

# 2021 Monitoring Report, Dolores River Restoration on Lease Tract C-SR-13

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U.S. DEPARTMENT OF  
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## Abbreviations

|      |                                       |
|------|---------------------------------------|
| BLM  | U.S. Bureau of Land Management        |
| DOE  | U.S. Department of Energy             |
| DRRP | Dolores River Restoration Partnership |
| LM   | Office of Legacy Management           |
| LMS  | Legacy Management Support             |

## Definitions

**absolute cover:** The area comprising ground cover, bare ground, and total foliar cover. The sum of ground cover, bare ground, and total foliar cover equals 100%.

**basal cover:** The percent of land surface covered by plant bases. Large basal gaps are important indicators of potential erosion, weed invasion, and wildlife habitat. Basal cover is measured in absolute cover but is reported in the total foliar cover values. Basal cover values are used for yearly comparisons.

**biological crust:** Communities composed of microorganisms (e.g., algae, cyanobacteria), fungi, lichens, and nonvascular plants (e.g., mosses) that grow on or just below the soil surface. Biological crusts are important in stabilizing soil surfaces. Visible biological crusts are reported in the total foliar cover values.

**desirable species:** Native and introduced plant species that are not invasive. Desirable species are included in absolute cover and relative cover values (see Sections 3.0 and 5.6 herein).

**ground cover:** The percentage of material, other than bare ground, covering the land surface. It may include standing dead vegetation, plant litter, cobble, gravel, stones, and bedrock. Ground cover is measured in percent absolute cover.

**introduced species:** Plant species that are not native to a particular geographical region. In this report, species native to areas other than the western United States are introduced.

**invasive species:** Plant species generally considered to be weeds in a region. Species that are invasive in this report are highlighted in Appendix A.

**line-point intercept:** A rapid, accurate method for quantifying vegetation and ground cover data that collects data at points along a line transect. Point data describing individual species, bare ground, plant litter, and other parameters are used to calculate plant abundance, plant composition, plant height, basal cover, and other ecological descriptors.

**native species:** Plant species that are endemic to a particular geographic region. In this report, species endemic to the western United States are native.

**noxious weed:** An invasive species that is listed by a federal, state, or local entity and targeted for monitoring or control. In Colorado, noxious weeds are categorized as “List A,” “List B,” “List C,” or “Watch List” species.

**photomonitoring:** An ecological monitoring technique that establishes fixed points from which similar photographs may be taken at regular intervals.

**relative cover:** The percent of individual species or groups of species (e.g., desirable, invasive, and noxious species) that contribute to the total foliar cover. The sum of the relative cover of all species or groups of species is 100%.

**species richness:** The total number of species present.

**standing dead vegetation:** Dead leaves and stems that are brown, tan, or gray in color and considered to be previous years' growth.

**total foliar cover:** The area of ground surface within a sample area obscured at any height by the current year's growth of leaves and stems of all plant species. Current year's growth is identified as green material and live woody stems. The area of ground surface covered by biological crust (see definition) is also included in total foliar cover.

## 1.0 Background

Invasive plants can displace native plant communities, degrade wildlife habitat and forage, hinder recreational opportunities, and increase risks associated with wildfire. The Dolores River Restoration Partnership (DRRP) is a coalition of public and private organizations working to restore the riparian corridor of the Dolores River in western Colorado and eastern Utah. Since 2011, the U.S. Department of Energy (DOE) Office of Legacy Management (LM) has supported DRRP's ecological and management goals by conducting weed control, restoration, and monitoring activities along LM's Uranium Lease Tract C-SR-13 that exists within the Dolores River corridor.

Approximately 3.3 miles of the Dolores River riparian corridor is on LM's C-SR-13 uranium lease tract. Within the corridor are intact populations of stretchberry (also known as New Mexico privet) that form a community considered globally imperiled and identified as a potential type conservation area (CNHP 2000<sup>1</sup>). Restoration activities on the lease tract began in late summer 2011 (DOE 2012), and annual monitoring began in summer 2012<sup>2</sup> to assess the success of restoration efforts over time. Monitoring results have shown restoration efforts have helped improve habitat quality, including reductions of noxious plant species cover and increases in the cover and number of native species. Results from August 2021 monitoring—the tenth year of monitoring since initial restoration activities commenced—are summarized in this report.

## 2.0 History of Restoration

Prior to 2011, large stands of invasive plants were present along the Dolores River corridor within the boundaries of the C-SR-13 lease tract. Saltcedar<sup>3</sup> (also known as tamarisk) was the dominant invasive shrub/tree in the overstory, and Russian olive<sup>3</sup> and Siberian elm<sup>4</sup> were minor components. In the understory, hardheads (also known as Russian knapweed) were major components of the plant cover, and smaller populations of Canada thistle<sup>3</sup>, nodding plumeless thistle<sup>3</sup> (also known as musk thistle), saltlover<sup>5</sup> (also known as halogeton), and other noxious and invasive species were present.

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<sup>1</sup>“Globally imperiled” and “potential conservation area” are not considered legal designations but are descriptors given to the Dolores River corridor by the Colorado Natural Heritage Program to guide management decisions concerning these communities (CNHP 2000).

<sup>2</sup> Monitoring began in 2012, but those data are incompatible with later data and not used in this report.

<sup>3</sup> **List B noxious species** are species for which management plans are implemented and designed to stop the continued spread of these species (Colorado Department of Agriculture 2019).

<sup>4</sup> **Watch List noxious species** are species that have been determined by the state to pose a potential threat to agricultural productivity and environmental values. The Watch List is intended to serve advisory and educational purposes only. Its purpose is to encourage the identification and reporting of these species to the Colorado Department of Agriculture to assist the Department in determining which species should be designated as noxious weeds (Colorado Department of Agriculture 2019).

<sup>5</sup> **List C noxious species** are species for which management plans are implemented and designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species (Colorado Department of Agriculture 2019).

LM has been involved in the following DRRP activities that began in 2011:

- August 29–September 8, 2011: Gold Eagle Mining Inc. (leaseholder for lease tract C-SR-13) cut invasive trees with a track hoe-mounted mulcher head and treated the stumps with herbicide. Large stands of hardheads were also treated with herbicide, and many areas with disturbed soils were seeded with a native plant seed mix (DOE 2012).
- July 24–25, 2012: Legacy Management Support (LMS) ecologists performed data collection for *2012 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2013).
- September and October 2012: Gold Eagle Mining Inc. applied foliar herbicide to resprouted saltcedar, small infestations of saltlover and Canada thistle, and approximately 25 acres of hardheads. Mature saltcedar trees were also cut and treated with herbicide (DOE 2012).
- August 13–15, 2013: LMS ecologists performed data collection for *2013 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2015a).
- November 2013: Hedges Spraying, LLC, treated approximately 23 acres of hardheads and smaller infestations of Canada thistle, saltlover, and resprouted saltcedar. Several mature saltcedar trees were also cut and treated with herbicide.
- August 12–14, 2014: LMS ecologists performed data collection for *2014 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2015b).
- October 20–November 12, 2014: The Southwest Conservation Corps treated approximately 12 acres of hardheads, Canada thistle, nodding plumeless thistle, and saltcedar with herbicide.
- April 4, 2015: LM signed the DRRP Memorandum of Understanding and officially became a member of the partnership (DOE 2015c).
- August 16–18, 2015: LMS ecologists performed data collection for *2015 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2016).
- October 20–November 11, 2015: The Southwest Conservation Corps and LMS staff treated approximately 3 acres of hardheads, Canada thistle, nodding plumeless thistle, and saltcedar with herbicide.
- August 15–17, 2016: LMS ecologists performed data collection for *2016 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2018a).
- October 24–27, 2016: The Southwest Conservation Corps and LMS staff treated approximately 2.3 acres of hardheads, Canada thistle, nodding plumeless thistle, and saltcedar with herbicide.
- May 3–4, 2017: LMS staff applied herbicide to approximately 1.1 acres of the invasive weed burningbush (also known as kochia) within monitoring regions 12, 14, 16, 16A, and 31A (Figure 1) to remove high-density infestations of this weed and provide an open soil surface for reseeding in fall 2017.
- August 21–24, 2017: LMS ecologists performed data collection for *2017 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2018b).
- October 30–November 3, 2017: Hedges Spraying, LLC, and LMS staff treated approximately 21 acres of hardheads and smaller infestations of Canada thistle and saltcedar with herbicide. LMS staff broadcast-seeded approximately 4 acres of relatively barren ground within monitoring regions 12, 14, 16, 16A, and 31A that had formerly been infested

with burningbush and hardheads. The seed mix, which included many pollinator-friendly species, was sown to facilitate native plant succession and deter invasive weeds from reestablishing.

