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UMTRA Project

2007 Weed Control Plan for the Moab, Utah UMTRA Project Site

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2007 Weed Control Plan
for the Moab UMTRA Project Site

Work Performed by S.M. Stoller Corporation under DOE Contract No. DE–AC01–02GJ79491 for the U.S. Department of Energy Office of Environmental Management, Grand Junction, Colorado

1.0 Executive Summary

The Moab *Weed Control Plan* identifies noxious and undesirable plants and presents control methodology. In addition, mapping and monitoring plans will be utilized to assess program results and new infestations. A systematic plan and review will facilitate budget preparation. The plan and list of target weed species will be used to raise Moab UMTRA Project Site (Moab Site or site) personnel awareness of the list of undesirable plants and the need for control. A handout showing noxious weeds will be prepared to more easily identify undesirable weeds.

2.0 Introduction

Revegetation at the Moab Site began in late 2004, and since that time, weed control has been employed. A weed control plan is recommended for 2007 because the scale of operations is large enough to warrant a more comprehensive plan. This plan is intended to address weed control at the site and integrate management approaches for 2007. Plan components include weed mapping, weed-specific preventive and reactive treatments, and awareness for site workers.

3.0 Weed Mapping

Weed mapping is extremely valuable for locating and monitoring weed populations over time and evaluating treatment effectiveness. Preparation of a site-wide weed map is recommended. The map should show locations of known weed infestations and dates, types, and effectiveness of treatments applied. Future mapping should be conducted in spring, mid-summer, and early fall across the site (and adjacent vicinity properties as necessary). Maps should be updated each time to reflect current conditions and should include all weeds listed in Section 4.0 (below).

4.0 Treatment of Weed Infestations

Individual weed species of concern at the Moab Site are listed as follows, in approximate order of concern from highest to lowest. Each weed is then discussed separately, with control recommendations. Note: for reference, weeds with noxious listings in nearby Colorado are also included; List B species are considered more noxious than List C.

- Russian knapweed (*Acroptilon repens*), Utah-listed noxious weed (see Table 1); also noxious in Colorado (CO List B).
- Diffuse knapweed (*Centaurea diffusa*), Utah-listed noxious weed; also Colorado (CO) List B.
- Kochia (*Bassia scoparia*), common annual with local management concerns.
- Tamarisk/saltcedar (*Tamarix ramosissima*), CO noxious List B.
- Puncturevine (*Tribulus terrestris*), undesirable, noxious in Colorado (CO List C).
- Russian thistle (*Salsola tragus*), common annual with local management concerns.
- Russian olive (*Elaeagnus angustifolia*), undesirable, CO noxious List B.
- Halogeton (*Halogeton glomeratus*), toxic, noxious in Colorado (CO List C).

- Others including horseweed (*Conyza canadensis*); redstem filaree (*Erodium cicutarium*), CO noxious List B; common cocklebur (*Xanthium strumarium*), undesirable/toxic; and cheatgrass (*Bromus tectorum*), CO List C.

Table 1. State of Utah Noxious Weed List (updated 2006)

Common Name	Scientific Name
Whitetop; hoary cress	*Cardaria draba*
Musk thistle	*Carduus nutans*
Diffuse knapweed	*Centauria diffusa*
Spotted knapweed	*Centaurea stoebe* ssp. *micranthos*
Russian knapweed	*Acroptilon repens*
Yellow star thistle	*Centaurea solstitialis*
Squarrose knapweed	*Centaurea virgata* ssp. *squarrosa*
Canada thistle	*Cirsium arvense*
Field bindweed	*Convolvulus arvensis*
Bermuda grass	*Cynodon dactylon*
Quackgrass	*Elymus repens*
Leafy spurge	*Euphorbia esula*
Dyer's woad	*Isatis tinctoria*
Broadleaf pepperweed	*Lepidium latifolium*
Purple loosestrife	*Lythrum salicaria*
Scotch thistle	*Onopordum acanthium*
Johnson grass	*Sorghum halepense*
Perennial sorghum	*Sorghum almum*
Medusahead	*Taeniatherum caput-medusae*

4.1 Russian and Diffuse Knapweed

Very dense populations of Russian knapweed existed on the eastern portion of the site prior to 2005. Foliar herbicides were applied in 2005 and 2006, and treatments have been highly successful. Isolated individuals of diffuse knapweed were found in 2006.

