DOE-EM/GJRAC1655

Moab UMTRA Project
Revegetation and Weed Control Plan

Revision 10

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U.S. Department of Energy

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Moab UMTRA Project Revegetation and Weed Control Plan

Revision 10

Review and Approval

1/2/2024

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Revision History

Revision	Date	Description
0	April 2009	Initial issue.
1	September 2010	Update includes 2010 areas and future planning.
2	July 2014	Update includes 2014 areas and activities.
3	June 2017	Revision includes update to performance monitoring and activities and incorporation of the Weed Control Plan (formerly DOE-EM/GJTAC1406).
4	July 2018	Updated to include watering schedule and various new methodologies.
5	August 2019	Periodic update to reflect SME recommendations and associated procedures.
6	July 2020	Periodic update to establish revegetation zones and zone numbers.
7	February 2021	Revisions to include updated goals, priorities, 1-, 3-, and 5-year plans, and noxious weed management.
8	February 2022	Revision includes updates to 1-, 3-, and 5-year plans and tracking tools; addition of comparison tracking tool figures.
9	January 2023	Change document designation from TAC to RAC. Included Crescent Junction site, updated site locations and descriptions. Revised goals and 1-, 3-, and 5-year plans. Removed and/or updated noxious weed tables and figures. Technical herbicide information will be transferred to the *Moab UMTRA Project Revegetation Operations and Maintenance Manual for the Moab Site* (DOE-EM/GJTAC2262). Added new figure for repeat photo monitoring program. Updated references.
10	January 2024	Updated site goals and moved to Section 2.0. Consolidated 1, 3, and 5-year plans. Updated Crescent Junction (CJ) information with 2023 plant inventory information, site map (Figure 6), and included plant inventory report (Appendix A). Removed wording regarding chipping operations. Updated Section 4.3 to include CJ information and removed color-coded weed control figures. Updated Section 6.0 Strategic Partnerships. Minor edits throughout.

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Acronyms and Abbreviations

AMSL	Above Mean Sea Level
BLM	Bureau of Land Management
BMP	best management practices
CA	Contamination Area
CAA	Clean Air Act
CFR	Code of Federal Regulations
CJ	Crescent Junction
CO	Colorado
CUP	Conditional Use Permit
CWA	Clean Water Act
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DNR	Division of Natural Resources
dS/m	decisiemens per meter
EMS	Environmental Management Standard
EO	Executive Order
ESA	Endangered Species Act
ET	Evapotranspiration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, & Rodenticide Act
FFSL	Forestry, Fire, and State Lands
FSS	Final Status Survey
H&S	Health and Safety
LM	Legacy Management
MBTA	Migratory Bird Treaty Act
MOA	memorandum of agreement
MOU	memorandum of understanding
MSO	methylated seed oil
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	U.S. National Park Service
RAC	Remedial Action Contractor
RRR	Rim to Rim Restoration
SDS	safety data sheets
SME	subject matter expert
SOP	standard operating procedure
SURP	Southeast Utah Riparian Partnership
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Assistance Contractor
UPDES	Utah Pollutant Discharge Elimination System
UMTRA	Uranium Mill Tailings Remedial Action
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
USU	Utah State University
UTV	utility terrain vehicle
WRI	Watershed Restoration Initiative

1.0 Introduction

The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project Revegetation and Weed Control Plan outlines the vision, goals, priorities and planning, implementation, monitoring and evaluation for disturbed areas at the Moab and Crescent Junction sites. The revegetation workflow is illustrated below (Figure 1).

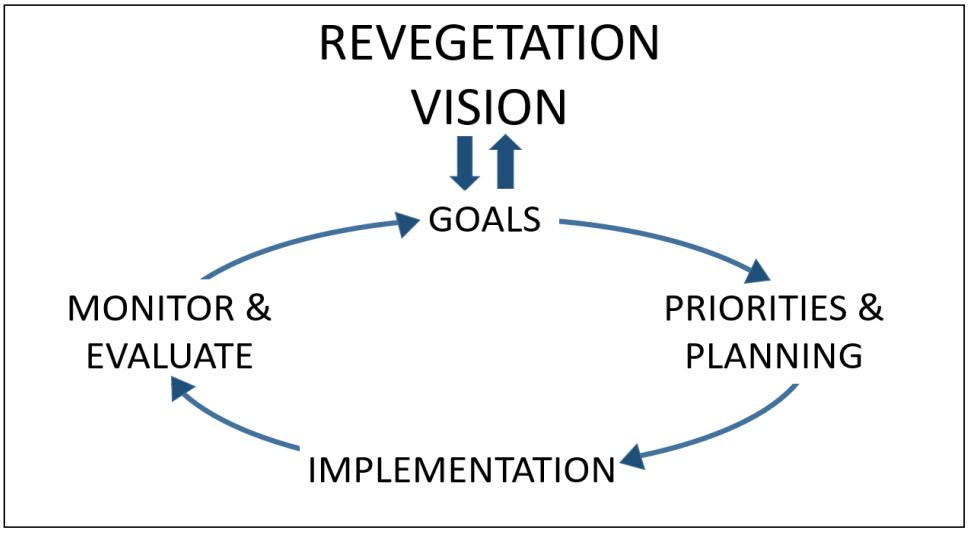

Figure 1. Workflow of Overall Revegetation and Weed Control Program

Both revegetation and weed control are critical in restoring the Project's remediated areas to a sustainable, resilient, native ecosystem. Revegetating with desirable, native plant species stabilizes soil, decreases competition of weed species, minimizes fugitive dust production, reduces water-use, and controls storm water erosion and off-site transport of sediment. Native revegetation also promotes biodiversity, improves wildlife habitat and aesthetics, and encourages potential recreational opportunities.

Non-native weed species can be invasive and aggressive with the potential to cause significant damage to native ecosystems and/or cause economic losses. Invasive plants are a concern because of their potential to reduce native plant diversity, increase soil erosion, degrade wildlife habitat, damage watersheds, and adversely impact the general ecological health of native ecosystems (Idaho Power 2020). Ecological damage from uncontrolled weed infestations can be permanent, rendering lands unable to return naturally to their pre-invasion condition (Lowry et al. 2017).

Careful, species-specific planning and long-term efforts are necessary to achieve desired results, especially in disturbed, arid ecosystems. The purpose of this document is to outline a plan that will promote good stewardship, conservation of natural resources, and improve resilient native ecosystems while complying with applicable federal, state, and local regulations.

1.1 Background and Site Locations

The Moab UMTRA Project site, owned by the Department of Energy (DOE), is a former uranium ore-processing facility located about 4 miles northwest of the city of Moab in Grand County, Utah (Figure 2).

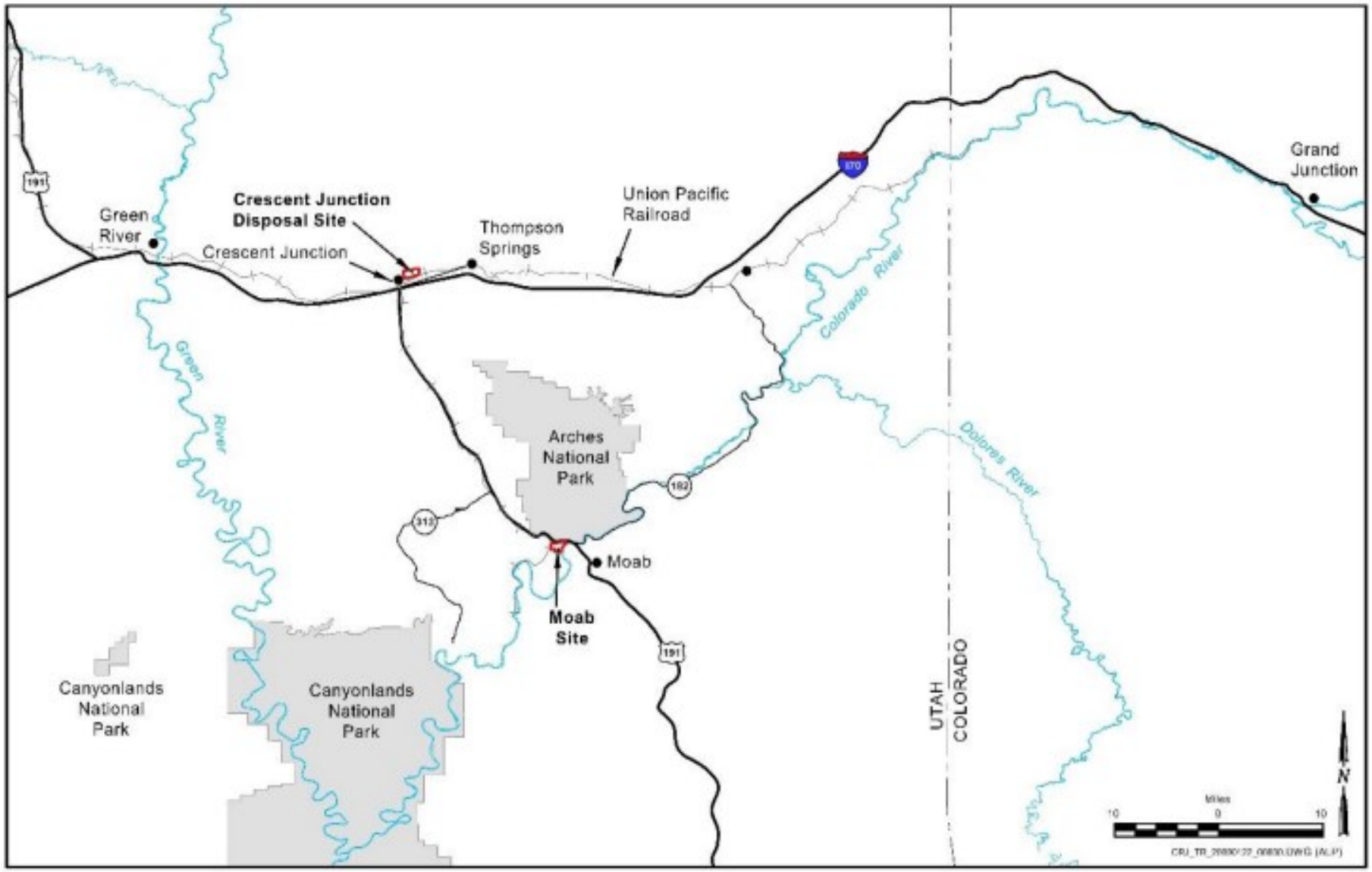

Figure 2. Location of Moab and Crescent Junction Sites

The Moab site encompasses 480 acres, of which approximately 130 acres are covered by a uranium mill tailings pile (Figure 3). The Moab Project mission is to safely relocate mill tailings and other process-related wastes, collectively known as residual radioactive material (RRM), from the former uranium ore-processing facility (mill site) in Moab site to an engineered disposal cell constructed near Crescent Junction, approximately 30 miles north (Figure 4). The mission also includes active remediation of contaminated groundwater at the Moab site.

Refer to the *Moab UMTRA Project Annual Site Environment Report for Calendar Year 2022* (DOE-EM/GJ3101) for more details about site history and background.

