Names**	**Application Rate**	**Application Timing**	**Notes**
	Clean Crop Amine 4 Clean Crop Low Vol 6 Ester Salvo LV Ester 2,4-D 4# Amine Weed Killer Clean Crop LV-4 ES Savage DS Cornbelt 4 lb. Amine Cornbelt 4# LoVol Ester Cornbelt 6# LoVol Ester Amine 4 Lo Vol-4 Lo Vol-6 Ester Base Camp Amine 4 Broadrange 55 Agrisolution 2,4-D LV6 Agrisolution 2,4-D Amine 4 Agrisolution 2,4-D LV4			
Imazapic	Panoramic 2SL Plateau	8-12 oz/acre + MSO at 1 quart/acre	Full bloom or fall to rosettes	
Glyphosate	Aqua Star Forest Star GlyStar Gold Gly Star Original Gly Star Plus Gly Star Pro Glyphosate 4 PLUS Glyphosate 5.4 Glyfos Glyfos PRO Glyfos Aquatic ClearOut 41 Plus Accord Concentrate Accord SP Accord XRT Accord XRT II Glypro Glypro Plus Rodeo Showdown Mirage Mirage Plus Aquamaster Roundup Original Roundup Original II Roundup Original II CA Honcho Honcho Plus Roundup PRO Roundup PRO Concentrate Roundup PRO Dry Roundup PROMAX	2-3 lbs a.e./acre	Bolt growth stage.	Certain formulations available to use in areas near/in aquatic sites.

Active Ingredient	Trade Names	Application Rate	Application Timing	Notes
	Aqua Neat Credit Xtreme Foresters Razor Razor Pro GlyphoMate 41 AquaPro Aquatic Herbicide Rattler Buccaneer Buccaneer Plus Mirage Herbicide Mirage Plus Herbicide Gly-4 Plus Gly-4 Plus Gly-4 Glyphosate 4 Agrisolutions Cornerstone Agrisolutions Cornerstone Plus Agrisolutions Rascal Agrisolutions Rascal Plus			
Metsulfuron methyl	MSM 60 AmTide MSM 60DF Herbicide Escort DF Escort XP MSM E-Pro 60 EG Herbicide MSM E-AG 60 EG Herbicide Patriot PureStand Metsulfuron Methyl DF	0.5-1 oz. ai/acre+ non-ionic surfactant at 0.25% V/V	Early in the spring, to regrowth before bud stage, or to fall regrowth.	Residual herbicide. Selective, will not harm many grass species. Do not apply near water.
Chlorsulfuron	Alligare Chlorsulfuron Telar DF Telar XP NuFarm Chlorsulf SPC 75 WDG Herbicide Chlorsulfuron E-Pro 75 WDG	1.0-1.5 oz a.i/acre+ non-ionic surfactant at 0.25% V/V	Pre-bloom to bloom; or fall	Residual herbicide. Selective, will not harm many grass species. Do not apply near water.

a.i. = active ingredient; a.e. = acid equivalent

Mechanical

Mowing alone will not effectively control whitetop and may injure desirable vegetation. Mowing to ground level at the early flower growth stage may reduce stem density and the number of seeds produced, but does not provide long-term control. Repeat mowing when the plants re-bud. Mowing integrated with an appropriate herbicide about a month later can be effective.

Cultural

Where approved for use by the landowner or land-managing agency, the effectiveness of a mowing program can be increased by planting perennial grasses as competitors.

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Attachment C

Pesticide Use Proposal Form

UNITED STATE DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

PESTICIDE USE PROPOSAL

STATE:
COUNTY:
FIELD OFFICE:
DURATION OF PROPOSAL:

DATE:
PROPOSAL NUMBER:
EA REFERENCE NUMBER:
DECISION RECORD (DR) NUMBER:

LOCATION:

ORIGINATOR – NAME:
ORIGINATOR – COMPANY:
ORIGINATOR – CONTACT INFORMATION:

I. APPLICATION INFORMATION – (Including mixtures and adjuvants):

1. TRADE NAME(S):
2. COMMON NAME(S):
3. EPA REGISTRATION NUMBER(S):
4. MANUFACTURER(S):
5. METHOD OF APPLICATION:
6. MAXIMUM RATE OF APPLICATION – AS STATED ON THE LABEL:
    a. Formulated Product:
    b. Pounds Active Ingredient or Acid Equivalent:
7. INTENDED RATE OF APPPLICATION:
    a. Formulated product:
    b. Pounds Active Ingredient or Acid Equivalent:
8. APPLICATION DATE(S):
9. NUMBER OF APPLICATIONS:

II. PEST [List specific pest(s) and reason(s) for the proposed application of the pesticide]:

III. DESIRED RESULTS OF THE APPLICATION – LINKED TO THE OBJECTIVES OF THE APPLICATION:

IV. APPLICATION SITE DESCRIPTION:

1. ESTIMATED NUMBER OF ACRES:
2. GENERAL DESCRIPTION (Describe land type or use, size, stage of growth of target species, soil characteristics, and any additional information that may be important in describing the area to be treated.)

V. SENSITIVE ASPECTS AND PRECAUTIONS (Describe sensitive areas – marsh, endangered, threatened, candidate, and sensitive species habitat – and distance to application site. List measures to be taken to avoid impact to these areas):

VI. NON-TARGET VEGETATION (Describe potential immediate and cumulative impacts to non-target pests in Project area as a result of the pesticide application. Identify any planned mitigation measures that will be employed – BE GENERAL, SPECIFICS DISCUSSED IN THE EA):

VII. INTEGRATED PEST MANAGEMENT PRACTICES CONSIDERED IN THE OVERALL PROJECT:

VIII. SIGNATURES:

1. Pesticide Use Proposal's Originator: _____ Date:_____
   a. Company: _____
2. Certified Pesticide Applicator: _____ Date:_____
   a. Printed Name: _____
   b. Address: _____
   c. License Number: _____
   d. Certifying Organization: _____

3. Field Office Weed and Pest Coordinator: _____ Date: _____

4. Field Office Manager: _____ Date:_____

5. BLM State Weed and Pest Coordinator: _____ Date:_____

6. Deputy State Director: _____ Date:_____
   - Concur or Approved
   - Not Concur or Disapproved
   - Concur or Approved With Modifications

     - Any changes (modifications) to this proposal by the state pesticide Coordinator will be listed below or in an attached memo to the manager requesting approval from the Deputy State Director