- August 12–15, 2018: LMS ecologists performed data collection for *2018 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2020a). LMS ecologists identified and characterized six reference areas. The established reference areas are shown in green on Figure 1 and are listed in Table A-1 (Appendix A). The selected reference areas are representative of minimally disturbed areas that illustrate intact hydrologic processes, geomorphic setting, and vegetation dynamics of the Dolores River corridor within the DOE lease tract boundary. Data collected from the reference sites are used as a comparison to assess the effectiveness of ongoing restoration efforts (Section 5.6).
- October 9–13, 2018: The Southwest Conservation Corps and LMS staff treated approximately 6 acres of burningbush, hardheads, Canada thistle, nodding plumeless thistle, and saltcedar with herbicide.
- November 28–29, 2018: LMS staff broadcast-seeded approximately 4 acres of relatively barren ground within monitoring regions 14, 15, 16, 16A, and 25/25p that had formerly been infested with burningbush and hardheads. The seed mix was the same mix utilized in fall 2017.
- August 3–6, 2019: LMS ecologists performed data collection for *2019 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2020b).
- September 30–October 2, 2019; October 21–23, 2019: LMS staff treated about 2.1 acres of Canada thistle, hardheads, and saltcedar with herbicide.
- June 2–4, 2020: LMS staff treated 6.4 acres of burningbush with herbicide.
- August 3–6, 2020: LMS ecologists performed data collection for *2020 Monitoring Report, Dolores River Restoration Project on Lease Tract C-SR-13* (DOE 2021b). LMS ecologists collected common reed specimens (see Figure 1) and submitted them for laboratory analysis. This work was conducted in collaboration with DRRP and the National Park Service to investigate the distribution of native, introduced, and hybrid subspecies across western Colorado and eastern Utah. The introduced subspecies exhibits invasive characteristics and is listed on the Colorado noxious weed Watch List. Recommendations are discussed in Section 6.0.
- October 6–8, 2020; October 20–22, 2020; November 11–12, 2020: LMS staff treated 4.7 acres of Canada thistle and hardheads with herbicide.
- January 5, 2021: LM renewed the DRRP Memorandum of Understanding to continue the partnership for another 5 years (DOE 2021a).
- June 21–October 21, 2021: To protect the Dolores River from potential sediment loads, LMS personnel relocated or stabilized and armored portions of a waste rock pile associated with the Burro Mine Complex along Burro Canyon Creek. Most of the disturbed area was pocked and seeded with a pollinator-friendly native species and organic nitrogen amendment. The Burro Mines Reclamation project exists within lease tract C-SR-13, on the north side of County Road S8. More information is available at <https://www.energy.gov/lm/articles/mine-reclamation-completed-southwestern-colorado>.
- October 19–21, 2021: The Southwest Conservation Corps and LMS staff treated 2.8 acres of Canada thistle and hardheads with herbicide.



### 3.0 Success Goals

In its Dolores River Riparian Action Plan (Tamarisk Coalition 2010), DRRP established a monitoring program and defined ecological success goals for the Dolores River project area. The plan was later modified (DRRP 2014) to include the following objectives related to the partnership's ecological goals:

- Live saltcedar will be reduced to less than 5% relative cover within the riparian corridor
- Invasive, nonnative plants other than saltcedar will be reduced to less than 15% relative cover within the riparian corridor
- The remaining plant cover within the riparian corridor will be composed of desirable or native species (i.e., greater than 80% relative cover)
- Total foliar cover within the riparian corridor will be greater than or equal to 30% (or less in particular areas where physical conditions hamper vegetation establishment)

In addition to the DRRP goals, LM established two additional success goals for the portion of the Dolores River Corridor on the C-SR-13 lease tract. These goals follow criteria previously utilized and achieved on DOE lease tract reclamation projects and are commonly used in uranium mine reclamation on the Colorado Plateau (DOE 2012). The LM success goals are as follows:

- Absolute cover of desirable species is at least 75% of that in nearby reference areas
- Noxious weeds compose less than 1% of the relative cover

These annual monitoring results are used to detect improvements in riparian habitat. LM compares the results to DRRP and LM success goals and assesses changes in species richness and the cover of desirable species over time. LM will consider an area successfully restored when all six of the goals listed above are met. Once goals are achieved, monitoring will occur biannually or triennially to ensure that the corridor remains healthy. Comparisons of monitoring results to DRRP and LM success goals are summarized in Section 5.6.