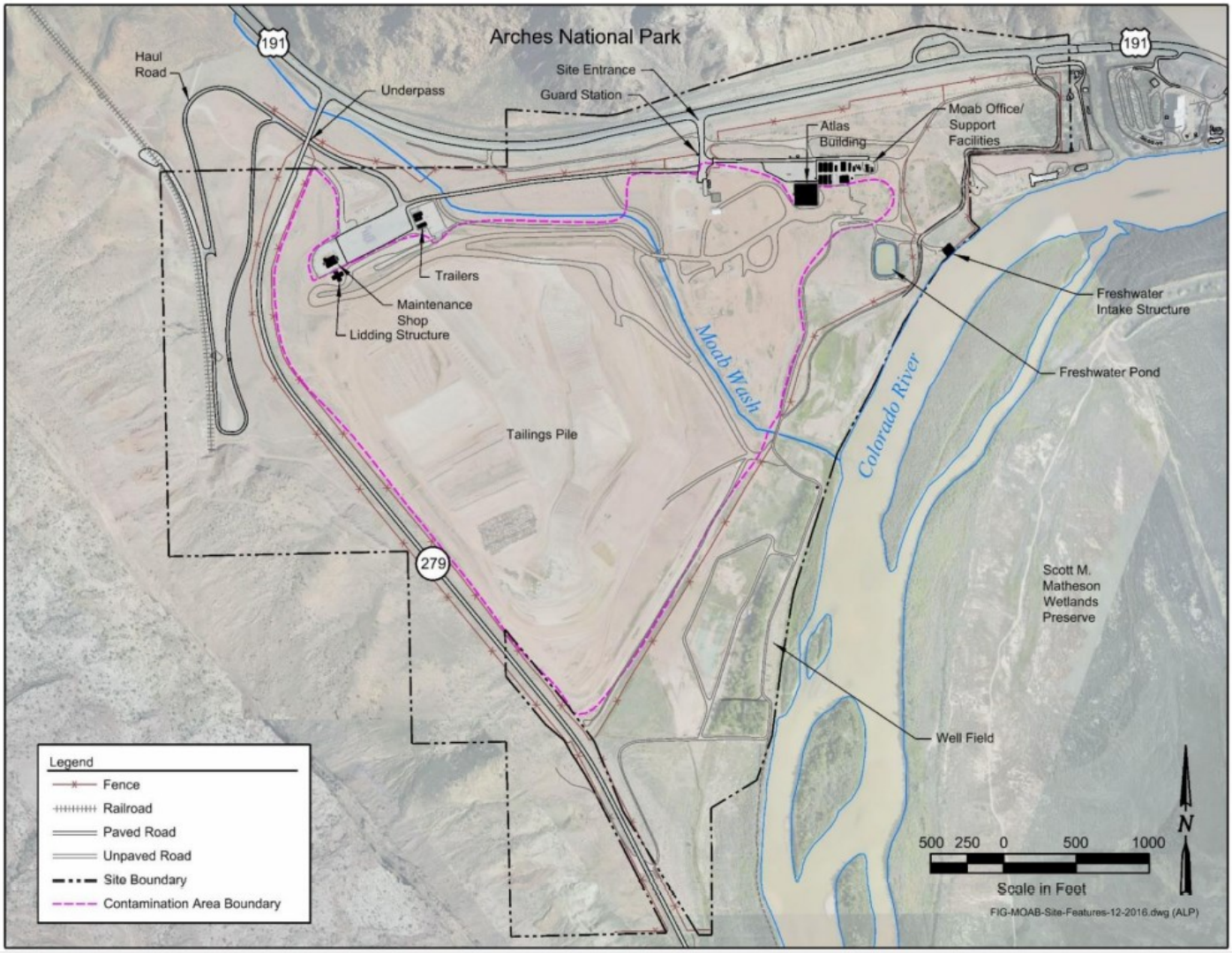

Figure 3. Moab Site Features

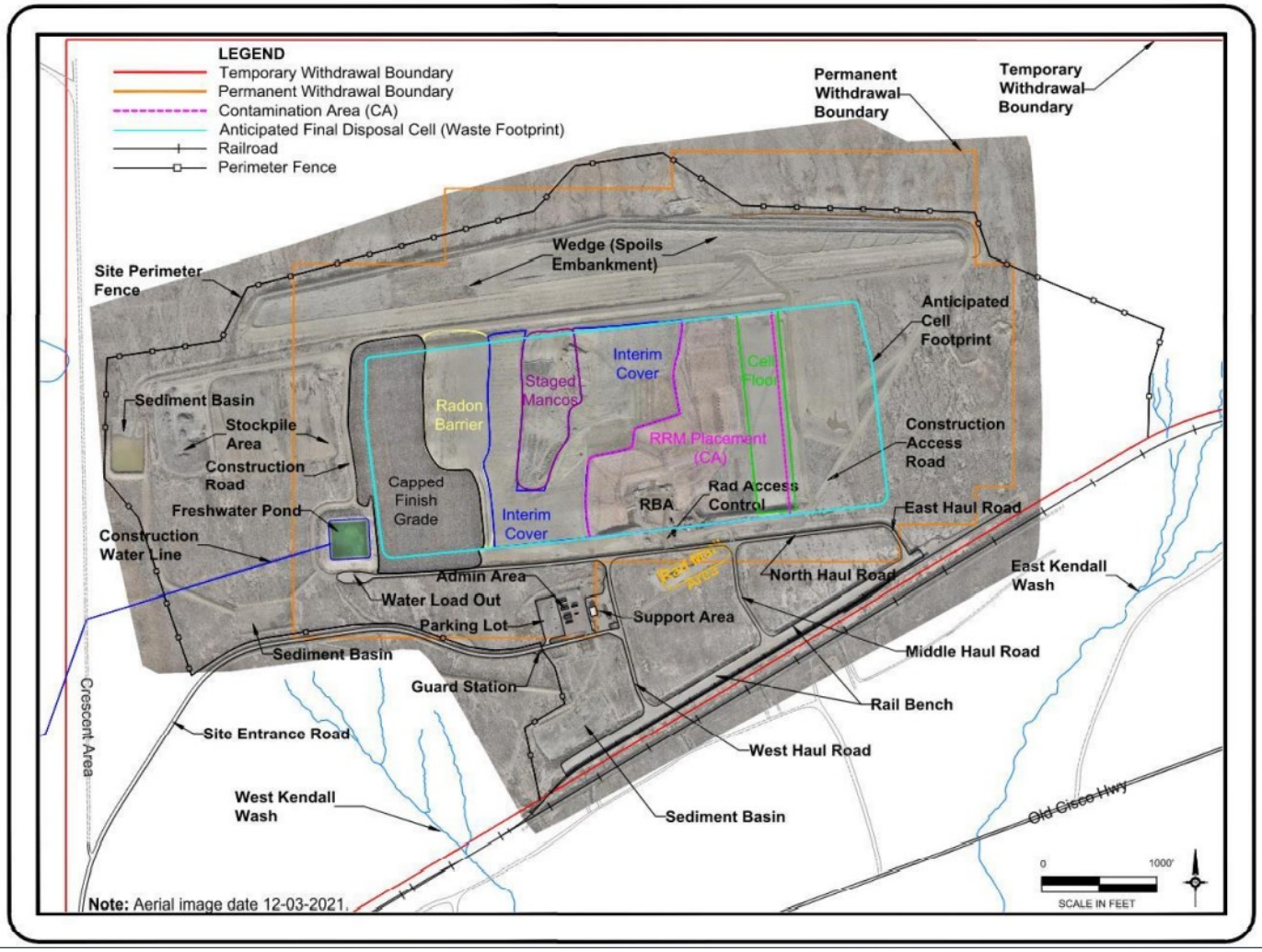

Figure 4. Crescent Junction Site Features

1.2 Site Descriptions

Moab Site

The Moab revegetation area consists of approximately 135 acres, surrounding the Contamination Area (CA) to the north, northeast, east, and southeast (Figure 3).

The Colorado River forms the eastern boundary of the Moab Project site. The site is transected by the Moab Wash, an ephemeral stream which flows during significant storm events. Approximately one-third of the site lies within the 100-year floodplain of either the Colorado River or Moab Wash. The Moab site is susceptible to flooding from the Colorado River and/or Moab Wash during runoff of spring snowmelt in the Rocky Mountains, generally reaching a maximum flow between late May and early June. Thunderstorms in the drainage basin of the Moab Wash can also have an impact on the floodplain at the Moab site. Groundwater underlying the site moves from northwest to the southeast, discharging to the Colorado River.

The climate of the Moab site is semi-arid with average annual temperature approximately 59° F. January is the coldest month, with the lowest temperature recorded for the month at 12.3° F. July is the warmest month, with the highest temperature recorded at 107.1° F. The total rainfall is

approximately 7.0 inches with half of the precipitation falling from July through September. Most of the rainfall occurs as high-intensity, convective thunderstorms in late summer. Light snow falls in winter, but usually does not remain on the ground very long.

The primary hydrogeologic unit at the Moab site consists of unconsolidated alluvium on the valley floor flanked by consolidated sandstones and shale on the canyon walls beyond the site boundary. Soil at the site is highly disturbed due to the removal of 12-72 inches of topsoil during previous remediation efforts. Soils at the site are variable, but generally are alkaline, saline, and fine grained, which further complicates vegetation establishment. Flooding can impact portions of the revegetation area. A berm located along the Colorado River north of the Moab Wash and several off-pile areas of the site were remediated in the winter of 2010/2011. As part of this remediation, the berm previously installed along the riverbank north of Moab Wash and more than 158,000 cubic yards of contaminated soil were removed, creating areas of lower elevation. As a result of the soil remediation activities, this eastern off-pile area has been more susceptible to flooding at lower river stages.

Due to higher-than-normal precipitation in winter 2022/2023, the Colorado River reached flood stage in spring of 2023 (40,900 cubic feet per second). Flood waters inundated the wellfield portions of the Moab site for much of the summer. Refer to the *Moab UMTRA 2023 Flood Response Summary* (DOE–EM/GJRAC3110) for more details on the flooding.

Historically, the southern side of a site dirt road and Moab Wash crossing (where Moab Wash leaves the eastern CA boundary) has been an entry point for higher flood waters to enter the southern end of the site (i.e., the wellfield). In spring 2021, a berm was constructed at this location. It has successfully demonstrated preventing storm water from late summer monsoons from entering the wellfield. During the 2023 flood, it kept higher flood waters out of the wellfield in this area and the main point of entry into the wellfield was along a berm that paralleled the Moab Wash. The natural downward slope in the wellfield topography also allowed flood waters to enter from the southern end.. Due to the bottomland morphology of much of the well field, high-water floods resulted in standing water several feet deep. Poor drainage is an issue, leading to high salt concentrations and poor soil quality in this area (Parent 2010). Refer to *Moab UMTRA Flood and Drought Mitigation Plan* (DOE-EM-GJ1640) for more details on flooding.

The Moab site consists of upland and riparian vegetation characteristic of the Colorado Plateau. Plant communities are comprised of a mixture of salt desert shrub, mixed desert shrub, and lowland riparian. Predominant native vegetation includes cottonwood (*Populus fremontii*), coyote willow (*Salix exigua*), Gooding's willow (*Salix gooddingii*), rabbit brush (*Ericameria nauseosa*), four-wing salt bush (*Atriplex canescens*), sand sagebrush (*Artemisia filifolia*); native grasses such as alkali sacaton (*Sporobolus airoides*), inland salt grass *(Distichlis spicata*), and native forbs including scarlet globemallow (*Sphaeralcea coccinea*), Rocky Mountain bee plant (*Cleome serrulata*), firecracker penstemon (*Penstemon eatonii*), and annual sunflowers (*Helianthus annuus*).

Due, in large part, to the removal of topsoil during remediation efforts, much of the off-pile area at the site has been populated with non-desirable weeds. Many undesirable flora species have spread and most of these species thrive in soils that are alkaline, highly saline, and lacking in organic material. Prominent non-native species include tamarisk *(Tamarix ramosissima)*, kochia (*Bassia scoparia*), Russian knapweed (*Acroptilon repens*), Russian olive (*Elaeagnus*

angustifolia), cheatgrass *(Bromus tectorum*), tumbleweed (*Salsola tragus*), perennial pepperweed *(Lepidium latifolium*), and halogeton (*Halogeton glomeratus*).

Crescent Junction

The disturbed areas at the Crescent Junction site outside of the CA and the disposal cell are the main areas for revegetation, including the Wedge spoils embankment (Figure 4) for storm water requirements. Refer to the *Moab UMTRA Project Crescent Junction Storm Water Pollution Prevention Plan* (DOE-EM/GJ1238) for more details regarding SWPPP requirements.

The climate of the Crescent Junction site, similar to the Moab site, is also semi-arid. The average annual temperature at the Crescent Junction site is approximately 59° F. January is the coldest month with the lowest temperatures recorded for the month at 3.9° F. July is the warmest month, with the highest temperature recorded at 101.6° F. The total annual average rainfall is approximately 8.3 inches. Most of the rainfall occurs as high-intensity, convective thunderstorms in late summer. Light snow falls in winter, but usually does not remain on the ground very long.

The Crescent Junction site is on a gently south-sloping surface of unconsolidated alluvium underlain by consolidated Mancos Shale. The site lies at the base of the Book Cliffs to the north. Surface drainage flows to ephemeral washes located to the south of the site that ultimately drain to the Green River. Run off occurs mostly as sheet washes and can also collect in converging gullies.

Soils consist primarily of silt and clayey silt alluvium, that represent successive sheet wash deposits form erosion of Quaternary deposits and Mancos Shale along the lower slopes of the Bookcliffs. Two native soil types exist for Crescent Junction:

1. Toddler-Ravola-Glenton families' association soils were deposited at elevations ranging from 4,000 to 5,000 ft above mean sea level (AMSL) in flood plains and drainages. The parent material for this soil class is alluvium, derived from sandstone and shale. The soils are well drained, slightly to strongly saline, with moderate water storage capacities, and moderate runoff potential. These soils are prone to gully formation in areas where runoff is concentrated.
2. The Chipeta complex soils were deposited at elevations ranging from 4,200 to 6,100 ft AMSL in cuestas or mesas. The parent material for this soil class is colluvium derived from shale and/or residuum weathered from shale. The soils are well drained, non-saline to very slightly saline, with low storage capacities and high runoff potential.

There are no streams, lakes, or wetlands located within proximity of the Crescent Junction site. Groundwater underlying the Crescent Junction site occurs intermittently in sand lenses in the alluvium and in fractures in the Mancos Shale (depth to water table is 80 inches). No groundwater was found in any of the bedrock swales or surface washes.

The Wedge was constructed to divert storm water runoff from the Bookcliffs and downslope alluvial fan around the disposal cell. Surface water run-on from the area is split to flow eastward and westward around the Wedge. The top of the Wedge has been seeded in the past with native grasses and dryland pasture mix to stabilize the soils and sediment. Water that collects directly atop the Wedge is captured by containment berms which prevent concentrated surface flows down the side slopes of the structure.

A plant inventory was conducted at the Crescent Junction site in summer 2023. The Crescent Junction site vegetation type consists predominantly of low-growing desert grass and shrub communities. Low density populations of desert grasses, shrubs, and forbs occur on the upland soils. Overall, the site was dominated by non-native annuals such as cheatgrass (*Bromus tectorum*), tall tumble mustard (*Sisymbrium altisimma*), halogeton (*Halogeton glomeratus*), kochia (*Bassia scoparia*) and Russian thistle (*Salsola tragus*). Areas with recently disturbed soil, including the dark caprock on the west side of the disposal cell, were almost exclusively halogeton and Russian thistle. Areas with more native vegetation were dominated by perennial shrubs such as salt bushes (*Atriplex* sp.), broom snakeweed (*Gutierrezia sarothrae*) and rubber rabbitbrush (*Ericameria nauseosa*); as well as moderate amounts of native grasses such as galleta grass (*Hilaria jamesii*). Forbs are sparse and include tansyaster (*Machaeranthera canescens*), globemallow (*Sphaeralcea* sp.), and Sego lily (*Calochortus nuttallii*). Only two noxious weed species were seen onsite: tamarisk (*Tamarisk ramosissima*) and scotch thistle (*Onopordum acanthium*). See full plant inventory report in Appendix A.