Recommendations:

- Map all populations and scattered individuals (preliminary, mid-summer, fall).
- Spot-treat in mid- and late-summer with appropriate herbicide.[1]
- Continue monitoring (via fall mapping) previously infested areas for 10 years.
- Evaluate possible control measures in nearby areas. Greater control of seed sources could be achieved by reducing populations on adjacent properties and also in the contaminated area.

4.2 Kochia

This annual weed is common on newly revegetated sites and it decreases with competition. Irrigated plants can become extremely large, curtailing the establishment of desirable species. Mowing and hand-pulling have been successful in some portions of the site, but are labor-intensive. Early chemical control was attempted in spring 2006, but the herbicide (Milestone)

[1] Rotation of herbicides is recommended every third year to prevent plants from building up resistance.

proved to be ineffective on emerging kochia. Late-summer herbicide treatments with different chemicals were more effective. Control of kochia within bermed areas is not recommended because these populations are decreasing.

Recommendations:

- Map all populations in uncontaminated portions of site (preliminary, spring, fall).
- Apply pre-emergent herbicide (non-damaging to established shrubs) in *early* spring, ONLY in the patches watered with bubblers in Area A's shrub zone. The selected herbicide should also minimize damage to existing grass and desirable forb species.
- Reduce Area A's shrub zone watering to approximately once per week.
- Hand-pull surviving kochia in Area A's shrub zone in mid summer.
- Apply pre-emergent herbicide to margins of well field in Area C and between bermed areas. Use only fish-safe chemicals, and apply in *early* spring.
- Seed inside and outside of berms in Area C (see Table 2).
- Apply broadleaf herbicide to inside and outside of berms in Area C in late June.
- Mow surviving kochia in mid-summer between berms and late-summer on berms.

Note: many kochia populations are herbicide-resistant, or can easily become so over time. The most appropriate long-term control, where feasible, is revegetation rather than the repeated use of herbicides.

Table 2. Recommended grass seed mix for weed control in 2007

Common Name	Scientific Name	Pounds PLS/acre[2]
Distichlis spicata	Inland salt grass	5
Bouteloua gracilis	Blue grama	4
Achnatherum hymenoides	Indian ricegrass	3
Sporobolus cryptandrus	Sand dropseed	3
Pleuraphis jamesii	Galleta	2
Poa secunda	Nevada bluegrass	2
Elymus trachycaulus	Slender wheatgrass	1
Pascopyrum smithii	Western wheatgrass	1
Puccinellia distans	Weeping alkaligrass	1
Puccinellia nuttalliana	Nuttall's alkaligrass	1
Sporobolus airoides	Alkali sacaton	1
	TOTAL	**24**

4.3 Tamarisk/Saltcedar

Tamarisk was the most common undesirable species on the site prior to revegetation. It has been reduced by root crown excavation and cut-and-treat techniques; some plants have re-sprouted from previously-treated stumps and some new seedlings have sprouted. Because tamarisk is resistant to many chemicals, any treatments effective on tamarisk are potentially dangerous to desirable plants. In fall 2005, tamarisk was carefully spot-sprayed in Area A with "Habitat"

[2] Drill-seed application rate is given; double this rate for broadcast seeding

herbicide; unfortunately, this chemical migrated through the soil and damaged desirable trees and shrubs.

In 2006, tamarisk leaf beetles (*Diorhabda elongata*) spread across the site and defoliated many plants, *including seedlings*. The beetles are expected to drastically reduce populations over three to five years, but will not eliminate the weed. Seedling tamarisk will likely be most affected by the leaf beetle in 2007 because of small root mass. Seed production of mature plants is also expected to be reduced by beetle damage.