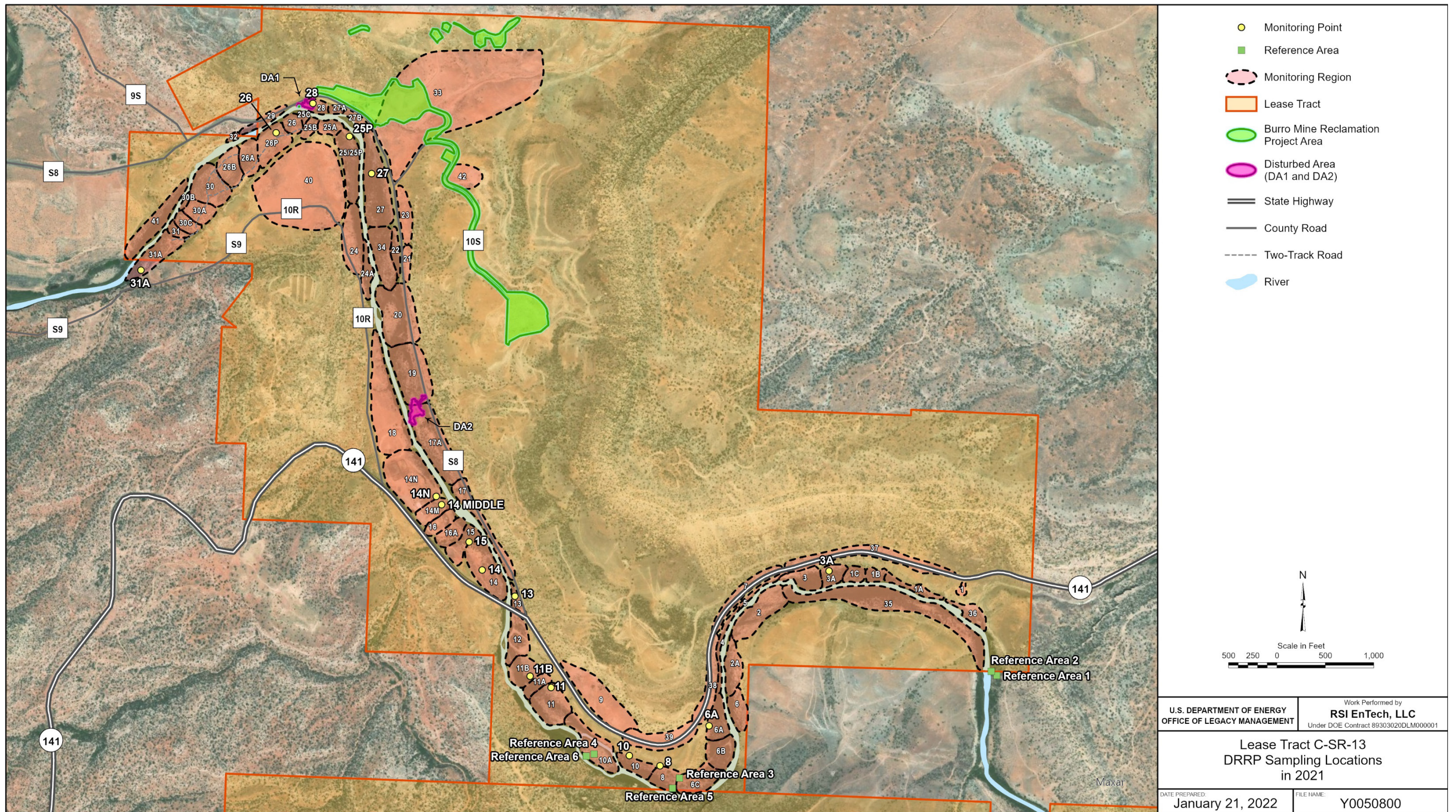


Figure 1. Lease Tract C-SR-13 DRRP Monitoring Points, Photo Points, Monitoring Regions, Reference Areas, and Burro Mine Reclamation in 2021



## 4.0 Monitoring Methods

Ecologists use three primary data collection methods—vegetation and ground cover measurements, noxious weed mapping, and photomonitoring—to monitor restoration efforts in the riparian corridor of the lease tract. Methodology continues to evolve from initial monitoring efforts in 2012 and now includes the collection of additional statistics and more encompassing information. In 2011, ecologists identified known weed infestations within the riparian corridor of lease tract C-SR-13 on a project map. In 2012, established monitoring points were created at those coordinates with a portable GPS unit. Vegetative and ground cover data were collected, and photographs were taken at each point from 2012 through 2021. The 16 designated monitoring points are shown in yellow on Figure 1 and listed in Table A-1 (Appendix A). Scientific nomenclature and common names of the plants identified on the lease tract follow the U.S. Department of Agriculture Natural Resources Conservation Service PLANTS Database (USDA 2021). To gather additional information, ecologists later expanded the riparian corridor into numbered monitoring regions to identify broader areas to collect opportunistic data and note areas of concern (Figure 1). The three primary data collection methods used in 2021 are described in the following sections.

### 4.1 Vegetation and Ground Cover

In August 2021, LMS ecologists conducted line-point intercept methods to collect vegetative and ground cover data at each monitoring point. The sampling points were located with a GPS unit, and a 25-meter tape measure was used to establish a transect at a preestablished, random azimuth. Data were collected at 0.5-meter intercepts along the transects, resulting in 50 data points at each transect (Herrick et al. 2017). Species observed adjacent to the monitoring transect were also recorded. Results were summarized and compared to DRRP’s success goals, LM’s success goals, reference area data, and previous years’ data.

### 4.2 Noxious Weed Mapping

During 2021 monitoring, the approximate size, location, and species of noxious weed infestations were mapped in the field, primarily with a GPS unit, and are summarized in this report. However, because noxious weeds are no longer a dominant component of the vegetation at lease tract C-SR-13, detailed maps of noxious weed infestations are managed by weed control teams and are no longer included in this report.

### 4.3 Photomonitoring

Photographs were taken at the established monitoring points to visually track changes in vegetation at specific points over time. The selected locations are representative of river corridor areas containing current or historical weed infestations. Although only a subset of the photographs is included in this report, all photographs are maintained as records in the project files.

## 5.0 Results

Ecologists conducted monitoring between August 23 and 26, 2021. Results are summarized below. A detailed species list and line-point intercept data are provided in Appendix A.

### 5.1 Ground Cover

Average total foliar cover at the 16 monitoring points (not including reference areas) increased from 35% in 2020 to 48% in 2021. Much of the increase is attributed to an abundance of introduced annual weeds (burningbush, little hogweed, and prickly Russian thistle—a combined 15% relative foliar cover). The increase in foliar cover (i.e., introduced annual weeds) could likely be due to an increase in precipitation from 2020 to 2021 (United States Drought Monitoring 2021). A summary of ground cover for all years of monitoring is in Table 1.

Ecologists have observed evidence of heavy livestock grazing (i.e., closely grazed vegetation, low herbaceous vegetation height, and cattle manure) for several years, which can impact restoration efforts. Although managed grazing (i.e., proper carrying capacities and seasonal rotations) can be compatible with the restoration goals, overgrazing could cause setbacks. LM has no control over grazing on the C-SR-13 lease tract as the land surface is owned by private entities or, in some areas, managed by the U.S. Bureau of Land Management (BLM).

Two areas of disturbance were identified within the riparian zone of the Dolores River (Figure 1, Photos 1 and 2). These areas will be monitored and treated as part of LM's efforts supporting DRRP.

Ecologists observed evidence of beaver activity including several downed trees, which can impact progression of restoration goals (Photo 3).



*Photos 1 and 2. Disturbed Areas Within the Dolores River Riparian Zone*





*Photo 3. Downed Cottonwood Trees from Beaver Activity*

## **5.2 Vegetation Composition and Species Richness**

In August 2021, invasive species (noxious and non-noxious species) accounted for 21% of the relative foliar cover, an increase from 17% recorded in 2020. Of these, non-noxious species composed of burningbush, cheatgrass<sup>5</sup>, common reed, little hogweed, prickly Russian thistle, and quackgrass<sup>5</sup> accounted for a combined 20% relative cover. The most abundant noxious species was hardheads, which had a 1% relative cover. All large saltcedar trees within the lease tract have been treated (manually cut and treated with herbicide) but small resprouts were observed throughout the lease tract.

Desirable species (native and introduced) accounted for 79% of the relative foliar cover, a decrease from 83% in 2020. Of these, woody species (trees and shrubs) composed 41%, grasses 38%, and forbs 21% of the relative foliar cover. Dominant desirable species included saltgrass, rubber rabbitbrush, stretchberry, narrowleaf willow, sand dropseed, and alkali sacton.

Ecologists continually identify new species within the riparian corridor of the lease tract. Some species have populated through seeding efforts (e.g., Rocky Mountain beeplant, Photo 4). Additionally, ecologists have begun to document more observed species within the monitoring regions to better understand the entire floral community. In 2021, the mean species richness at the 16 monitoring points was 21. Since monitoring began in 2012, ecologists have identified and documented 151 different plant species within the lease tract.



*Photo 4. Seeded Species, Rocky Mountain Beeplant (Cleome serrulata), at Monitoring Point 14*

### 5.3 Reference Areas

Ecologists performed the line-point intercept method to collect vegetative and ground cover data at six reference areas during 2021 monitoring. The selected reference areas are representative of minimally disturbed areas that illustrate intact hydrologic processes, geomorphic setting, and vegetation dynamics of the Dolores River corridor within the lease tract. Data collected from the reference areas are used as a comparison to assess the effectiveness of ongoing restoration efforts.

Total foliar cover increased in the reference areas from 58% in 2020 to 65% in 2021, consistent with the increase in cover at the 16 monitoring points and likely due to increased precipitation. Only trace amounts of noxious weeds were observed (<1% relative cover) in the reference areas. Invasive species (non-noxious weeds) were found in small amounts (2% average relative cover). Dominant woody species were narrowleaf willow, stretchberry, rubber rabbitbrush, and skunkbush sumac—all desirable native species. Dominant herbaceous species (grasses and forbs) were alkali sacaton, Wyoming Indian paintbrush, and hoary tansyaster—also desirable native species. Table 1 compares reference area averages with monitoring point averages. The complete dataset from the reference areas is in Appendix A.