1.3 Purpose and Scope

The scope of this document focuses on revegetation and weed control for the Moab and Crescent Junction sites of the Moab UMTRA Project. Revegetation areas include disturbed areas outside the Contamination Areas (Figures 3 and 4) for the Moab and Crescent Junction sites. This document will focus on revegetation objectives, address weed control and propose treatments for noxious and non-noxious weed species.

2.0 Revegetation Priorities and Planning

The second step in the workflow is determining the priorities and planning for revegetation projects.

Revegetation will be dynamic as the Project changes over time. The following goals are for revegetation efforts and weed control as the Project moves towards closure:

MOAB SITE:

- Assist Closure Team with vegetation needs for Radiological Final Status Survey (FSS); i.e., reducing vegetation height to 6-8” to accommodate FSS survey equipment.
- Maintain current revegetation projects.
- Revegetation personnel will await the results of the FSS before proceeding with new revegetation projects.
- Manage non-native species (e.g., mowing kochia).
- Continue the noxious weed control program.
- In disturbed post-construction areas, establish vegetative cover (i.e., storm water pollution prevention plan (SWPPP), fugitive dust, etc.)
- Maintain SWPPP vegetative buffers (50 ft surrounding surface waters).
- Manage cottonwoods hedgerows: based on Grand County Conditional Use Permit, the cottonwoods will no longer receive water starting in 2024 and be replaced with native pollinator plants as the trees die out.
- Protect underperforming areas for physical crust if vegetation cannot be established.

CRESCENT JUNCTION SITE:

- Start noxious weed control program.
- Post-construction stabilization of the Wedge for SWPPP requirements (i.e., reseeding).
- In disturbed post-construction areas, establish vegetative cover (SWPPP, fugitive dust, etc.).
- Monitor any SWPPP revegetation and Wedge seeding projects.

2.1 Revegetation Management Zones

For management purposes, revegetation zones in the revegetation area are categorized by similar current vegetative composition and cover, and/or ecological potential. At the Moab site, most are delineated by road boundaries or washes, but a few are demarcated by discernable differences in vegetation and/or soil (Figure 5).

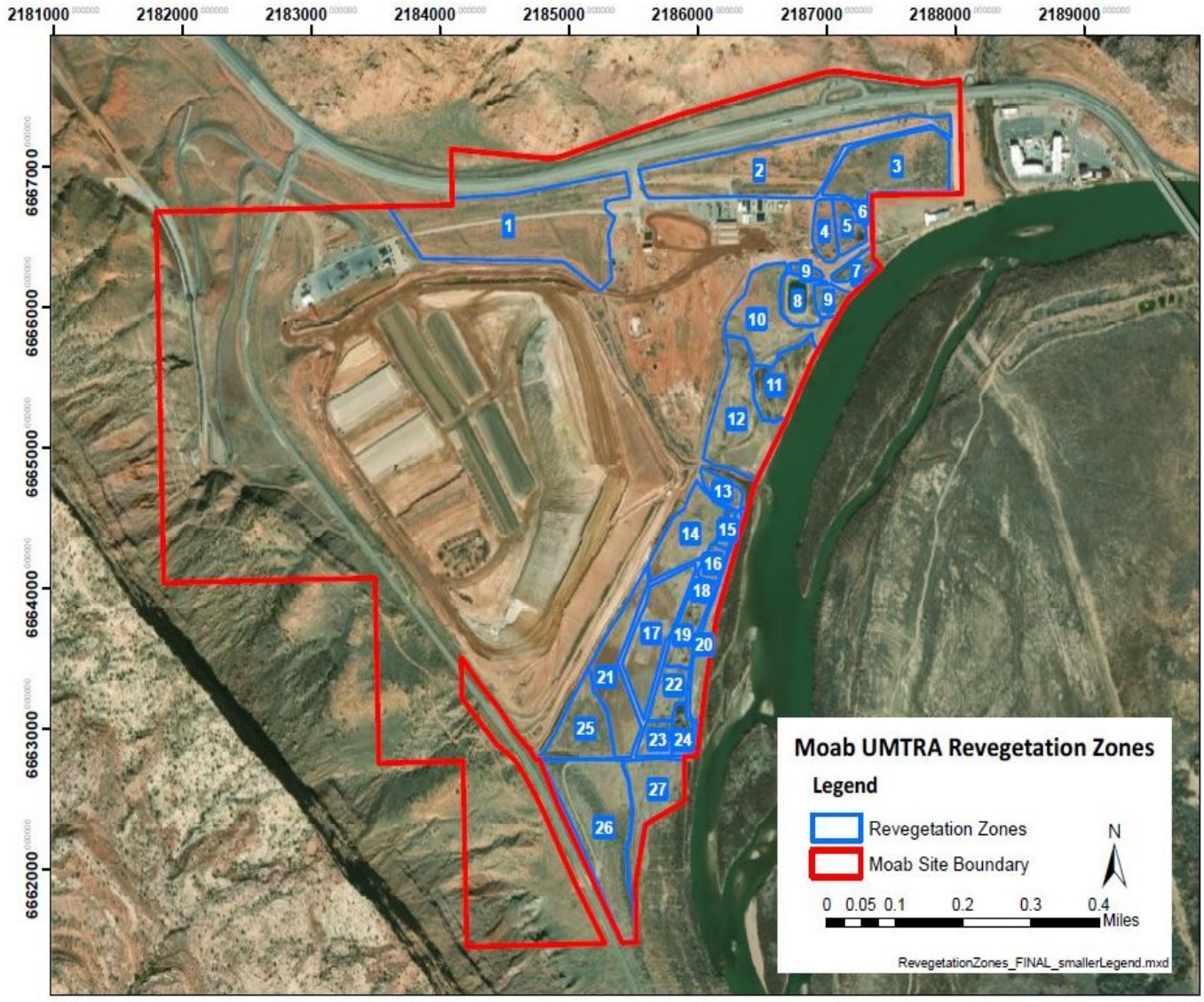

Figure 5. Revegetation Management Zones for the Moab Site

Revegetation zones for the Crescent Junction site can be found in Figure 6 below.

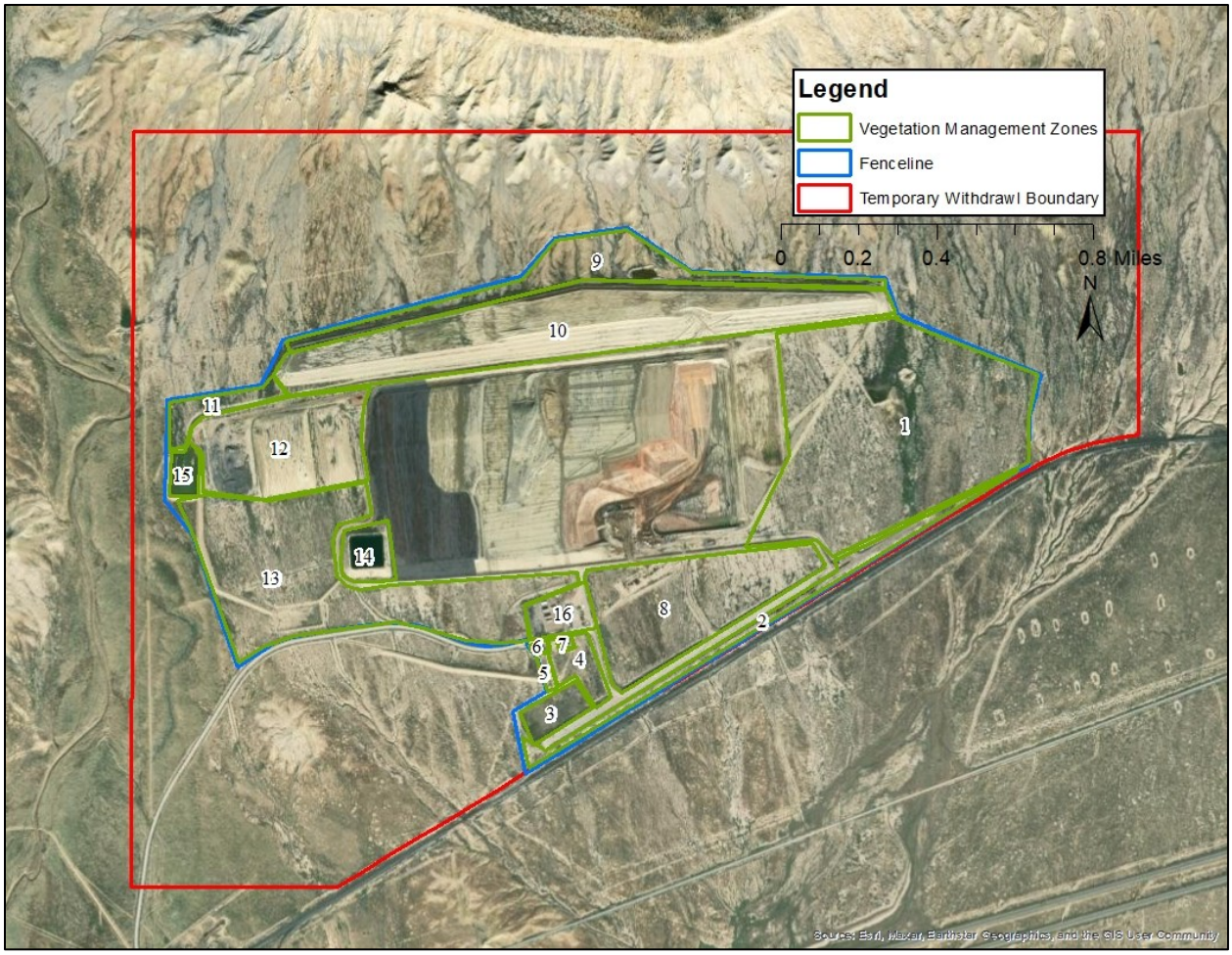

Figure 6. Revegetation Management Zones for Crescent Junction Site

2.2 Revegetation Planning Assumptions

This revegetation plan is intended as guidance for the Moab UMTRA Project site. It may be modified, altered, or departed from as specific locations warrant, as needs arise, and/or as priorities change.

2.3 Jurisdiction and Regulatory Compliance in Revegetation Areas

Revegetation areas may be subject to jurisdiction and regulations of another entity, which may impact revegetation activities (Table 2). Approximately 4.7 acres located at the Moab site along the Colorado River near the Moab Wash were identified in the *Moab UMTRA Project Floodplain and Wetlands Assessment for Additional Interim Actions at the Moab Project Site* (DOE-EM/GJ805-2005) as Jurisdictional Wetlands. Disturbance of jurisdictional wetland areas would require a U.S. Army Corps of Engineers 404 permit that may have additional requirements for reconstruction or mitigation.

Revegetation staff will ensure that compliance with rules and regulations are being met for revegetation activities. If there is any uncertainty regarding regulations associated with revegetation work, staff should bring these concerns to the attention of the RAC Environmental Compliance.

In regard to weed control, two more items are part of the regulatory framework:

1. Executive Order
   Executive Order 13751, *Safeguarding the Nation from the Impacts of Invasive Species* (December 5, 2016), calls on federal agencies to prevent the introduction, establishment, and spread of invasive species and to eradicate and control populations of invasive species that are established.

2. State of Utah
   Utah noxious weed law is administered by the Utah Department of Agriculture and Food. Pursuant to Utah Noxious Weed Act (Utah Code 4-17-101 et seq.) and Utah Administrative Code R-68, it is the duty of every property owner to control and prevent spread of noxious weeds within their possession or control. As per authority vested in the Commissioner of Agriculture and Food under Section 4-17-3, a state noxious weed list has been designated and published (Appendix A).

Table 1. Environmental Compliance and Impacts on Revegetation Activities

Compliance Obligation (Issue Agency/Regulator)	Summary	Permit, Agreement, or Action	Impact(s) on Revegetation Activities
Grand County Conditional Use Permit (CUP) Resolution #2006-2741	Conditional Use Permits address criteria to determine if reasonably anticipated detrimental effects of proposed land use and whether reasonable conditions can be imposed to mitigate them.	Per requirements of the Grand Country Conditional Use Permit Resolution #2006-2741, DOE submits Annual Statement of Continued Compliance, item #17 of the resolution (dated 2019).	Affects the Moab site U.S. Hwy 191 cottonwood hedgerow originally planted in 2006 for a visual barrier, which it has not been providing. In 2018, Grand County approved the Project to reduce watering, and replacing dying cottonwoods with pollinator plants. In 2024, no more supplemental water will be applied to hedgerow. As cottonwood trees die they will be removed, and small pollinator plants will be seasonally planted in their place.
Section 7 of the Endangered Species Act of 1973 (ESA) as amended (16 U.S.C. 1532 et seq.) and the Interagency Cooperation Regulations (50 CFR 402)	The ESA prohibits activities that would jeopardize the continued existence of an endangered or threatened species or cause adverse modification to a critical habitat.	The Project reviewed work activities for potential impacts on threatened or endangered species. Critical fish habitat is protected by interception of contaminated groundwater and injection of fresh water in wells near the Colorado River. Biological Opinion and Incidental Take Statements for Moab and Green River.	Revegetation work completed near the Colorado River side channel habitats must be in compliance with the Biological Opinion of the Remediation of the Moab Uranium Mill Tailings, Grand and San Juan Counties, Utah, Final Environmental Impact Statement (FEIS).
National Environmental Policy Act (NEPA)	NEPA requires federal agencies to follow a prescribed process to anticipate impacts on the environment of proposed major federal actions and alternatives. DOE codified its implementation of NEPA in 10 CFR 1021, “National Environmental Policy Act Implementing Procedures.”	NEPA reviews are required periodically to ensure proposed Project activities are within the original bounds of the Final Environmental Impact Statement (FEIS).	An Environmental Aspects Checklist (Form 3000 on SharePoint) must be completed for any new non-routine activity to determine if a NEPA review is required.
Federal Insecticide, Fungicide, & Rodenticide Act (FIFRA)	FIFRA governs the distribution, sale, and use of pesticides. This Act categorizes pesticides as either restricted or general use.	General use pesticides applied at the Moab and Crescent Junction (CJ) sites.	Any revegetation activity which includes pesticides (which includes herbicides) must comply with FIFRA.
Clean Air Act (CAA)	CAA establishes the requirements for facility air quality and air emissions.	The CAA is enforced at the state level through fugitive dust control plans prepared for the Moab and CJ sites.	Implementing control measures while doing revegetation activities that can produce dust or affect air quality (e.g., mowing, seeding, etc.).