Recommendations:

- Map populations on site (preliminary; fall).
- No additional control is recommended at this time, but re-evaluation of tamarisk populations and potential additional control methods in fall 2007 is recommended.
- If individual tamarisk trees are to be removed for aesthetic reasons, cut-and-stump techniques in spring 2007 are recommended. However, these actions would reduce the effectiveness of the establishing leaf beetles.
- In Areas B and C, flood irrigation should be reduced to once every two weeks throughout the growing season. This will also reduce the establishment of seedling tamarisk.

4.4 Puncturevine

Though not listed as noxious in Utah, puncturevine (also called goathead) is a very undesirable plant, easily spread by vehicle and foot traffic. This weed increased on site in 2006 and has the potential to spread across the remediated US–191 area and further into Area A in 2007.

Recommendations:

- Map populations on site and in US–191 right-of-way (preliminary, mid-summer, and fall).
- Spot-spray site plants with glyphosate- and/or 2,4-D-based herbicide in mid-summer.
- Remove surviving plants manually with a shovel in late summer before seed set and discard (if plants are left on-site, they will still set seed).
- Release bio-control insects (weevils, available commercially or from the Palisade Insectary) with permission of nearby properties containing source populations.

Note: Weevils should not be released on the site where herbicide treatment is planned, but only to reduce the continued spread of the weed from nearby sources.

4.5 Russian Thistle

Russian thistle is a common annual weed that decreases with competition from desirable vegetation. It is not noxious or competitive after new vegetation has established. It is visible in utility right-of-ways on site.

Recommendations:

- Map populations on site (preliminary, spring, fall).
- Infestations in areas without competing vegetation should be seeded (see Table 2).
- If control is desired for cosmetic reasons, mowing three times during the summer and hand pulling is recommended.

Note: Herbicides are not recommended because Russian thistle populations develop herbicide resistance, and they prevent establishment of desirable vegetation over time.

4.6 Russian Olive

Most of the Russian olive trees on the site have been removed during remediation, but this aggressive exotic has great potential to spread and displace desirable riparian trees and shrubs.

Recommendations:

- All plants on site should be mapped (preliminary; fall).
- All plants should be controlled as soon as possible with cut-and-treat techniques.

Because Russian olive is not currently widespread on the site, it is possible to eliminate it. After the plants have been treated, all riparian areas on site should continue to be monitored (via weed mapping) and treated to prevent reinvasion and spread.

4.7 Halogeton

Halogeton is toxic to cattle and sheep, and it can be very aggressive in areas with sparse vegetation. This plant exists at the site, particularly along US–191, but it is not currently widespread.

Recommendations:

- Map all plants on site (preliminary, midsummer, fall).
- If halogeton is found in Area A or the US–191 remediation area in 2007, spot spraying with an appropriate post-emergent herbicide is recommended to protect populations of desert bighorn that frequently visit the area.

4.8 Other Weeds

Passive control is recommended for weed species described in this section. The species listed below are currently not high-priority species, but if resources become available or populations begin to increase substantially, they should be actively controlled.

<u>Horseweed</u>

Horseweed was found in high frequencies in some portions of Area C in 2006; seed was probably introduced in irrigation water. Though visible, horseweed is not noxious or aggressive. Hand-pulling was done in Area C in 2006 for aesthetic reasons.

Recommendations:

- Map areas of infestation (preliminary; mid-summer).
- Active control is not recommended at this time; if control is desired for aesthetic reasons and resources are available, hand-pulling may be done.
- If mapping indicates that the weed is increasing to become a local nuisance, spot-spray in spring 2008 after the plants have emerged (with a fish-safe herbicide).

Redstem Filaree

Redstem filaree existed on the site prior to remediation, and it persists. This weed has the potential to become a nuisance weed at the Moab Site, but it is not currently.

Recommendations:

- Map areas of infestation (preliminary, spring, fall).
- Control measures are not needed at this time.