Table 1. Summary of Vegetation Monitoring Data at Lease Tract C-SR-13, 2013–2021

| Year  | Monitoring Point |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     | Mean |
|---|------------------|----|-----|-----|----|-----|----|----|-----|-----|-----|-----|-----|----|----|-----|------|
|   | 3A               | 6A | 8   | 10  | 11 | 11B | 13 | 14 | 14M | 14N | 15  | 25P | 26P | 27 | 28 | 31a |      |
| <b>Total foliar cover (%)</b>   |                  |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     |      |
| 2013  | 73               | 68 | 25  | 50  | 48 | 63  | 73 | 28 | -   | -   | 13  | 33  | 53  | 23 | 28 | -   | 44   |
| 2014  | 55               | 50 | 15  | 50  | 40 | 45  | 75 | 75 | 55  | -   | 30  | 25  | 25  | 25 | -  | -   | 43   |
| 2015  | 55               | 70 | 35  | 20  | 35 | 50  | 35 | 55 | 70  | 60  | 20  | 35  | 40  | 25 | 35 | -   | 43   |
| 2016  | 35               | 45 | 20  | 20  | 55 | 30  | 50 | 45 | 40  | 40  | 45  | 25  | 40  | 50 | 50 | -   | 39   |
| 2017  | 75               | 80 | 30  | 75  | 60 | 55  | 60 | 70 | 80  | 90  | 80  | 65  | 65  | 80 | 85 | -   | 70   |
| 2018  | 52               | 60 | 36  | 66  | 34 | 34  | 44 | 31 | 58  | 40  | 72  | 56  | 24  | 44 | 42 | 26  | 45   |
| 2019  | 54               | 64 | 44  | 70  | 42 | 46  | 82 | 44 | 54  | 48  | 80  | 64  | 50  | 52 | 62 | 82  | 59   |
| 2020  | 32               | 48 | 34  | 50  | 12 | 30  | 42 | 26 | 42  | 38  | 58  | 40  | 42  | 34 | 28 | 4   | 35   |
| 2021  | 46               | 50 | 44  | 62  | 40 | 40  | 68 | 44 | 54  | 42  | 68  | 56  | 28  | 42 | 40 | 42  | 48   |
| <b>2021 REFERENCE AREAS</b>   |                  |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     | 65   |
| <b>Relative cover of noxious species (State of Colorado List B Noxious Species) (%)</b> |                  |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     |      |
| 2013  | 25               | 0  | 6   | 32  | 6  | 77  | 2  | 10 | -   | -   | 26  | 17  | 42  | 12 | 4  | -   | 20   |
| 2014  | 33               | 6  | 0   | 0   | 9  | 3   | 3  | 0  | 0   | -   | 12  | 0   | -   | 30 | 23 | -   | 9    |
| 2015  | 4                | 0  | 0   | 0   | 3  | 3   | 3  | 6  | 0   | 0   | 4   | 0   | 2   | 0  | 3  | -   | 2    |
| 2016  | 0                | 0  | 0   | 0   | 8  | 4   | 0  | 2  | 0   | 0   | 0   | 2   | 2   | 10 | 0  | -   | 2    |
| 2017  | 1                | 0  | 1   | 1   | 11 | 18  | 26 | 25 | 16  | 21  | 24  | 0   | 10  | 6  | 5  | -   | 11   |
| 2018  | 3                | 1  | 0   | 0   | 0  | 44  | 0  | 0  | 2   | 5   | 10  | 5   | 3   | 2  | 20 | 51  | 9    |
| 2019  | 0                | 0  | 0   | 2   | 0  | 20  | 0  | 0  | 0   | 0   | 2   | 0   | 0   | 0  | 3  | 0   | 2    |
| 2020  | 0                | 0  | 0   | 0   | 0  | 10  | 0  | 5  | 0   | 5   | 0   | 0   | 5   | 0  | 0  | 0   | 2    |
| 2021  | 0                | 0  | 0   | 0   | 0  | 13  | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0  | 0  | 0   | <1   |
| <b>2021 REFERENCE AREAS</b>   |                  |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     | 0    |
| <b>Relative cover of invasive species (noxious and non-noxious weeds) (%)</b>           |                  |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     |      |
| 2013  | 28               | 53 | 22  | 32  | 8  | 82  | 31 | 86 | -   | -   | 37  | 17  | 42  | 12 | 4  | -   | 35   |
| 2014  | 33               | 9  | 0   | 0   | 13 | 6   | 80 | 76 | 0   | -   | 98  | 0   | -   | 39 | 30 | -   | 30   |
| 2015  | 8                | 55 | 3   | 0   | 3  | 26  | 50 | 55 | 0   | 0   | 96  | 0   | 2   | 14 | 45 | -   | 24   |
| 2016  | 11               | 13 | 0   | 0   | 8  | 4   | 52 | 93 | 0   | 2   | 100 | 7   | 2   | 31 | 24 | -   | 23   |
| 2017  | 9                | 1  | 1   | 1   | 21 | 27  | 55 | 36 | 24  | 29  | 53  | 23  | 35  | 13 | 37 | -   | 24   |
| 2018  | 3                | 2  | 0   | 0   | 4  | 48  | 2  | 16 | 2   | 5   | 40  | 6   | 6   | 4  | 20 | 51  | 13   |
| 2019  | 8                | 10 | 0   | 18  | 8  | 32  | 50 | 27 | 0   | 0   | 52  | 6   | 18  | 7  | 14 | 75  | 20   |
| 2020  | 10               | 6  | 0   | 12  | 0  | 10  | 25 | 25 | 0   | 10  | 30  | 0   | 26  | 13 | 7  | 100 | 17   |
| 2021  | 21               | 0  | 17  | 0   | 5  | 13  | 38 | 66 | 0   | 5   | 35  | 4   | 7   | 10 | 15 | 100 | 21   |
| <b>2021 REFERENCE AREAS</b>   |                  |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     | 2    |
| <b>Relative cover of desirable species (native and introduced) (%)</b>                  |                  |    |     |     |    |     |    |    |     |     |     |     |     |    |    |     |      |
| 2013  | 72               | 47 | 78  | 68  | 92 | 18  | 69 | 14 | -   | -   | 63  | 83  | 58  | 88 | 96 | -   | 65   |
| 2014  | 67               | 91 | 100 | 100 | 87 | 94  | 20 | 24 | 100 | -   | 2   | 100 | -   | 61 | 70 | -   | 70   |
| 2015  | 89               | 45 | 97  | 100 | 97 | 74  | 50 | 45 | 100 | 100 | 4   | 100 | 98  | 86 | 55 | -   | 76   |
| 2016  | 89               | 87 | 100 | 100 | 92 | 96  | 48 | 17 | 100 | 98  | 0   | 93  | 98  | 69 | 76 | -   | 78   |
| 2017  | 91               | 99 | 99  | 99  | 79 | 73  | 45 | 64 | 76  | 71  | 47  | 77  | 65  | 87 | 63 | -   | 76   |
| 2018  | 97               | 98 | 100 | 100 | 96 | 52  | 98 | 83 | 98  | 95  | 61  | 94  | 94  | 96 | 80 | 49  | 86   |