Table 1. Environmental Compliance and Impacts on Revegetation Activities (continued)

Compliance Obligation (Issue Agency/Regulator)	**Summary**	**Permit, Agreement, or Action**	**Impact(s) on Revegetation Activities**
Utah Administrative Code (UAC) R307-205-8,"Emission Standards; Fugitive Emissions and Fugitive Dust; Tailings Piles and Ponds"	This state administrative code establishes minimum work practices and emission standards for sources of fugitive emissions and fugitive dust.	Monitor fugitive dust emissions by individuals certified to EPA Method 9 and implement the controls outlined in the site fugitive dust control plans to the greatest extent practicable.	Implementing control measures while doing revegetation activities that can produce dust (e.g., mowing, seeding, etc.). Opacity will comply with program requirements.
33 USC 1251, Clean Water Act (CWA) / National Pollutant Discharge Elimination System (NPDES) Utah Administrative Code (UAC) Rule 317-8-3.9, "Storm Water Discharges"	Under the CWA, the NPDES was designed to regulate and control pollutants from industrial wastewater and storm water discharges, both of which can have negative impacts on the quality of U.S. surface waters. The federal discharge requirements are implemented by the Utah Pollutant Discharge Elimination System (UPDES), an equivalent state system.	Utah Pollutant Discharge Elimination System (UPDES) Storm Water General Permits, Moab and CJ Annual Notice of Intent (NOIs) Implement site Storm Water Pollution Prevention Plans	Revegetation activities that disturb the land surface must be in compliance with the *Moab UMTRA Project Moab Site Storm Water Pollution Prevention Plan* (DOE-EM/GJRAC1475). Vegetative buffers (50 ft or more) must be maintained around surface waters (e.g., Colorado River).
Clean Water Act (CWA) Section 404	Restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Prohibit the discharge of any pollutant into a navigable water, including wetlands, unless otherwise authorized by a permit.	Joint 404/Stream Channel Alteration Permit for Off-Pile Remediation; U.S. Army Corps of Engineers (USACE), Utah Division of Water Rights.	Notify the RAC Environmental Manager when planning work within 30 ft of the ordinary high-water mark of the Colorado River or Moab Wash. A 404 permit may be necessary.
National Historic Preservation Act (NHPA)	Memorandum of agreement (MOA) is in place among DOE, the Utah State Historic Preservation Office (SHPO), the Utah Department of Transportation (DOT), and the Bureau of Land Management (BLM) for protection of cultural and historic resources at the Project sites.	Annual cultural resource inventory performed at the Crescent Junction site for Native American art sites, and an annual report prepared and submitted in accordance with the applicable MOA. The conditions of the Moab site MOA have been previously met.	Any discovery of cultural resources must be reported to the RAC Environmental Manager and no further surface-disturbing activity will take place until DOE makes a decision concerning the disposition of the items.

Table 1. Environmental Compliance and Impacts on Revegetation Activities (continued)

Compliance Obligation (Issue Agency/Regulator)	Summary	Permit, Agreement, or Action	Impact(s) on Revegetation Activities
Migratory Bird Treaty Act (MBTA)	The MBTA implements various treaties and conventions among the U.S. and several other countries for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds, their body parts, nests, or eggs is unlawful.	Identify and/ or monitor endangered, threatened, or candidate species at Project sites. Evaluate Project activities that could impact endangered, threatened, or candidate species.	Walk down areas prior to mowing looking for ground nests and inspecting trees that are to be removed for active nests. If such nests are found, suspend activity until birds have migrated.
DOE O 436.1, "Departmental Sustainability" Executive Order (EO) 13834 on Efficient Federal Operations EO 11988, "Floodplain Management"	DOE O 436.1 requires all DOE sites to implement sound stewardship practices protective of the air, water, land, and other natural resources impacted by DOE operations. It also requires DOE sites to cost effectively meet or exceed compliance requirement for applicable environmental, public health, and resource protection laws, regulations, and DOE requirements. DOE's implementation of regulations in 10 CFR 1022, "Compliance with Floodplain and Wetland Environmental Review Requirements," identify the requirements of EO 11988 for actions that may affect floodplains. Portions of the Moab site fall within the 100-year floodplain of the Colorado River.	Develop annual Site Sustainability Plan and implement an Environmental Management Standard (EMS). Activities conducted in the floodplain require evaluation.	Purchase items from the Bio-based list when feasible (www.biopreferred.gov) and report purchases to the RAC Sustainability Coordinator. Recycle or upcycle revegetation equipment, materials and supplies when possible. Revegetate with Utah native "Water Wise" plants and/or pollinators to the extent practical. Prior to implementation, discuss all floodplain revegetation activities with RAC Environmental Compliance Manager to ensure compliance.

Table 1. Environmental Compliance and Impacts on Revegetation Activities (continued)

Compliance Obligation (Issue Agency/Regulator)	**Summary**	**Permit, Agreement, or Action**	**Impact(s) on Revegetation Activities**
EO 11988, "Floodplain Management EO 11990, "Protection of Wetlands"	DOE's implementation of regulations in 10 CFR 1022, "Compliance with Floodplain and Wetland Environmental Review Requirements," identify the requirements of EO 11988 for actions that may affect floodplains. Portions of the Moab site fall within the 100-year floodplain of the Colorado River.10 CFR 1022 implements the requirements of EO 11990 for actions that may affect wetlands.	Activities conducted in the floodplain require evaluation. Evaluate Project activities that could impact jurisdictional wetlands.	Prior to implementation, discuss all floodplain revegetation activities with RAC Environmental Compliance Manager to ensure compliance. It was noted in the *Moab-Flood Plain and Wetlands Assessment for Additional Interim Actions* (2005) that 4.7 acres of jurisdictional wetlands exist on-site along the Colorado River. If any work is planned beyond the berm of the Colorado River, contact the RAC Environmental Compliance Manager.
EO 11990, "Protection of Wetlands"	10 CFR 1022 implements the requirements of EO 11990 for actions that may affect wetlands.	Evaluate Project activities that could impact jurisdictional wetlands.	It was noted in the *Moab-Flood Plain and Wetlands Assessment for Additional Interim Actions* (2005) that 4.7 acres of jurisdictional wetlands exist on-site along the Colorado River. If any work is planned beyond the berm of the Colorado River, contact the RAC Environmental Compliance Manager.

3.0 Revegetation Implementation

Sustainable revegetation needs to be accomplished within the confines of the existing ecosystem of the area (Anderson 2002). Advice from local Subject Matter Experts (SME) and collaborative research from strategic partnerships (e.g., U.S. Geological Survey, Rim to Rim Restoration) will help guide the decision-making process for best management practices, depending on the project. This will be important given some of the challenging conditions onsite.

A site assessment of the biological resources required for revegetation is a good practice. It may include a characterization of the vegetation, evaluation of the soils, history of disturbance, climatic data, or identification of possible "troubled areas" (Anderson 2002). Time is a critical factor for establishing a native revegetation planting, and it may take several years, or even decades, for the revegetation areas to begin to resemble native plant communities found on the undisturbed portions of the site. Other environmental conditions, such as drought or extreme heat, may factor into the establishment of vegetation.

Where feasible, begin with a small-scale pilot project before implementing a plan for an entire area. This helps in determining effectiveness of a particular approach, which can conserve funds and avoid wasted time (Sher 2010). To initiate this concept, a 2-year collaborative research project with the U.S. Geological Survey (USGS) began in fall 2020 investigating revegetation variables (e.g., soil amendments, seed mixes, fertilizers, etc.) in the wellfield (Zone 17). Experimental plots (336 total) were installed. Baseline data was collected in 2021 and further data collected in 2022. Research performed on site by USGS and UMTRA staff can be used as a tool for successful revegetation of the site. Continued data collection is currently being discussed between USGS and UMTRA.

One revegetation project to highlight from the Moab site is the successful seeding and native grass establishment in the wellfield (area that was formerly flood-irrigated forest plots). This project demonstrates the following steps that can lead to revegetation success.

3.1 Soil Characterization

Knowing your soil type is vital to revegetation (K. Dohrenwend, personal communication, Jan. 20, 2021). Soil sample data will support decisions regarding plant species and other necessary additional steps needed to affect successful revegetation (Sher 2010). Some soil conditions may require the use of amendments which can be time consuming and expensive.

However, many native species do not need soil amendments and adverse conditions can be addressed through the selection of appropriate plants, such as salt tolerant species (Dohrenwend 2013). Land managers in upper Colorado River basin have found that selection and use of halophytic (i.e., salt loving) species is the best management response to restoration situations exhibiting elevated soil salinity (Sher 2010).

In active flood areas, it is also important to note that soil conditions may be significantly altered during a flood. These dynamics may be a factor in the revegetation process and are considered in site management planning.

3.2 Seedbed Preparation

Proper seedbed preparation is essential for establishment of vegetation. Depending on soil type and conditions, certain areas may require various soil amendments and/or treatments before seeding. Addition of compost or mycorrhizal inoculants may help. The soil bed may receive further preparations such as disking or tilling to promote proper conditions for seedbeds. Soil compaction may also need to be addressed.

Addressing soil issues can greatly enhance establishment of species. However, it should be acknowledged that addressing some of these problems may be logistically or fiscally infeasible in some zones, and thus may be the reason to deprioritize them for revegetation (e.g., very little will establish in soil salinity levels over 15 dS/cm). The addition of clean fill dirt, when available, may aid in the establishment of these areas.

Compost is being created onsite and revegetation staff continue to explore best management practices. Composted materials and wood chips may be used to create a soil amendment for underperforming areas to improve soil chemistry and fertility.

3.3 Seeding, Seed Mixes & Planting

One of the most important aspects of the revegetation effort is species selection. Native species are often required because they are either adapted to the conditions that will exist at the site after revegetation, or they are disturbance-adapted and perform well during the first few years (Anderson 2002). Past performance of particular plant species in similar conditions and availability of seed or plant material should be considered in the species selection process. The source of the seed or plant materials should be as close as possible, geographically, to the area being revegetated (Anderson 2002), including collecting seeds from onsite plants when feasible.

Seed mixes need to be carefully selected and targeted towards current soil conditions (i.e., salt-tolerant species). When seeding, mixes of native species (grasses, forbs, and shrubs) are used to encourage overall successful vegetation establishment. Because of the challenging conditions onsite, the final vegetation cover may not be biodiverse. It is noted that the revegetation subject matter expert (SME) has stated for certain areas onsite (i.e., bare ground due to poor soil conditions), it may take several years to establish native vegetation, if at all (K. Dohrenwend, personal communication, Jan. 20, 2021). This is not a result of lack of effort, but rather due to the ecological and environmental limitations.

Although, initially, the common native plant species that are being seeded have been carefully selected for the limiting conditions in some areas onsite, other native grasses, forbs, shrubs, or trees could be seeded and planted at a future time, if desired, to provide greater diversity to the revegetation locations. Succession is also a natural process, with some species performing better initially and being replaced by other species over time. This should be anticipated and planned for (Sher 2010). Another consideration is planting initial vegetation (e.g., grasses) that will still allow the use of an herbicide (e.g., broadleaf herbicide) without harming that species (Sher 2010).

Time is a critical factor for establishing a native revegetation planting. It may take several years, or even decades, for the revegetation areas to begin to resemble native plant communities found

on the undisturbed portions of the site. Native plants often take longer to germinate and establish than non-native species. For the first year or two, many native species spend most of their energy developing a substantial root system before sending up much aboveground growth. It is also normal for revegetation efforts and plant succession to go through an initial stage of annual weeds followed by the establishment and dominance of the desired perennial species.

There are many aspects to seeding success, some of which we have no control (Mealor). Seeding may be done by broadcasting, drill seeding, or hand seeding. Depending on the location and purpose, planting may consist of seeding or planting poles or cuttings and, in some cases, may involve using containerized stock. Considerations, such as application rate, timing, warm vs cool season seeds, wind, and herbivory, will be evaluated at the time of planting (K. Dohrenwend, personal communication, Jan. 20, 2021).

Noxious weed species are prohibited species (Table 3), and use of non-native plants is to be avoided to the extent practical. Selected seed mixes shall be verified weed-free prior to purchasing.

Documentation of seeding and planting activities will be essential in the monitoring and evaluation process, especially since many seeds will not germinate for years after planting and some will only after other species have been established (Sher 2010).