Cheatgrass

Cheatgrass is a pervasive annual weed across the site, primarily occurring on the utility right of ways. It also pre-existed on vicinity properties remediated in 2006.

Recommendations:

- Map newly revegetated areas of the site and vicinity properties (preliminary, spring, fall)
- If significant monocultures of cheatgrass develop, they should be treated and reseeded in 2008 before infestations have the opportunity to spread.

Common Cocklebur

Common cocklebur occurs in wetland and riparian areas on the site. It pre-existed on vicinity properties remediated in 2006. Although it is not listed noxious, it is undesirable and toxic to wildlife.

Recommendations:

- Map areas of infestation (fall).
- Hand pull or chop on an opportunistic basis throughout the growing season.

Noxious weeds may enter the site at any time on vehicle tires or equipment. They could also arrive in irrigation water or be wind-borne. Any State of Utah-listed noxious weeds (Table 1) new to the site should be controlled immediately by hand-pulling or chemical treatment.

Other undesirable species that have not been found on the site, but should be included on a "watch list" include houndstongue (*Cynoglossum officinale*, CO List B) and common burdock (*Arctium minus*, CO List C). Other species should be added to the "watch list" over time as conditions change.

4.9 Schedule and Summary of Recommended Tasks

Table 3. Recommended Active Control Task Schedule and Summary

Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prepare preliminary weed maps from site records	X											
Create weed handout (see Section 4.0)	X	X										
Cut / treat Russian olive	X	X	X							X	X	X
Cut / treat tamarisk	X	X	X							X	X	X
Spray pre-emergent in Area A Shrub Zone and Area C (between berms and margins of well fields)		X	X									
Seed berms in Area C			X									
Seed Russian thistle areas without other vegetation		X	X									
Map spring emergents[a]				X								
Hand-pull horseweed					X	X	X	X				
Spray Area C berms with broadleaf herbicide					X	X						
Spot-spray puncturevine[b]						X	X					
Puncturevine bio-control on adjacent properties[c]						X	X					
Treat Russian knapweed[d]						X	X	X	X			
Hand-pull weeds in Area A Shrub Zone						X	X	X				
Map midsummer weeds[e]							X					
Spot spray halogeton (if any) in Area A and US–191							X	X				
Mow annual weeds in Area C							X	X	X			
Mow Russian thistle in utility right of way							X	X	X			
Hand-remove puncturevine								X	X			
Map fall weeds[f]									X			
Evaluate need for future tamarisk control in addition to beetle										X		

Note: tasks undertaken only for aesthetic reasons are highlighted in gray.
[a]Spring emergents include kochia, Russian thistle, redstem filaree, and cheatgrass.
[b]Herbicides are not effective after flowering; timing is best determined by weed control subcontractor.
[c]Timing should coincide with insectary's recommendations.
[d]Treat during early flowering period; timing is best determined by weed control subcontractor.
[e]Mid-summer weeds include Russian knapweed, diffuse knapweed, puncturevine, halogeton, and horseweed.
[f]Fall weeds include Russian knapweed, diffuse knapweed, kochia, tamarisk, puncturevine, Russian thistle, Russian olive, redstem filaree, cheatgrass, and halogeton.

Additional tasks include:

- Evaluate potential control measures for Russian and diffuse knapweed on adjoining properties and in the contaminated area.
- Utilize new watering schedule (once per week in Area A's shrub zone; once every two weeks in Areas B and C).

5.0 Worker Awareness

Vehicles and other equipment are the main agents of weed seed introduction and spread. All statements of work for earthwork and/or revegetation should include provisions for pressure-washing equipment prior to arriving on site. These provisions need to be strictly enforced by all site personnel; equipment that is not clean should be removed and cleaned prior to use on site.

Because early detection of weeds new to a site may prevent high-cost weed control measures later, it would be beneficial to maximize chances of weed identification. It is recommended that a handout showing Utah's noxious weeds be prepared and posted at the site so that workers can more easily identify potential problem plants.