Table 1. Summary of Vegetation Monitoring Data at Lease Tract C-SR-13, 2013–2021 (continued)

| Year   | Monitoring Point |     |     |     |     |     |    |    |     |     |    |     |     |    |    |     | Mean |
|--|------------------|-----|-----|-----|-----|-----|----|----|-----|-----|----|-----|-----|----|----|-----|------|
|  | 3A               | 6A  | 8   | 10  | 11  | 11B | 13 | 14 | 14M | 14N | 15 | 25P | 26P | 27 | 28 | 31a |      |
| <b>Relative cover of desirable species (native and introduced) (%) (continued)</b> |                  |     |     |     |     |     |    |    |     |     |    |     |     |    |    |     |      |
| 2019   | 92               | 90  | 100 | 82  | 92  | 68  | 50 | 73 | 100 | 100 | 48 | 94  | 82  | 93 | 86 | 25  | 80   |
| 2020   | 90               | 94  | 100 | 88  | 100 | 90  | 75 | 70 | 100 | 85  | 70 | 100 | 69  | 87 | 93 | 0   | 83   |
| 2021   | 79               | 100 | 83  | 100 | 95  | 87  | 62 | 34 | 100 | 95  | 65 | 96  | 93  | 90 | 85 | 0   | 79   |
| <b>2021 REFERENCE AREAS</b>  |                  |     |     |     |     |     |    |    |     |     |    |     |     |    |    |     | 98   |
| <b>Species richness</b>  |                  |     |     |     |     |     |    |    |     |     |    |     |     |    |    |     |      |
| 2013   | 14               | 12  | 10  | 10  | 9   | 10  | 10 | 6  | -   | -   | 5  | -   | 11  | 4  | 6  | -   | 9    |
| 2014   | 11               | 11  | 10  | 5   | 10  | 8   | 6  | 5  | 5   | -   | 5  | 6   | 4   | 8  | -  | -   | 7    |
| 2015   | 18               | 17  | 8   | 8   | 11  | 7   | 8  | 7  | 6   | 3   | 4  | 7   | 4   | 6  | 11 | -   | 8    |
| 2016   | 9                | 7   | 6   | 9   | 11  | 6   | 5  | 4  | 5   | 4   | 5  | 6   | 4   | 5  | 6  | -   | 6    |
| 2017   | 24               | 10  | 11  | 13  | 12  | 17  | 12 | 22 | 19  | 15  | 16 | 18  | 26  | 14 | 22 | -   | 17   |
| 2018   | 12               | 15  | 12  | 17  | 15  | 17  | 12 | 5  | 10  | 6   | 18 | 31  | 15  | 10 | 17 | 15  | 14   |
| 2019   | 23               | 23  | 23  | 23  | 13  | 22  | 16 | 19 | 18  | 16  | 13 | 25  | 29  | 14 | 19 | 9   | 20   |
| 2020   | 29               | 31  | 18  | 31  | 26  | 24  | 23 | 31 | 23  | 23  | 29 | 42  | 31  | 26 | 26 | 20  | 27   |
| 2021   | 21               | 20  | 20  | 23  | 28  | 29  | 16 | 32 | 20  | 14  | 18 | 21  | 18  | 16 | 20 | 21  | 21   |
| <b>2021 REFERENCE AREAS</b>  |                  |     |     |     |     |     |    |    |     |     |    |     |     |    |    |     | 24   |

**Note:**

A dash indicates that no data were collected for this point during the monitoring event.

## 5.4 Noxious Weed Mapping Results

The locations of noxious weed infestations were mapped during monitoring. Infestations of hardheads, jointed goatgrass<sup>3</sup>, saltlover, Canada thistle, saltcedar, and nodding plumeless thistle were mapped. Detailed weed maps were provided to weed control specialists and are maintained as records in the project files. Weed control efforts have significantly reduced noxious weed populations. The majority of large monocultural stands have been reduced, and now only scattered noxious weeds are present throughout the river corridor. LMS staff treated approximately 2.8 acres of hardheads and Canada thistle with herbicide in fall 2021.

## 5.5 Photomonitoring Results

Photomonitoring results from six selected locations monitored in 2021, and the corresponding photos from previous years are included below. The photos detailed below are at reference area 3 and monitoring points 31A, 3A, 6A, 26, 14N, and 25P. Photomonitoring data suggest the following trends:

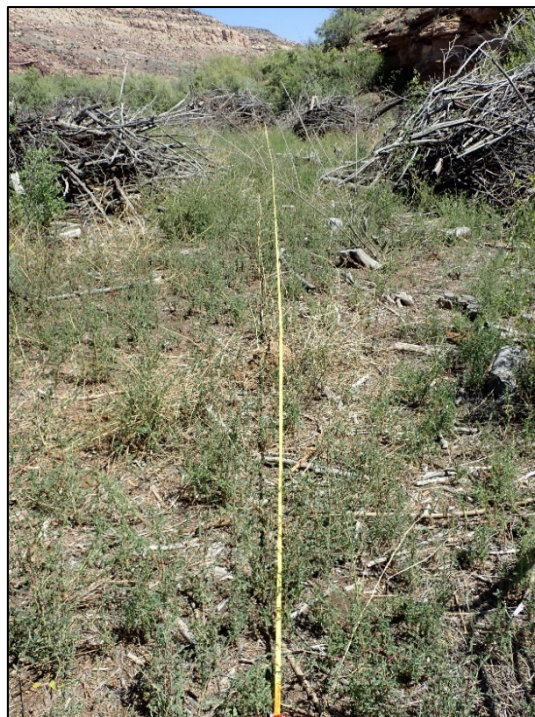
- A visible and significant reduction can be seen in the cover of noxious weeds at all photomonitoring locations
- In many areas, native vegetation growth is evident in areas previously dominated by hardheads or saltcedar
- Fluctuations of the abundance of annual invasive weeds were observed



## Monitoring Point 31A, View to the Southeast



*Photo 5a. 2020—Saltcedar Debris Piles and Minimal Foliar Cover  
(4% Total Foliar Cover Comprised Entirely of Burningbush, an Invasive Weed)*



*Photo 5b. 2021—Increase of Foliar Cover  
(42% Total Foliar Cover Comprised Almost Entirely of Burningbush)*

**Monitoring Point 3A, View to the East**



*Photo 6a. 2012—Understory Dominated by Hardheads*



*Photo 6b. 2021—Hardheads Have Been Nearly Eliminated*



**Photo Point 6A, View to the North-Northeast**



*Photo 7a. 2012—Understory of Hardheads Surrounding Observer*



*Photo 7b. 2021—Reduction of Hardheads;  
Native Fourwing Saltbush in Foreground*



**Photo Point 26, View to the West**



*Photo 8a. 2012—Understory Dominated by Hardheads  
(Appears as Small White Flowers in Foreground)*



*Photo 8b. 2021—Reduction of Hardheads;  
Understory is Now Dominated by Native Saltgrass and Alkali Sacton*



**Photo Point 14N, View to the North**



*Photo 9a. 2012—Flowering Plants in Foreground Are Hardheads*



*Photo 9b. 2021—A Few Hardheads are Present, But Native Inland Saltgrass Is the Dominant Ground Cover; Visible Decrease in Foliar Cover and Closely Grazed Vegetation*



**Photo Point 25P, View to the South**



*Photo 10a. 2012—Saltcedar (Shrub with Orange Flagging), Not Yet Treated*



*Photo 10b. 2021—Same Saltcedar After Treatment (Now Woody Debris on the Ground) and Recruitment of Several Native Species*

## 5.6 Comparison of 2020 Results to Success Goals

Table 2 provides a comparison of 2021 results at the 16 monitoring points to the four DRRP success goals and two LM goals. Green-shaded cells indicate areas where goals have been met. Three of the six goals were met in 2021; however, results indicate conditions are near the success criteria for all goals.

The mean relative cover of invasive species (21%), desirable species (native and introduced, 79%), and desirable vegetation compared to the reference areas (59%) did not meet success criteria in 2021. Since 2012, the mean cover of noxious species at the 16 monitoring points has declined considerably (saltcedar: 2012—15%, 2020—<1%; hardheads: 2012—20%, 2020—<1%); however, scattered populations remain throughout the lease tract. Jointed goatgrass, first identified during the 2019 monitoring, was still present in 2021 but did not appear to be as prevalent. The mean relative cover of invasive species (noxious and non-noxious weeds) increased slightly from 17% in 2020 to 21% in 2021.