3.4 Watering

Irrigation may be used to help establish vegetation growth in newly planted areas and to facilitate additional growth in areas that have been revegetated. A variety of irrigation methods are available including sprinklers, hose reels, drip systems, and flooding. The watering schedule will be designed to encourage permanent establishment of plants. After the first few years, the amount of irrigation water applied is reduced to encourage plant adaptation to the local water table/precipitation. The goal is to establish resilient native vegetation that does not require supplemental watering.

Past lessons learned show that improper watering has led to a host of problems. This includes a previous stand of planted cottonwoods in the wellfield that were constantly flood irrigated and when the watering regime changed (to encourage the roots to go deeper), trees experienced mortality, fell over, and created safety hazards.

SMEs and irrigation resources will be consulted to ensure proper water methods and timing. Irrigation type, design, and scheduling will be targeted for each zone. This is an on-going project which requires substantial maintenance and effort. Much of the historical irrigation layout is no longer relevant, and a large portion of the above ground system has been damaged beyond use by years of exposure in the desert environment.

Water application is recorded via irrigation log and will be updated to accurately track water use. A focus on reducing water use, as much as possible, throughout the life of the Project, is also important given the current and forecasted state of drought in this area.

3.5 Revegetation Activities & Vegetative Debris

Revegetation activities are important to the maintenance of revegetation areas along with specific project objectives. These activities include mowing, pruning, thinning, chipping/shredding, and mulching. Periodic thinning of mature cottonwood and willow trees is performed to improve overall growth and avoid creating a safety hazard. These activities may create large quantities of vegetative debris, in particular woody debris.

Vegetative debris will be evaluated on a case-by-case basis and may be dealt with in a variety of ways: mulching, composting, or taken to landfill.

This document will not go onto details about how to perform each these revegetation activities; more information is available in the *Moab UMTRA Project Revegetation Operations and Maintenance Manual* (DOE–EM/GJRAC2262).

4.0 Weed Control

Managing noxious and invasive weeds is a critical component to achieve DOE's vision for a self-sustaining native plant landscape (Mattson et al. 2020). This Weed Control Plan uses an integrated framework of techniques to control present and prevent future infestations of noxious weeds, enhance the native plant communities, reduce wildfire hazards, and improve wildlife habitat.

Weed control, particularly noxious weed control, has been one of the top accomplishments of the Moab UMTRA Project revegetation program in recent years. Weed control efforts have made a significant difference at the Moab site since 2020, reducing the number of noxious weed species present and the overall size of infestations.

4.1 Weed Control Objectives

As appealing as it is to have a goal of being noxious-weed free onsite, the reality is that the Moab UMTRA Project site is located along the Colorado River, which is a major corridor for spreading invasive weed species. Without great expense, it is difficult, if not impossible in the long term, to maintain a weed-free island surrounded by weed-covered lands. This is a regional problem, and one that other organizations are also tackling.

Collaborations and strategic partnerships with other land agencies are important to address shared weed problems. The Moab UMTRA site boundary is considered the berms closest to the river, thus the extent of onsite management. Any vegetation towards the river from the berms will be managed by Utah Division of Natural Resources. Collaboration will allow beneficial management for both agencies.

Given the location of the project site, weed control will most likely always be a management concern. However, it may be feasible to keep weed populations to a low maintenance level by following the *Utah Strategic Plan for Managing Noxious Weeds* (Whitesides 2004) as a guideline. Objectives of the Moab UMTRA weed control plan, specifically for noxious weeds:

1. Prevention
    a. Education and Personnel Training
2. Early Detection and Rapid Response
3. Management of Established Populations
    a. Identify the perimeter
    b. Eradicate satellite populations
    c. Contain and suppress main population
    d. Treatment methods
    e. One, three, and five-year management plans
4. Revegetation or Restoration
5. Monitoring and Reporting

4.2 Weed Classifications and Weed Lists

Invasive plant species are non-native, aggressive plants with the potential to cause significant damage to native ecosystems and/or cause significant economic losses. Invasive plants are opportunistic plant species that readily flourish in disturbed areas, are difficult to control, and thereby, can compete with and/or prevent native plant species from re-establishing (Idaho Power 2020).

Invasive noxious weeds have been described as a raging biological wildfire—out of control, spreading rapidly, and causing enormous economic losses (Lowry et al. 2017). Noxious weeds are capable of spreading at rates of up to 60% annually (Smith et al. 1999). Devastation caused by noxious weeds is enormous. Economic losses from weeds exceed $30 billion annually in the U.S. and the cost continues to grow (Pimentel et al. 2005).

Noxious weeds are a subset of invasive plants that are officially designated by a federal, state, or local agency as injurious to public health, agriculture, recreation, wildlife, or property (Sheley and Petroff 1999).

4.2.1 State of Utah

Under the Utah Noxious Weed Act, five classes of noxious weeds have been designated for the state of Utah based on preventive or management measures:

Class 1A. Early Detection Rapid Response / Watch List: Declared noxious and invasive weeds not native to the state of Utah and not known to exist in the State that pose a serious threat to the state and should be considered as a **very high priority**.
Class 1B. Early Detection Rapid Response: Declared noxious and invasive weeds not native to the State of Utah that are known to exist in the state in very limited populations and pose a serious threat to the state and should be considered as a **very high priority**.
Class 2. Control: Declared noxious and invasive weeds not native to the state of Utah, that pose a threat to the state and should be considered a **high priority** for control. Weeds listed in the control list are known to exist in varying populations throughout the state. The concentration of these weeds is at a level where control or eradication may be possible.
Class 3. Contain: Declared noxious and invasive weeds not native to the State of Utah that are widely spread. Weeds listed in the containment noxious weeds list are known to exist in various populations throughout the state. Weed control efforts may be directed at **reducing or eliminating new or expanding weed populations**. Known and established weed populations, as

determined by the weed control authority, may be managed by any approved weed control methodology, as determined by the weed control authority. These weeds pose a threat to the agricultural industry and agricultural products and should not enter commercial channels.
Class 4. Prohibited for sale or propagation: Declared noxious and invasive weeds, not native to the state of Utah, that pose a threat to the state through the retail sale or propagation in the nursery and greenhouse industry. Prohibited noxious weeds are annual, biennial, or perennial plants that the commissioner designates as having the potential or are known to be **detrimental to human or animal health, the environment, public roads, crops, or other property**.

See Appendix B for the current State of Utah noxious weed list.

4.2.2 Grand County

The Utah Noxious Weed Act states that "*Each county in Utah may have different priorities regarding specific State designated Noxious Weeds and is therefore able to reprioritize these weeds for their own needs*."

See Appendix C for the current Grand County noxious weed list.

4.2.3 Moab UMTRA Project Site

A Moab UMTRA site-specific target weed list was created in 2020, which compiled noxious weeds lists from Grand County and State of Utah. Invasive (but technically not noxious) weed species of ecological impact and of management concern (e.g., kochia) were determined by revegetation personnel and also included on the Moab UMTRA site-specific target list. Because noxious weed lists are continually updated by the state and county to reflect new invasive species, the site-specific Moab UMTRA target list was updated in 2022 and is still current for both sites (Table 3).

A total of 65 weed species are on the Moab UMTRA target list: 56 noxious weed species and 9 invasive weed species of concern. Noxious weeds will be of highest priority.

It is noted that Phragmites *(Phragmites australis* subsp. *americanus)* is present on site in two small patches (<200 sq ft), but is the native subspecies, not the noxious introduced variety *(Phragmites australis*). Project staff will continue to monitor the presence of any non-native Phragmites.

Cheatgrass (*Bromus tectorum*) was intentionally not included on the target weed list or in the previous weed mapping. It is pervasive and considered beyond management control throughout much of the West. However, new treatment strategies are promising. Future plans may consider these new options.

Table 2. Updated Moab UMTRA Site-specific Target Weed List 2024

GRAND & STATE NOXIOUS (Class 2-4)	
Bermudagrass	*Cynodon dactylon*
Black Henbane	*Hyoscyamus niger*
Canada thistle	*Cirsium arvense*
Cogongrass	*Imperata cylindrical*
Dalmatian toadflax	*Linaria dalmatica*
Dame's Rocket	*Hesperis matronalis*
Diffuse knapweed	*Centaurea diffusa*
Dyers woad	*Isatis tinctoria*
Field bindweed	*Convolvulus arvensis*
Hoary cress	*Cardaria spp.*
Houndstongue	*Cynoglossum officinale*
Jointed Goatgrass	*Aegilops cylindrical*
Leafy spurge	*Euphorbia esula*
Medusahead	*Taeniatherum caput-medusae*
Musk thistle	*Carduus nutans*
Myrtle spurge	*Euphorbia myrsinites*
Perennial pepperweed	*Lepidium latifolium*
Perennial Sorghum spp. (Incl. but not limited to Johnson grass and Sorghum almum)	*Sorghum halepense* & *Sorghum almum* etc.
Phragmites (Common reed, non-native variety)	*Phragmites australis*
Poison hemlock	*Conium maculatum*
Puncturevine (goathead)	*Tribulus terrestris*
Purple loosestrife	*Lythrum salicaria*
Quackgrass	*Agropyron repens*
Ravenna grass	*Tripidum ravennae*
Rush skeletonweed	*Chondrilla juncea*
Russian knapweed	*Centaurea repens*
Russian olive	*Elaeagnus angustifolia*
Scotch broom	*Cytisus scoparius*
Scotch thistle	*Onopordum acanthium*
Spotted knapweed	*Centaurea maculosa*
Squarrose knapweed	*Centaurea squarrosa*
Tamarisk/Salt cedar	*Tamarix ramosissima*
Yellow Starthistle	*Centaurea solstitialis*
Scotch broom	*Cytisus scoparius*
Yellow toadflax	*Linaria vulgaris*

UMTRA-SPECIFIC WEEDS OF CONCERN	
Bull thistle	*Cirsium vulgare*
Crested wheatgrass	*Agropyron cristatum*
Halogeton	*Halogeton glomeratus*
Kochia	*Kochia scoparia*
Tumbleweed	*Salsola tragus*
Tumbling mustard	*Sisymbrium altissimum*
Wooly mullein	*Verbascum thapsus*
Yellow salsify	*Tragopogon dubius*
Yellow sweet clover	*Melilotus officinalis*

GRAND & STATE NOXIOUS (Class 1B & 1A)	
Class 1B: Early Detection Rapid Response (EDRR)	
African mustard	*Brassica tournefortii*
Blueweed (Vipers bugloss)	*Echium vulgare*
Camelthorn	*Alhagi maurorum*
Common St. Johnswort	*Hypericum perforatum*
Cutleaf vipergrass	*Scorzonera laciniata*
Elongated mustard	*Brassica elongata*
Garlic mustard	*Alliaria petiolata*
Giant reed	*Arundo donax*
Goatsrue	*Galega officinalis*
Japanese knotweed	*Polygon cuspidatum*
Oxeye daisy	*Chrysanthemum leucanthemum*
Purple starthistle	*Centaurea calcitrapa*
Class 1A: EDRR / Watch List	
African rue	*Peganum harmala*
Common crupina	*Crupina vulgaris*
Malta starthistle	*Centaurea melitensis*
Mediterranean sage	*Salvia aethiopis*
North African grass	*Ventenata dubia*
Plumeless thistle	*Carduus acanthoides*
Small bugloss	*Anchusa arvensis*
Spring millet	*Milium vernale*
Syrian beancaper	*Zygophyllum fabago*

4.3 Current Noxious Weed Inventories, Surveys, and Results

Initial weed inventory and mapping were conducted at the Moab site by revegetation personnel in summer 2020, which established a baseline data for the weed control program. See *Moab UMTRA Project Revegetation and Weed Control Plan Revision 7* (DOE–EM/GJTAC1655) for details and methodologies. For the Crescent Junction site, an initial weed and plant inventory was conducted in summer 2023 and the report can be found in Appendix A.

A summary table of weed species for both sites can be found in Table 4, showing eight different noxious weed species for the Moab site and two for the Crescent Junction site, current status and weed control activities for each species.

Table 3. Current Status of Noxious Weed Species Onsite and Summary of Weed Control Activities Conducted at the Moab and Crescent Junction Sites

	NOXIOUS WEED SPECIES ONSITE	CURRENT STATUS	WEED CONTROL ACTIVITIES & NOTES
MOAB SITE			
1	Tamarisk	Most wide-spread and extensive noxious weed onsite; all growth stages present	This is the most challenging noxious weed to treat. Previous treatments showing success.
2	Russian knapweed	Mostly large, sparsely covered patches throughout site	Previous treatments from 2020-2023 showing significant success. Some areas may need multiple treatments. Monitoring areas.
3	Russian olive	A few seedlings and saplings scattered throughout site	Previous treatments in 2021-2023 showing significant success, however multiple treatments may be necessary. Monitoring areas.
4	Perennial pepperweed	Few individuals found onsite.	Previous treatments in 2021-2023 showing significant success. Monitoring areas.
5	Goathead (puncturevine)	Encroaching from seeds washing in along boundaries	Previous treatments in 2021-2023 are showing significant success. Monitoring areas.
6	Bermuda grass	Small (<200 sq ft), contained patches	Appears to be eradicated; monitoring area.
7	Canada thistle	Small (<200 sq ft), contained patches	Appears to be eradicated; monitoring area.
8	Field bindweed	Small (<200 sq ft), contained patches	Treated; monitoring area.
CRESCENT JUNCTION SITE			
1	Tamarisk	Largest and densest infestations are in sediment basins. Scattered individuals in ditches throughout site.	Will begin weed control in next year.
2	Scotch thistle	Only two individuals were found in ditch north of CJ railbench and were hand pulled.	Appears to be eradicated; monitoring area.