The relative cover of desirable species meets the DRRP success criteria (>80%) at 11 of the 16 monitoring points. When compared to the reference areas, the relative cover of desirable species meets LM success criteria at 5 of the 16 monitoring points. Invasive species other than saltcedar remain at most of the monitoring points but do not make up a significant portion of the foliar cover. With continued vegetation management, it is expected that goals will be met in the next several years.

Table 2. Comparison of 2021 Data at Established Monitoring Points to Success Goals

| Goal   | 3A  | 6A  | 8  | 10  | 11  | 11B | 13  | 14 | 14M | 14N | 15  | 25P | 26P | 27  | 28  | 31a | Mean |
|--|-----|-----|----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| <b>DRRP Goals</b>  |     |     |    |     |     |     |     |    |     |     |     |     |     |     |     |     |      |
| Relative cover of saltcedar <5%                                  | 0   | 0   | 0  | 0   | 0   | 0   | obs | 0  | 0   | obs | 0   | obs | obs | 0   | 0   | obs | <1   |
| Relative cover of invasive species <15%                          | 21  | 0   | 17 | obs | 5   | 13  | 38  | 66 | obs | 5   | 35  | 4   | 7   | 10  | 15  | 100 | 21   |
| Relative cover of desirable (native and introduced) species >80% | 79  | 100 | 83 | 100 | 95  | 87  | 62  | 34 | 100 | 95  | 65  | 96  | 93  | 90  | 85  | 0   | 79   |
| Total foliar cover >30%  | 46  | 50  | 44 | 62  | 40  | 40  | 68  | 44 | 54  | 42  | 68  | 56  | 28  | 42  | 40  | 42  | 48   |
| <b>LM Goals</b>  |     |     |    |     |     |     |     |    |     |     |     |     |     |     |     |     |      |
| Absolute cover of desirable species >75% of reference areas      | 57  | 78  | 57 | 97  | 59  | 54  | 66  | 23 | 84  | 62  | 69  | 84  | 41  | 59  | 53  | 0   | 59   |
| Relative cover of noxious species <1%                            | obs | 0   | 0  | 0   | obs | 13  | 0   | 0  | obs | 0   | obs | obs | obs | obs | obs | 0   | <1   |

**Note:**

Green-shaded cells indicate areas where goals have been met.

**Abbreviation:**

obs = plants observed at the monitoring point but accounted for <1% of the foliar cover

## 6.0 Recommendations

Monitoring in 2021 showed progress toward restoration goals in some areas along the 3.3 miles of the Dolores River corridor on LM lease tract C-SR-13. Weed control efforts (herbicide treatments and mechanical removal) have decreased invasive and noxious species foliar cover, but some areas still contain notable populations. Many areas show increases in native species through reseeding efforts and passive recruitment.

The following recommendations are provided based on 2021 monitoring results:

- Although the foliar cover of invasive and noxious species has significantly decreased, scattered populations remain in small amounts throughout the lease tract. Ecologists recommend that LM continue to monitor and spot spray weed infestations to improve ongoing restoration efforts and to comply with state and local noxious weed regulations as described in the *Procedure for Handling Herbicides at Western Legacy Management Sites* (LMS/PRO/S12853).
- To maximize effectiveness, noxious weed control activities should be scheduled for the appropriate season, depending on the targeted species. Herbicide spraying for noxious biennial thistles, burningbush, and saltlover should take place in spring before plants flower and produce seed. Saltcedar cutting and spraying should take place in late summer or fall when plants are taking up nutrients. Herbicide treatments for hardheads and Canada thistle should take place in June during bud stage or in fall as the plants go dormant.
- Ecologists have observed an increase in evidence of heavy livestock grazing on the lease tract since 2020. Although properly managed grazing can be compatible with LM restoration goals, overgrazing can cause setbacks. Additionally, ecologists believe that the continuing drought in the Slick Rock area may be adversely affecting plant cover. If heavy grazing appears to continue in 2022, it is recommended that ecologists meet with DRRP representatives, BLM, and local landowners to discuss this issue.
- LMS ecologists collected common reed specimens to submit for laboratory analysis in August 2020. This work was conducted in collaboration with DRRP and the National Park Service to investigate the distribution of native, nonnative, and hybrid subspecies across western Colorado and eastern Utah. The nonnative species exhibits invasive characteristics and is listed on the Colorado noxious weed Watch List. Results indicated that both native and nonnative species are present within the lease tract (Utah State University 2020). Currently there are no suggested management strategies for the species, but continued involvement with DRRP will help support data needs regarding the ecologic impacts of the species and development of management strategies.
- Investigate potential revegetation efforts, such as seeding or transplanting, at monitoring points with low foliar cover (monitoring points 3A, 4, 11, 11B, 27, 28, and 31A shown on Figure 1).
- Evaluate installation of wire mesh exclosures around the base of trees to discourage damage from beaver activity.
- Establish new monitoring locations within the two disturbed areas to document revegetation success.



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## **Appendix A**

### **Complete Dataset for 2021 Dolores River Restoration Monitoring, Lease Tract C-SR-13**

Table A-1. Complete Dataset for 2021 Dolores River Restoration Monitoring, Lease Tract C-SR-13

| Reference Area or Monitoring Point            |                              | REF 1                     | REF 2 | REF 3 | REF 4 | REF 5 | REF 6 | REF Mean | 3A  | 6A  | 8   | 10  | 11  | 11B | 13  | 14  | 14Middle | 14N | 15a | 25p | 26  | 27  | 28  | 31a | Mean |  |
|---|------------------------------|---------------------------|-------|-------|-------|-------|-------|----------|-----|-----|-----|-----|-----|-----|-----|-----|----------|-----|-----|-----|-----|-----|-----|-----|------|--|
|   |                              | <b>Absolute Cover (%)</b> |       |       |       |       |       |          |     |     |     |     |     |     |     |     |          |     |     |     |     |     |     |     |      |  |
| Total foliar cover                            |                              | 72                        | 76    | 62    | 38    | 64    | 80    | 65       | 46  | 50  | 44  | 62  | 40  | 40  | 68  | 44  | 54       | 42  | 68  | 56  | 28  | 42  | 40  | 42  | 48   |  |
| Bare ground                                   |                              | 20                        | 18    | 24    | 34    | 18    | 20    | 22       | 30  | 28  | 20  | 14  | 22  | 28  | 8   | 34  | 18       | 24  | 12  | 26  | 38  | 0   | 16  | 8   | 20   |  |
| Rock  |                              | 0                         | 0     | 0     | 10    | 0     | 0     | 2        | 0   | 0   | 32  | 0   | 32  | 16  | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 10  | 0   | 6    |  |
| Herbaceous litter                             |                              | 6                         | 6     | 4     | 18    | 18    | 0     | 9        | 14  | 18  | 4   | 20  | 6   | 16  | 14  | 22  | 26       | 26  | 20  | 18  | 34  | 50  | 28  | 40  | 22   |  |
| Woody litter                                  |                              | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 8   | 6   | 10  | 2    |  |
| Basal   |                              | 0                         | 0     | 2     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |  |
| Lichen  |                              | 0                         | 0     | 8     | 0     | 0     | 0     | 1        | obs | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |  |
| Standing dead                                 |                              | 2                         | 0     | 0     | 0     | 0     | 0     | 0        | 10  | 4   | 0   | 4   | 0   | 0   | 10  | 0   | 2        | 8   | 0   | 0   | 0   | 0   | 0   | 0   | 2    |  |
|   |                              | <b>Relative Cover (%)</b> |       |       |       |       |       |          |     |     |     |     |     |     |     |     |          |     |     |     |     |     |     |     |      |  |
| Scientific Name                               | Common Name (USDA)           |                           |       |       |       |       |       |          |     |     |     |     |     |     |     |     |          |     |     |     |     |     |     |     |      |  |
| <i>Acer negundo</i>                           | Boxelder                     | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0        | 0   | 39  | 0   | 0   | 0   | 0   | obs | 2    |  |
| <i>Achillea millefolium</i>                   | Common yarrow                | 0                         | 0     | 0     | obs   | 0     | 0     | 0        | obs | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |  |
| <i>Achnatherum hymenoides</i>                 | Indian ricegrass             | 0                         | 0     | 0     | 5     | 0     | 0     | 1        | 0   | 0   | obs | obs | 0   | 0   | 0   | obs | obs      | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |  |
| <i>Acroptilon repens</i>                      | Hardheads (Russian knapweed) | obs                       | obs   | 0     | obs   | 0     | obs   | 0        | obs | 0   | 0   | 0   | 0   | 13  | 0   | obs | 0        | obs | 0   | 0   | obs | obs | 0   | 0   | 1    |  |
| <i>Aegilops cylindrica</i>                    | Jointed goatgrass            | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |  |
| <i>Agrostis stolonifera</i>                   | Creeping bentgrass           | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |  |
| <i>Alyssum desertorum</i>                     | Desert madwort               | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |  |
| <i>Amaranthus blitoides</i>                   | Mat amaranth                 | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | obs | 0   | 0   | 0   | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |  |
| <i>Amaranthus retroflexus</i>                 | Redroot amaranth             | 0                         | 0     | 0     | 0     | 0     | obs   | <1       | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |  |
| <i>Ambrosia artemisiifolia</i>                | Annual ragweed               | 0                         | 0     | 0     | 5     | 0     | 0     | 1        | obs | 0   | 0   | 0   | obs | obs | 0   | 0   | 0        | 0   | obs | 4   | 0   | 0   | 0   | 0   | <1   |  |
| <i>Apocynum cannabinum</i>                    | Indianhemp                   | 0                         | obs   | 0     | 0     | 0     | 2     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | obs | 0   | 0   | 0   | 0   | <1  |      |  |
| <i>Aristida purpurea</i>                      | Purple threeawn              | 0                         | 0     | 0     | 5     | obs   | 0     | 1        | 0   | 0   | 4   | 0   | 5   | obs | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 1   |      |  |
| <i>Artemisia dracunculus</i>                  | Tarragon                     | 0                         | 0     | 0     | 0     | 0     | obs   | 0        | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0        | 0   | obs | 4   | 0   | 0   | 0   | <1  |      |  |
| <i>Artemisia filifolia</i>                    | Sand sagebrush               | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | <1  |      |  |
| <i>Artemisia frigida</i>                      | Prairie sagewort             | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | *   |      |  |
| <i>Artemisia nova</i>                         | Black sagebrush              | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   |      |  |
| <i>Artemisia tridentata ssp. wyomingensis</i> | Wyoming big sagebrush        | 0                         | obs   | 9     | obs   | 2     | obs   | 2        | 4   | 11  | obs | 6   | obs | 8   | 0   | obs | obs      | obs | obs | 0   | 0   | 0   | 0   | obs | 2    |  |
| <i>Artemisia tridentata ssp. tridentata</i>   | Basin big sagebrush          | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0        | 0   | 0   | obs | 0   | 0   | 0   | <1  |      |  |
| <i>Asclepias cryptoceras</i>                  | Pallid milkweed              | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | *   |      |  |
| <i>Asclepias speciosa</i>                     | Showy milkweed               | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   |      |  |
| <i>Asparagus officinalis</i>                  | Garden asparagus             | 0                         | 0     | 0     | 0     | 0     | obs   | <1       | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   |      |  |
| <i>Astragalus sp.</i>                         | Milkvetch                    | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | obs | obs | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   |      |  |
| <i>Astragalus bisulcatus</i>                  | Twogrooved milkvetch         | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | *   |      |  |
| <i>Astragalus mollissimus</i>                 | Woolly locoweed              | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | *   |      |  |
| <i>Atriplex canescens</i>                     | Fourwing saltbush            | 9                         | 0     | obs   | obs   | 0     | 0     | 1        | 7   | 47  | obs | 6   | obs | obs | 19  | 7   | obs      | obs | obs | 0   | 0   | 0   | 15  | 0   | 6    |  |
| <i>Atriplex confertifolia</i>                 | Shadscale saltbush           | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | obs | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0        | 0   | obs | 0   | 0   | 0   | 0   | <1  |      |  |
| <i>Atriplex gardneri</i>                      | Gardner's saltbush           | 0                         | obs   | 0     | 0     | 0     | 0     | <1       | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   |      |  |
| <i>Bassia scoparia</i>                        | Burningbush                  | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | obs | obs | 8   | 34  | obs      | 5   | 20  | 0   | 0   | 10  | 5   | 95  | 11   |  |
| <i>Bouteloua barbata</i>                      | Sixweeks grama               | 0                         | obs   | 0     | 0     | 0     | 0     | <1       | 7   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0    |  |
| <i>Bouteloua curtipendula</i>                 | Sideoats grama               | 0                         | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   |      |  |

Table A-1. Complete Dataset for 2021 Dolores River Restoration Monitoring, Lease Tract C-SR-13 (continued)