At the Moab site, weed control activities since 2021 have shown overall significant results by reducing noxious weeds onsite. Starting in 2023, weed control operations were scaled back and many areas are being monitored to ensure containment and/or eradication. At the Crescent Junction site, the two Scotch thistles were hand-pulled and the area is being monitored. Weed control for tamarisk will start in the next year. Currently, invasive weed species (non-noxious) of concern were not treated this year for either site. Future plans may include this.

It is important to note that weed control is a dynamic situation. Due to adaptations and abilities of noxious weed species to rapidly invade and outcompete native vegetation, managing noxious weeds takes diligent effort over time and continual monitoring. Rarely does one treatment completely eliminate the species. Changes in environmental conditions (e.g., drought) can alter surroundings for favorable situations for certain noxious weed species. Eliminating seed banks in the soil may take a tremendously long time, depending on species and environmental factors.

Revegetation personnel are prepared for this and continue to monitor the site, especially treated areas.

4.4 Management of Noxious Weeds & Weeds Species of Concern

This section of the Plan describes the steps Moab UMTRA will take to prevent and control the establishment and spread of noxious weed species using the *Utah Strategic Plan for Managing Noxious Weeds* (Whitesides 2004) key elements.

4.4.1 Prevention

Prevention is the best method of weed management (Dewey 1995). The most efficient and cost-effective way of dealing with noxious weeds is to prevent them in the first place.

4.4.2 Education and Personnel Training

All revegetation and other on-the-ground environmental personnel (i.e., groundwater, air monitoring, etc.) will be instructed on the importance of controlling noxious weeds and trained in weed identification. Moab UMTRA personnel detecting emerging noxious weed infestations will be key to prevention.

Revegetation personnel will be trained in weed mapping and inventory methods and be familiar with established populations of noxious weeds. Knowledge of weed ecology, reproduction, and known pathways for invasive species will help identify the most susceptible areas. Personnel will be trained in treatment strategies, equipment, and best management practices (BMPs). Those using herbicides are highly encouraged to acquire their herbicide/pesticide applicators license certification through the State of Utah.

Other preventative actions may include:

- Reseeding significantly disturbed areas with a native seed mix to help outcompete non-native species.
- Avoiding disturbance of soil in stable areas or places not actively being managed.
- Ensuring any imported materials (e.g., straw, hay, mulch, gravel, seed, compost, etc.) are weed-free.
- Using wattles in places where roads are draining into surrounding areas and weed species are spreading.
- Developing designated vehicle turn-out and/or turn-around spots along roads in revegetation areas to reduce disturbing soil.
- Avoiding use of noxious weed species in the compost
- Considering impact of noxious weeds when moving soil from one area to another.
- Choosing areas free of noxious weeds as the origin location to reduce seed dispersal onsite.
- Cleaning of equipment, boots, undercarriages, and tires to avoid seed dispersal.
- Personnel will inspect, remove, and appropriately dispose of weed seed and plant parts found on their clothing and equipment.
- Evaluating engineering controls to determine volume and occurrence of flood events in revegetation areas.

4.4.3 Early Detection and Rapid Response

Detecting new invaders early and taking urgent action before they become significant, ecosystem-altering or economically devastating issues is first line of defense (Whitesides 2004). The goal is to keep newly detected weed species from becoming established.

Early detection actions include:

- Revegetation and other personnel to be aware of potential invaders "watch list". Train personnel in plant identifications and what to look out for.
- Develop routine and systematic surveys as part of weed management program.
- Know high risk areas and monitor frequently.
- Report new invasions to revegetation and/or weed management lead.
- Keep abreast of emerging county and state noxious weed species (e.g., African Rue recently discovered in Grand County).
- Share pertinent findings with Grand County Weed District and other surrounding landowners (e.g., Bureau of Land Management, private property) to educate others and promote partnerships.

Rapid response actions include:

- Act as soon as possible
- Follow the species-specific treatment (see *Moab UMTRA Project Revegetation Operations and Maintenance Manual for the Moab Site* (DOE-EM/GJTAC2262)), which outlines best management practices. Knowing proper treatment strategies is important before taking action. Some actions can produce negative results (i.e., tilling promoting root reproduction, etc.)
- Research treatment strategies, if uncertain
- Utilize resources, such as Utah State University (USU) Extension, Grand County Weed District or Rivers Edge West, for treatment methods and information.

4.4.4. Management of Established Populations

For established populations of noxious weeds, the goal is to identify the size of the infestation and work from the edges towards the central area of infestation. Weed mapping and inventories will be an important tool to identify established populations and track progress of treatment strategies.

The main objectives of controlling established weed populations are as follows:

- Identify the perimeter: during weed mapping, finding the outer perimeter of the infestation is important to know the size of the infestation.
- Eradicate satellite populations: eliminate smaller populations until one main infestation is left to control and manage, using species-specific treatment strategies and BMPs.
- Contain and suppress main population: once satellite populations have been controlled, direct all efforts on the main area of infestation to control and ultimately, eliminate.

4.4.5 Treatments

Control of noxious weeds will be implemented through mechanical, biological, and chemical control measures:

- Mechanical: removal of aboveground plants and/or roots with hand tools or heavy machinery (e.g., tractor with mowing attachment). Mechanical methods can be useful for smaller, isolated populations of noxious weeds in areas of sensitive habitats. Some rhizomatous plants can spread through mechanical means; therefore, implementation of this method will be species specific. Mechanical treatments that disturb the soil surface within native habitats will be avoided in favor of herbicide application. This will help prevent soil disturbance and establishment of new colonies of weeds.

- Biological: use of living organisms (insects, diseases, and livestock) to control noxious weeds (i.e., biocontrol). Many noxious weed species are from other continents (usually Eurasia) and recently introduced into North America. They have few natural enemies to control their population here. The biological control agent is typically adapted to a specific species and selected for their ability to attack critical areas of the plant that contribute to its persistence. Some biocontrol (e.g., gall wasps for Russian knapweeds) must be purchased in other states and a permit is required to cross state lines.

- Chemical: use of selective herbicides, specific to weed species. Herbicide treatment can be effective for large populations of noxious weeds where other means of control may not be feasible. Vehicle-mounted sprayers (i.e., Utility Terrain Vehicle - UTV) may be used in open areas readily accessible by vehicles. Hand sprayers and backpack sprayers will be used in small areas or areas hard to access by UTV. Impacts to non-target plant species and other environmental concerns will be addressed before applying herbicide. The DOE prefers that all herbicides used on-site are 2, 4-D-free and/or bio based.

Treatments will be carefully researched for best management practices— a wrong treatment for a species may exacerbate the infestation. Control measures will be based on species-specific and site-specific conditions (e.g., proximity to water or riparian areas, season of application, occurrence of special status plant species, etc.). Noxious weed control measures will be implemented in accordance with existing state and county regulations. Care must be exercised during treatment of weeds to prevent seed spread and dispersal.

Moab UMTRA species-specific control methodologies are documented in the *Moab UMTRA Project Revegetation Operations and Maintenance Manual for the Moab Site* (DOE-EM/GJRAC2262). The compilation was created based on recommendations from SMEs such as Navarro (previous DOE-Legacy Management contractor), Grand County weed department, Dinosaur National Monument, and other local weed managers. As of this writing, research into certain treatments for specific species is still being conducted.

Current treatment examples at Moab UMTRA project site include mechanical means (i.e., mowing) for kochia and tamarisk, and chemical means (herbicide application on Russian knapweed). A biological means used onsite is the tamarisk leaf beetle (*Diorhabda elongata*), which was released by Grand County in 2001 to defoliate and control tamarisk.

Treatment results will be assessed, and methods re-evaluated, if necessary. Discussions with DOE Legacy Management (LM) or other local SMEs are also advisable.

4.4.6 Herbicide Application, Handling, Storage, Spills and Cleanup

Safety procedures for using chemical methods can be found in IWP/JSA Number: *MB-IWP/JSA-003, Facility and Ground Maintenance* and *MB-IWP/JSA-069 Vegetative Debris Management*.

The current list of Moab UMTRA approved herbicides is provided in the *Moab UMTRA Project Revegetation Operations and Maintenance Manual for the Moab Site* (DOE-EM/GJRAC2262). All manufacturer safety data sheets (SDS) for these herbicides can be located onsite. Any new herbicide must be approved by Health & Safety before purchasing and application.

Herbicide application, handling, and storage actions include:

- Revegetation personnel using herbicide are strongly encouraged to acquire a Utah herbicide/pesticide applicator license certification.
- Following all FIFRA regulations (Table 2).
- The herbicide applicator will have readily available copies of the appropriate SDSs for the herbicides used.
- Herbicide applications will follow, by law, all label guidelines, as well as any federal, state, and/or county regulation. Application rates will be based on product label instructions.
- Herbicide handling will include all personal protective equipment (PPE) stated on the label for mixing and applying, and also approved by Health & Safety.
- All herbicide equipment and containers will have secondary containers and also be inspected for leaks. All herbicide equipment will be maintained and cleaned.
- Calibration checks of equipment will be conducted prior to, and periodically during application to ensure proper rates are achieved.
- Mixing will be done over a drip-catching device in an area devoid of sensitive vegetation and in an area that will limit human and wildlife exposure.
- Disposal of spent containers will be in accordance with the herbicide label or local authorities.
- Herbicides will be stored in a cabinet with secondary containers in the event of a leak.
- Herbicides capable of freezing will be stored in a climate-controlled environment during the winter months.

All reasonable precautions will be taken to avoid herbicide spills. Follow the SDS and *MB-IWP/JSA-003 Facility and Grounds Maintenance* for use/transfer/handling of chemicals.

4.4.7 Revegetation and Restoration

After invasion by an aggressive weed species and subsequent successful control/management activities, revegetation and restoration may be needed to return the site to a desirable species composition (Whitesides 2004). Refer to the *Revegetation Implementation* section for more details.

Revegetation and restoration actions related to this Noxious Weed Plan:

- Obtain knowledge of the system.
- Collaborate with partners for research and experiments with restoring degraded lands (i.e., US Geological Survey, Rim to Rim Restoration)
- Take soil samples for nutrient analysis and amend, if necessary.
- Develop a plan for each zone, including seeding and watering components.
- Plant seeds with end result in mind.
- Plant/seed native vegetation that is suitable for the local conditions.
- Seed mixes will be determined by soil type and site-specific conditions.
- Use of weed-free seed mixes.
- If areas are expected to be disturbed due to future projects, develop a seed mixture and application plan to reduce weed establishment.
- Re-evaluate annually.

5.0 Monitoring and Evaluation

Monitoring and evaluation are combined for the final step in the workflow of revegetation and weed control. It is a critical step in determining short- and long-term success towards achieving the vision of a self-sustaining native plant community. Restoration takes time and is an art form as much as it is a science (Sher 2010). Many factors can influence the success of revegetation. Some of these include variable climate (precipitation amounts, timing of precipitation events, temperatures), seedbed preparation, seed variability, soil fertility, undesirable species competition for resources, and herbivory.

Monitoring provides feedback on effectiveness of action steps taken and if goals, priorities, and/or implementation techniques need to be modified, altered, and/or maintained. Unknown challenges may be revealed, priorities may change, or efforts may need to be steered in a new direction as projects are implemented.

All revegetation projects should have appropriate monitoring and management to increase the probability that initial revegetation efforts will succeed. Initial success in all revegetation efforts is not a guarantee of long-term viability. Even if all these factors are favorable and conditions are conducive for revegetation success, a planting may still fail. Altering irrigation, fertilization, remedial planting, and invasive species control are examples of actions identified during monitoring as needed to improve restoration (Sher 2010).

When managing for weed control, monitoring invasive and noxious weed populations is a critical component at every stage of the weed plan. Prevention and early detection rely on monitoring to identify emerging weed species. Rapid response and treatment strategies need monitoring to assess results of actions taken. Comparing weed inventories over time is imperative to track populations over time, find any spread of new or known species, and report progress and success.

Monitoring can save significant time and money in the long term by addressing a wide range of problems before they become main factors in failure of the restoration effort. Post-planting monitoring, flexibility, and willingness to learn from mistakes are critical aspects of long-term success (Sher 2010).

Success criteria are determined as initial guidance; however, common sense combined with scientific data must be applied to final evaluations to determine whether further management actions are required. Also, conditions at some locations may never reach specified success criteria simply because the physical, environmental, and climatic factors at a location are not conducive for substantial vegetation growth.

Monitoring can be qualitative (e.g., photo points, field notes; Figure 7) and/or quantitative (e.g., permanent transects, quadrats, digital mapping, data collection). Collection of baseline data is an important first step (Sher 2010). Larger projects should have more intensive monitoring programs included as part of the project plan and implementation to help inform maintenance actions and to help future project managers learn from success and failure of past projects. Specific data to be collected should be guided in part by the original restoration goal (Sher 2010). If possible, past research done onsite would be replicated.

Figure 7. Example of Repeat Photo Program (taken from wellfield revegetation project, 2022)

For long-term maintenance, monitoring on a regular basis is essential. Evaluations will be conducted annually at revegetation locations until success criteria have been achieved or until determined to be unnecessary. After locations have met success criteria, they will be incorporated into a rotation in which they will continue to be monitored every few years. The primary purpose of the continued monitoring is to demonstrate that the success criteria continue to be met and whether additional management actions are necessary. Regulatory requirements may have their own monitoring protocols and success criteria.

Reporting and documentation of monitoring and evaluation will be important for documentation purposes and also to track progress. Informing others of successful strategies, lessons learned, and any emerging weed species will be helpful not only to Moab UMTRA Project, but also to other local land managers, collaborators and partners.

6.0 Strategic Partnerships

Over the past five years revegetation staff have been working to build strategic partnerships with various public and private entities. These relationships are being established to share relevant and non-classified information between parties that will benefit the Moab UMTRA site as well as the greater community in ecological restoration efforts. These relationships were generally established through the participation of UMTRA staff in local and regional ecological working groups. As the project progresses, participation in these groups should be encouraged to continue building relationships that benefit the Project in both an objective aspect as well as good public relations.

The following is a list of entities with whom relationships have been established and a brief description of the purpose of each of them. Any formal partnerships will be detailed and recorded in an official memorandum of understanding (MOU) between all parties involved.

U.S. Geological Survey (USGS) – Southwest Biological Science Center:

USGS scientists with expertise in soil restoration and revegetation of highly disturbed landscapes were invited to collaborate with Moab UMTRA revegetation staff. A Memorandum of Understanding (MOU) was drafted between the two agencies extending until 2025. In fall 2020,

336 experimental plots were installed in the well field (Zone 17) with the purpose of researching revegetation variables (e.g., soil amendments, seed mixes, fertilizers, biocrust inoculations, watering regimes, etc.). Two years of data collection occurred, including baseline data collection in 2021 and further data collection in 2022. In 2023, the Colorado River flooded this portion of the site and plots were inundated with several feet of water. Crews worked together to prepare the plots for the flood. No data collection occurred in 2023.

Research performed on site by USGS and UMTRA staff can be used as a tool for successful revegetation of the site. Research should also be used to develop scientific literature that will be beneficial to the broader community of land managers and scientists involved in ecological restoration of disturbed landscapes. Discussions are currently happening with USGS regarding the future of the plots. Results from the study will be applied to revegetation goals and activities.

Rim to Rim Restoration (RRR):

Rim to Rim Restoration is a non-profit organization in Moab, Utah dedicated to the reestablishment of native vegetation for the benefit of wildlife, recreation opportunities and to support maintaining sustainable watersheds in the Upper Colorado Plateau. RRR helps build community and facilitate regeneration of native plants through collaboration with local land managers, government agencies, non-profit organizations and community members. RRR spearheads the Utah Watershed Restoration Initiative (WRI) proposal which encourages collaborations for riparian restoration work along the Colorado River corridor. Moab UMTRA became part of the greater WRI project and was previously awarded native seed and herbicide in 2021 and native seed in 2022. An MOU with RRR was developed in 2021.

Southeast Utah Riparian Partnership (SURP):

The Southeast Utah Riparian Partnership is a diverse public-private partnership of local, state and federal agencies; businesses; nonprofit organizations; and individuals. The group's mission is to restore, protect and maintain a healthy riparian ecosystem in Utah's Colorado River Watershed. All members of the partnership are committed to information sharing, networking, and collaborative interdisciplinary action in research, planning, monitoring and on the ground project implementation. Revegetation staff attended SURP annual meetings in 2019-2023. Many of the SURP partners are also involved in the WRI proposals and information shared with partners will also assist in specific revegetation implementation and monitoring techniques. Rim to Rim Restoration (RRR) leads the SURP. An updated MOU with all entities in the SURP was finalized in 2023.

Previous partnerships prior to 2023 include U.S. National Park Service (NPS), Utah Division of Natural Resources/ Utah Forestry, Fire, and State Lands (DNR/FFSL), and RSI EnTech, LLC (contractor for DOE Legacy Management; previously Navarro).

7.0 Records

All documentation created as a result of compliance with this Plan is considered a Project record and will be managed in accordance with the *Moab UMTRA Project Records Management Program Plan* (DOE-EM/GJ1545), which follows DOE orders, policies, and regulations for retention and maintenance of records. Documentation may include (but is not limited to):

- Inspection forms.
- Photographs.
- Corrective action logs.
- General correspondence related to storm water discharges or permitting.

Copies of inspection reports shall be retained for at least 3 years from the date of final site stabilization and termination of the UPDES Permit.

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Appendix A:

Crescent Junction Site Plant Inventory Report

Appendix A: Crescent Junction Site Plant Inventory Report

MOAB UMTRA PROJECT
Crescent Junction Site Plant Inventory Report – 7/3/2023

Fieldwork personnel:

- Katrina Lund (RAC Environmental Compliance Manager)
- Wade Plafcan (RAC Environmental Compliance Technician)
- Andrew Larsen (RAC Revegetation Lead)
- Chris Gallis (RAC Revegetation Technician)

During June 19, 27, and 28 of 2023, the RAC Environmental Compliance and Revegetation Departments conducted a plant inventory survey for the Moab UMTRA Project Crescent Junction site. The survey results will help to inform on native seed mix for revegetation projects, developing tactics for non-native weed mitigation and acts as a baseline for future vegetation changes. All four personnel worked the first day of the survey and Wade, Andrew and Chris finished the remaining two days.

The survey style was based on Bureau of Land Management's "intuitive controlled survey" methods. This method involves a complete survey of areas with high potential for noxious/rare/new plants and a less intense survey in other areas. At the beginning of the survey, all observers walked in a line 10-15 meters apart in a grid pattern, identifying all plants seen, exhaustively covering the area walked. As the survey proceeded, surveyors walked further apart in areas of easy visibility and homogenous known vegetation. Large areas of very little or homogenous vegetation were inspected from a reasonable distance to save time. A full survey method was used in areas of dense, harder to see vegetation (i.e., ditches, sediment pond, edges of parking lots).

The site was divided into 16 different vegetation management zones based on topography, vegetation structure and disturbance factors (Figure 1). These zones will help break down the area into manageable segments for revegetation and weed management. The survey found total of 53 species with 15 species being non-native (Figure 2). Overall, the site was dominated by non-native annuals such as cheatgrass (Bromus tectorum), tall tumble mustard (*Sisymbrium altisimma*), halogeton (*Halogeton glomeratus*), kochia (*Bassia scoparia*) and Russian thistle (*Salsola tragus*). Areas with recently disturbed soil, including the dark caprock on the west side of the cell, were almost exclusively halogeton and Russian thistle. Areas with more native vegetation were dominated by perennial shrubs such as salt bushes (*Atriplex* sp.), broom snakeweed (*Gutierrezia sarothrae*) and rubber rabbitbrush (*Ericameria nauseosa*); as well as moderate amounts of native grasses such as galleta grass (*Hilaria jamesii*).

Two noxious weed species were seen on-site. Two small scotch thistle individuals (Utah class B, Grand County class 3) were seen in a ditch near the railyard (zone 8) and pulled the same day. It would be good to keep a look out near road/rail ditches for these and other weeds in the future. It is easier to control the spread if they are eradicated early on. Tamarisk (Utah class C, Grand County class 3) is the only remaining noxious species currently at this site. The largest cluster is a dense thicket around the edges of the dry sediment pond (zone 3) in the southwest corner of the site. Other scattered trees can be seen near zone 15 sediment pond and the zone 14 water holding area. No rare plants were seen during the survey.

Other species of note include a family of fox seen around the zone 3 dry sediment pond, presumably living amongst the tamarisk. This should be taken into consideration when planning tamarisk control in this area.

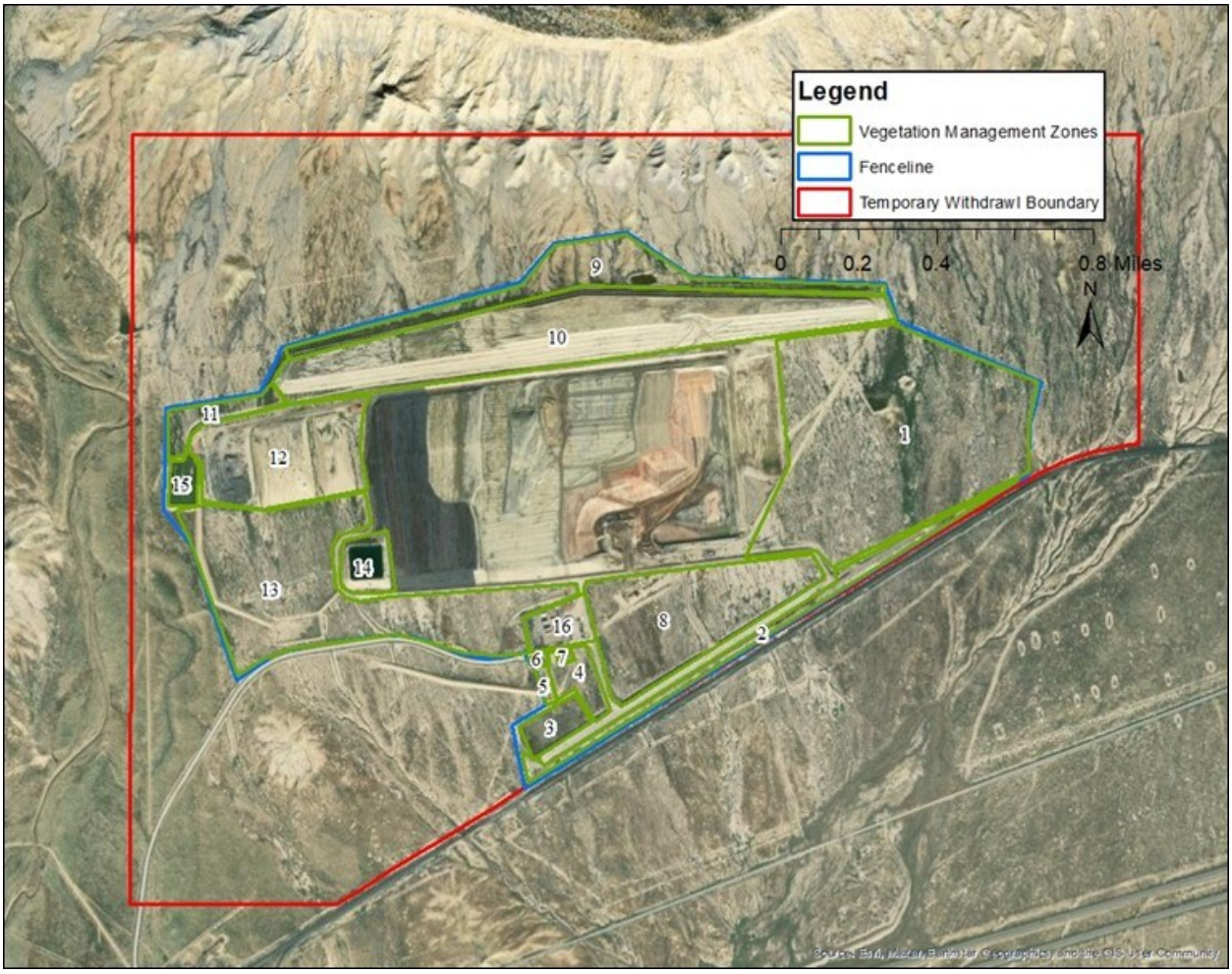

Figure 1. Crescent Junction site vegetation management zones and adjoining table with area calculations

Zone	Hectares	Acres
1	78.0	192.7
2	8.2	20.2
3	3.8	9.5
4	4.0	10.0
5	0.7	1.8
6	0.3	0.8
7	0.3	0.7
8	30.8	76.2
9	19.2	47.4
10	56.2	138.8
11	4.5	11.0
12	25.7	63.6
13	52.4	129.5
14	4.7	11.6
15	2.3	5.6
16	4.5	11.1
Total	295.6	730.4

Appendix A: Crescent Junction Site Plant Inventory Report (continued)

Scientific Name	Common Name	Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Atriplex canescens	Four-winged saltbush	Amaranthaceae	x	x	x	x	x	X	x	x		x		x	x	X	x	X
Atriplex confertifolia	Shadscale	Amaranthaceae	x				x			x			x				x	
Atriplex corrugata	Mat saltbush	Amaranthaceae	X							x	X							
Atriplex gardneri	Gardner's saltbush	Amaranthaceae	x							x	x	x	x	x	x			
Bassia (Kochia) scoparia	Kochia	Amaranthaceae	x		X				x	X	x						x	
Blitum nuttallianum	Nuttall's povertyweed	Amaranthaceae	x		x					x					x			
Halogeton glomeratus	Halogeton	Amaranthaceae	X	x		x	x		X	X		X	X	X	X	x	x	x
krascheninnikovia lanata	Winerfat	Amaranthaceae					x					x			x	x		
Salsola tragus	Russian thistle	Amaranthaceae	x	x	x	x				x	X	X	x	X	x	x	x	x
Asclepias subverticillata	Horsetail milkweed	Apocynaceae		x														
Artemisia filifolia	Old-man sage	Asteraceae						x				x				x		
Artemisia spinescens	Budsage	Asteraceae	x							x	x							
Conyza canadensis	Candian horseweed	Asteraceae																x
Ericameria nauseosa	Rubber rabbitbrush	Asteraceae	x	X	x	x	x	x	X	x					x	x	x	X
Erigeron bellidiastrum	Western fleabane	Asteraceae	x							x	x							
Gutierrezia sarothrae	Broom snakeweed	Asteraceae	x	X	x	X	X	x		x	x		x	x	X		x	
Helianthus annuus	Annual sunflower	Asteraceae	x	x	x	x	x	x		x	x	x					X	
Lactuca serriola	Prickly lettuce	Asteraceae	x	x		x	x		x	x					x			
Machaeranthera canescens	Hoary tansyaster	Asteraceae	x	x		x		x	x	x	x							
Machaeranthera tanacetifolia	Tansyleaf tansyaster	Asteraceae	x							x			x		x			x
Onopordum acanthium	Scoth thistle	Asteraceae								x								
Tetradymia spinosa	Shortspine horsebush	Asteraceae	x							x	x							
Tragopogon dubius	Yellow salsify	Asteraceae	x		x			x	x	x	x							
Lappula occidentalis	Western stickseed	Boraginaceae	x						x	x								
Alyssum desertorum	Desert alyssum	Brassicaceae	x			x				x	x		x		x			
Chorispora tenella	Musk mustard	Brassicaceae	x	x	x					x	x					x		
Descurainia pinnata	Western tansymustard	Brassicaceae	x		x	x			x	x								x
Sisymbrium altisimma	Tall tumblemustard	Brassicaceae	X		x	x			x					x	x	x	x	x
Strigosella africana	African mustard	Brassicaceae	x							x	x						x	
Opuntia polyacantha	Plains prickly pear	Cactaceae				x					x		x	x	x			
Ephedra torreyana	Torrey's ephedra	Ephedraceae									x							
Ephedra viridis	Green mormon tea	Ephedraceae					x											
Erodium cicutarium	Stork's bill	Geraniaceae	x	x						x								
Phacelia crenulata	Notch-leaved phaelia	Hydrophyllaceae									x							
Calochortus nuttallii	Sego Lilly	Liliaceae	x							x								
Sphaeralcea parvifolia	Small-leaf globemallow	Malvaceae	x	x		x	x			x		x	x	x	x	x	x	
Abronia fragrans	Fragrant verbena	Nyctaginaceae									x						x	
Oenothera cespitosa	Tuften evening primrose	Onagraceae									x	x						
Oenothera pallida	Pale evening primrose	Onagraceae	x	x						x								
Plantago patagonica	Wooly plantain	Plantaginaceae	x		x					x								
Achnatherum hymenoides	Indian ricegrass	Poaceae	x							x	x	x	x	x	x		x	
Bromus tectorum	Cheatgrass	Poaceae	X	x	X	X	X		x	x	X	x	X	x	x	x	X	
Elymus elymoides	Squirreltail	Poaceae			x	x	x					x				x		
Elymus smithii	Western wheatgrass	Poaceae														x		
Eremopyrum triticeum	Annual wheatgrass	Poaceae	x	x						x	X		x	x	x		x	
Hesperostipa comata	Needle and thread grass	Poaceae			x	x	x											
Hilaria jamesii	Galleta grass	Poaceae	x	x		x		X		x	X		x		x			x
Leymus cinereus	Basin wildrye	Poaceae					x	x			x							
Sporobolus airoides	Alkali sacaton	Poaceae					x											
Eriogonum inflatum	Desert trumpet	Polygonaceae									x	x						
Ceratocephala testiculata	Bur buttercup	Ranunculaceae	x							x								
Sarcobatus vermiculatus	Grease wood	Sarcobataceae													x		x	
Tamarix ramosissima	Saltcedar	Tamaricaceae		x	X		x									x	x	

Legend

	Non-native
	Weed of concern
	Noxious Weed
Upper case "X"	Dominant species in zone

Figure 2. List of plants found by zone for CJ site with legend indicating nativity information

Appendix B:

State of Utah Noxious Weed List

Appendix B: State of Utah Noxious Weed List

Available online at: Utah Noxious Weed Act (R68-9):

https://ag.utah.gov/farmers/plants-industry/noxious-weed-control-resources/state-of-utah-noxious-weed-list/

The following weeds are hereby officially designated and published as noxious for the State of Utah, as per the authority vested in the Commissioner of Agriculture and Food under Section 4-17-3.
There are hereby designated five classes of noxious weeds in the state: Class 1A (EDRR Watch List), Class 1 (EDRR), Class 2 (Control), Class 3 (Containment), and Class 4 (Prohibited for sale or propagation).

Class 1A: Early Detection Rapid Response (EDRR) Watch List Declared noxious and invasive weeds not native to the state of Utah and not known to exist in the State that pose a serious threat to the state and should be considered as a very high priority.

Common crupina – *Crupina vulgaris*
African rue – *Peganum harmala*
Small bugloss – *Anchusa arvensis*
Mediterranean sage – *Salvia aethiopis*
Spring millet – *Milium vernale*
Syrian beancaper – *Zygophyllum fabago*
Ventenata (North Africa grass) – *Ventenata dubia*
Plumeless thistle – *Carduus acanthoides*
Malta starthistle – *Centaurea melitensis*

Class 1B: Early Detection Rapid Response (EDRR) Declared noxious and invasive weeds not native to the State of Utah that are known to exist in the state in very limited populations and pose a serious threat to the state and should be considered as a very high priority.

Camelthorn – *Alhagi maurorum*
Garlic mustard – *Alliaria petiolata*
Purple starthistle – *Centaurea calcitrapa*
Goats rue – *Galega officinalis*
African mustard – *Brassica tournefortii*
Giant reed – *Arundo donax*
Japanese knotweed – *Polygonum cuspidatum*
Blueweed (Vipers bugloss) – *Echium vulgare*
Elongated mustard – *Brassica elongata*
Common St. John's Wort – *Hypericum perforatum*
Oxeye daisy – *Leucanthemum vulgare*
Cutleaf vipergrass – *Scorzonera laciniata*

Appendix B: State of Utah Noxious Weed List 2023 *(continued)*

Class 2: Control Declared noxious and invasive weeds not native to the state of Utah that pose a threat to the state and should be considered a high priority for control. Weeds listed in the control list are known to exist in varying populations throughout the state. The concentration of these weeds is at a level where control or eradication may be possible.

Leafy spurge – *Euphorbia esula*
Medusahead – *Taeniatherum caput-medusae*
Rush skeletonweed – *Chondrilla juncea*
Spotted knapweed – *Centaurea stoebe*
Purple loosestrife – *Lythrum salicaria*
Squarrose knapweed – *Centaurea virgata*
Dyers woad – *Isatis tinctoria*
Yellow starthistle – *Centaurea solstitialis*
Yellow toadflax – *Linaria vulgaris*
Diffuse knapweed – *Centaurea diffusa*
Black henbane – *Hyoscyamus niger*
Dalmatian toadflax – *Linaria dalmatica*

Class 3: Containment Declared noxious and invasive weeds not native to the State of Utah that are widely spread. Weeds listed in the containment noxious weeds list are known to exist in various populations throughout the state. Weed control efforts may be directed at reducing or eliminating new or expanding weed populations. Known and established weed populations, as determined by the weed control authority, may be managed by any approved weed control methodology, as determined by the weed control authority. These weeds pose a threat to the agricultural industry and agricultural products.

Russian knapweed – *Acroptilon repens*
Houndstongue – *Cynoglossum officinale*
Perennial pepperweed (Tall whitetop) – *Lepidium latifolium*
Phragmites (Common reed) – *Phragmites australis* ssp.
Tamarisk (Saltcedar) – *Tamarix ramosissima*
Hoary cress – *Cardaria* spp.
Canada thistle – *Cirsium arvense*
Poison hemlock – *Conium maculatum*
Musk thistle – *Carduus nutans*
Quackgrass – *Elymus repens*
Jointed goatgrass – *Aegilops cylindrica*
Bermudagrass* – *Cynodon dactylon*
Perennial Sorghum spp.: Johnson Grass (*Sorghum halepense*) and Sorghum almum (*Sorghum almum*)

Scotch thistle (Cotton thistle) – *Onopordum acanthium*

Field bindweed (Wild Morning-glory) – *Convolvulus* spp.

Puncturevine (Goathead) – *Tribulus terrestris*

*Bermudagrass (*Cynodon dactylon*) shall not be a noxious weed in Washington County and shall not be subject to provisions of the Utah Noxious Weed Law within the boundaries of that county. It shall be a noxious weed throughout all other areas of the State of Utah and shall be subject to the laws therein.

Class 4: Prohibited Declared noxious and invasive weeds, not native to the state of Utah, that pose a threat to the state through the retail sale or propagation in the nursery and greenhouse industry. Prohibited noxious weeds are annual, biennial, or perennial plants that the commissioner designates as having the potential or are known to be detrimental to human or animal health, the environment, public roads, crops, or other property.

Cogongrass (Japanese blood grass) – *Imperata cylindrica*

Myrtle spurge – *Euphorbia myrsinites*

Dames Rocket – *Hesperus matronalis*

Scotch broom – *Cytisus scoparius*

Russian olive – *Elaeagnus angustifolia*

Each county in Utah may have different priorities regarding specific State designated Noxious Weeds and is therefore able to reprioritize these weeds for their own needs.

The Weed Specialist coordinates weed control activities among the county weed organizations and the agricultural field representatives. Surveys of serious weed infestations are conducted, and control programs are developed through the county supervisors, county weed boards, and various landowning agencies. The weed specialist and the inspectors work continually with extension and research personnel in encouraging the use of the most effective methods to control the more serious weeds.

This entry was last updated on June 23, 2022.

Appendix C:

Grand County Noxious Weed List

Appendix C: Grand County Noxious Weed List

Available online at: https://www.grandcountyutah.net/168/Noxious-Weeds

Notice is hereby given this 20th day of March, 2023 Pursuant to the Utah Noxious Weed Act, Section 7, to every person who owns or controls lands in Grand County, Utah, that noxious weeds standing, being, or growing on such land shall be controlled and the spread of same prevented by effective cutting, tillage, cropping, pasturing, or treating with chemicals or other methods, or combination methods, or combination thereof, approved by the County Weed Supervisor, as often as may be required to prevent the weed from blooming and maturing seeds, or spreading by root, root stalks or other means.

Upon failure to comply with this notice, the owner or persons in possession of property upon which noxious weeds are present shall be deemed negligent and enforced control measures may be imposed at the discretion of county authorities. Expenses of control measures employed by the county shall be paid directly by the owner or person in possession of the property or shall constitute a lien on the property and become collectible by taxes.

The following are declared noxious weeds for the State of Utah and the County of Grand:

Class 1A EDRR – Early Detection Rapid Response Watch List:

Common crupina	*Crupina vulgaris*
African rue	*Peganum harmala*
Small bugloss	*Anchusa arvensis*
Mediterranean sage	*Salvia aethiopis*
Spring millet	*Milium vernale*
Syrian beancaper	*Zygophyllum fabago*
Ventenata (North Africa grass)	*Ventenata dubia*
Plumeless thistle	*Carduus acanthoides*
Malta thistle	*Centaurea melitensis*

Class 1B Early Detection Rapid Response:

Camelthorn	*Alhagi maurorum*
Garlic mustard	*Alliaria petiolate*
Purple starthistle	*Centaurea calcitrapa*
Goats rue	*Galega officinalis*
African mustard	*Brassica tournefortii*
Giant Reed	*Arundo donax*
Japanese knotweed	*Polygonum cuspidatum*
Blueweed (Vipers bugloss)	*Echium vulgare*
Elongated mustard	*Brassica elongate*
Common St. John's Wort	*Hypericum perforatum*
Oxeye daisy	*Leucanthemum vulgare*
Cutleaf vipergrass	*Scorzonera laciniata*

Appendix C: Grand County Noxious Weed List 2023 *(continued)*

Class 2 Control:

Leafy spurge	*Euphorbia esula*
Medusahead	T*aeniatherum caput-medusae*
Rush skeletonweed	*Chondrilla juncea*
Spotted knapweed	*Centaurea maculosa*
Purple loosestrife	*Lythrum salicaria*
Squarrose knapweed	*Centaurea Squarrosa*
Dyers woad	*Isatis tinctoria*
Yellow wtarthistle	*Centaurea solstitialis*
Yellow toadflax	*Linaria vulgaris*
Diffuse knapweed	*Centaurea diffusa*
Black henbane	*Hyoscyamus niger*
Dalmatian toadflax	*Linaria dalmatica*

Class 3 Contain:

Russian knapweed	*Centaurea repens*
Houndstongue	*Cynoglossum officinale*
Perennial pepperweed (Tall whitetop)	*Lepidium latifolium*
Phragmites (Common reed)	*Phragmites australis ssp*
Tamarisk (Saltcedar)	*Tamarix ramosissima*
Hoary cress	*Cardaria spp.*
Canada thistle	*Cirsium arvense*
Poison Hemlock	*Conium maculatum*
Musk Thistle	*Carduus nutans*
Quackgrass	*Agropyron repens*
Jointed goatgrass	*Aegilops cylindrical*
Bermudagrass*	*Cynodon dactylon*
Perennial Sorghum spp.	Johnson grass *(Sorghum halepense)* and Sorghum almum (*Sorghum almum)*
Scotch Thistle (Cotton thistle)	*Onopordum acanthium*
Field bindweed (Wild Morning-glory)	*Convolvulus spp.*
Puncturevine (Goathead)	*Tribulus terrestris*

Class 4 Prohibited:

Cogongrass (Japanese blood grass)	*Imperata cylindrical*
Myrtle spurge	*Euphorbia myrsinites*
Dame's Rocket	*Hesperis matronalis*
Scotch broom	*Cytisus scoparius*
Russian olive	*Elaeagnus angustifolia*

Grand County Class 4 Prohibited:

Ravenna grass	*Tripidium ravennae* (previously *Saccharum ravennae)*

* Bermudagrass shall not be a noxious weed in Washington County and shall not be subject to provisions of the Utah Noxious Weed Act within the boundaries of the county.