| Reference Area or Monitoring Point |                           | REF 1                          | REF 2 | REF 3 | REF 4 | REF 5 | REF 6 | REF Mean | 3A | 6A  | 8   | 10  | 11  | 11B | 13  | 14  | 14Middle | 14N | 15a | 25p | 26  | 27  | 28  | 31a | Mean |   |
|------------------------------------|---------------------------|--------------------------------|-------|-------|-------|-------|-------|----------|----|-----|-----|-----|-----|-----|-----|-----|----------|-----|-----|-----|-----|-----|-----|-----|------|---|
| Scientific Name                    | Common Name (USDA)        | Relative Cover (%) (continued) |       |       |       |       |       |          |    |     |     |     |     |     |     |     |          |     |     |     |     |     |     |     |      |   |
| <i>Bouteloua gracilis</i>          | Blue grama                | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | obs | obs | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0 |
| <i>Bromus inermis</i>              | Smooth brome              | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0 |
| <i>Bromus tectorum</i>             | Cheatgrass                | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 7  | 0   | 0   | obs | 0   | obs | 0   | 3   | 0        | 0   | obs | 0   | 0   | 0   | 0   | 5   | 5    | 1 |
| <i>Calamagrostis canadensis</i>    | Bluejoint                 | 0                              | 20    | 0     | 0     | 0     | 9     | 5        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 15  | 0   | 0   | 0   | 0   | 1    |   |
| <i>Calochortus nuttallii</i>       | Sego lily                 | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Carduus nutans</i>              | Nodding plumeless thistle | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Castilleja linariifolia</i>     | Wyoming Indian paintbrush | 2                              | 8     | obs   | obs   | 21    | 0     | 5        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | obs | obs      | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |   |
| <i>Chamaesyce maculata</i>         | Spotted sandmat           | 0                              | 0     | 0     | 9     | 0     | obs   | 2        | 0  | 0   | 0   | 0   | 5   | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |   |
| <i>Chenopodium album</i>           | Lambsquarters             | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | obs | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | obs  | 0 |
| <i>Chrysothamnus viscidiflorus</i> | Yellow rabbitbrush        | obs                            | 10    | 0     | 0     | 4     | 0     | 2        | 0  | 5   | 0   | 6   | 0   | obs | 0   | obs | obs      | 0   | obs | obs | obs | 19  | obs | obs | 2    |   |
| <i>Cirsium arvense</i>             | Canada thistle            | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | <1   |   |
| <i>Cirsium undulatum</i>           | Wavyleaf thistle          | 0                              | 0     | 0     | obs   | 0     | 0     | <1       | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Cirsium vulgare</i>             | Bull thistle              | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Clematis ligusticifolia</i>     | Western white clematis    | 0                              | 0     | 0     | obs   | 0     | 0     | <1       | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | <1   |   |
| <i>Cleome serrulata</i>            | Rocky Mountain beeplant   | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | obs | obs | 0   | 7   | obs      | 0   | obs | 8   | 0   | 0   | obs | 0   | 1    |   |
| <i>Comandra umbellata</i>          | Bastard toadflax          | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | <1   |   |
| <i>Convolvulus arvensis</i>        | Field bindweed            | 0                              | 0     | 0     | 0     | 0     | obs   | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Conyza canadensis</i>           | Canadian horseweed        | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Coreopsis</i> sp.               | Tickseed                  | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Cornus sericea</i>              | Redosier dogwood          | 0                              | 0     | 0     | 0     | 0     | obs   | <1       | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |   |
| <i>Descurainia pinnata</i>         | Western tansymustard      | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Distichlis spicata</i>          | Saltgrass                 | obs                            | obs   | 3     | 0     | 0     | 0     | 1        | 0  | 0   | 0   | 9   | 0   | obs | 11  | obs | 74       | 91  | 0   | 0   | 7   | 0   | 25  | 0   | 14   |   |
| <i>Echinocereus coccineus</i>      | Scarlet hedgehog cactus   | 0                              | 0     | obs   | 0     | 0     | 0     | <1       | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |   |
| <i>Echinochloa crus-galli</i>      | Barnyardgrass             | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Elymus canadensis</i>           | Canada wildrye            | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Elymus elymoides</i>            | Squirreltail              | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | obs | obs | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |   |
| <i>Elymus repens</i>               | Quackgrass                | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 19  | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1    |   |
| <i>Elymus trachycaulus</i>         | Slender wheatgrass        | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Ephedra torreyana</i>           | Torrey's jointfir         | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Equisetum hyemale</i>           | Scouring horsetail        | obs                            | 3     | 0     | 0     | 0     | obs   | 1        | 0  | obs | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | obs | obs | obs | obs | 0   | 0   | <1   |   |
| <i>Eremopyrum triticeum</i>        | Annual wheatgrass         | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |   |
| <i>Ericameria nauseosa</i>         | Rubber rabbitbrush        | 2                              | 0     | 13    | 9     | 0     | obs   | 4        | 39 | 0   | 0   | 9   | 43  | 25  | obs | 14  | 4        | obs | 16  | 0   | obs | obs | 10  | obs | 10   |   |
| <i>Erigeron</i> sp.                | Fleabane                  | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Eriogonum ovalifolium</i>       | Cushion buckwheat         | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Erodium cicutarium</i>          | Redstem stork's bill      | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Forestiera pubescens</i>        | Stretchberry              | 13                             | 13    | 0     | obs   | 6     | 2     | 6        | 4  | 37  | obs | 9   | obs | 21  | obs | obs | obs      | obs | 2   | obs | obs | 62  | obs | obs | 8    |   |
| <i>Fraxinus anomala</i>            | Singleleaf ash            | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |   |
| <i>Gaillardia pinnatifida</i>      | Red dome blanketflower    | 0                              | obs   | 0     | obs   | 0     | 0     | 0        | 0  | 0   | 0   | 0   | obs | obs | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |   |
| <i>Glycyrrhiza lepidota</i>        | American licorice         | 0                              | 2     | 0     | 0     | 6     | 4     | 2        | 0  | 0   | 0   | 0   | 0   | 0   | 0   | obs | obs      | obs | 0   | obs | obs | 0   | 0   | 0   | <1   |   |

Table A-1. Complete Dataset for 2021 Dolores River Restoration Monitoring, Lease Tract C-SR-13 (continued)

| Reference Area or Monitoring Point |                           | REF 1                          | REF 2 | REF 3 | REF 4 | REF 5 | REF 6 | REF Mean | 3A  | 6A  | 8   | 10  | 11  | 11B | 13  | 14  | 14Middle | 14N | 15a | 25p | 26  | 27  | 28  | 31a | Mean |
|------------------------------------|---------------------------|--------------------------------|-------|-------|-------|-------|-------|----------|-----|-----|-----|-----|-----|-----|-----|-----|----------|-----|-----|-----|-----|-----|-----|-----|------|
| Scientific Name                    | Common Name (USDA)        | Relative Cover (%) (continued) |       |       |       |       |       |          |     |     |     |     |     |     |     |     |          |     |     |     |     |     |     |     |      |
| <i>Grindelia squarrosa</i>         | Curlycup gumweed          | 0                              | 0     | 0     | 0     | obs   | obs   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | obs | 0   | 0   | 0   | 0   | <1   |
| <i>Gutierrezia sarothrae</i>       | Broom snakeweed           | obs                            | obs   | obs   | 5     | 0     | 0     | 1        | obs | obs | obs | 6   | 5   | obs | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1    |
| <i>Halogeton glomeratus</i>        | Saltlover                 | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | <1   |
| <i>Helianthus annuus</i>           | Common sunflower          | 0                              | obs   | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |
| <i>Hesperostipa comata</i>         | Needle and thread         | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Hesperostipa neomexicana</i>    | New Mexico feathergrass   | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |
| <i>Heterotheca villosa</i>         | Hairy false goldenaster   | 0                              | 0     | 0     | 23    | obs   | 0     | 4        | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Hymenopappus filifolius</i>     | Fineleaf hymenopappus     | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Ipomopsis aggregata</i>         | Scarlet gilia             | 0                              | 0     | 0     | 0     | obs   | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |
| <i>Juncus articus</i>              | Arctic rush               | obs                            | 2     | 0     | 0     | 0     | 0     | <1       | 0   | 0   | 0   | obs | obs | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Juniperus osteosperma</i>       | Utah juniper              | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | <1   |
| <i>Krascheninnikovia lanata</i>    | Winterfat                 | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs      | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Lappula occidentalis</i>        | Flatspine stickseed       | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | obs | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Lepidium montanum</i>           | Mountain pepperweed       | obs                            | 0     | 0     | obs   | obs   | 0     | 0        | obs | obs | 0   | 9   | 0   | 0   | obs | obs | 0        | 0   | obs | 0   | 0   | obs | 5   | obs | 1    |
| <i>Lepidium perfoliatum</i>        | Clasping pepperweed       | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | obs | obs | 0   | obs | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Leymus cinereus</i>             | Basin wildrye             | obs                            | obs   | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Linum rigidum</i>               | Stiffstem flax            | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |
| <i>Lomatium sp.</i>                | Desertparsley             | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |
| <i>Lygodesmia juncea</i>           | Rush skeletonplant        | 0                              | obs   | 0     | 0     | 0     | 0     | <1       | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |
| <i>Machaeranthera canescens</i>    | Hoary tansyaster          | 0                              | 0     | 0     | obs   | obs   | obs   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 8   | 0   | 0   | 0   | 0   | <1   |
| <i>Medicago sativa</i>             | Alfalfa                   | 0                              | 0     | 0     | 0     | 0     | obs   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | obs | 0   | 0   | 0   | 0   | 0   | 0    |
| <i>Melilotus officinalis</i>       | Sweetclover               | 0                              | obs   | 0     | obs   | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0    |
| <i>Mentzelia rusbyi</i>            | Rusby's blazingstar       | 0                              | obs   | 0     | 0     | 0     | 0     | <1       | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |
| <i>Mirabilis linearis</i>          | Narrowleaf four o'clock   | 0                              | 0     | 0     | obs   | 0     | 0     | <1       | obs | 0   | 0   | 0   | obs | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Mirabilis multiflora</i>        | Colorado four o'clock     | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | obs | obs | 4   | obs | 0   | 0   | 0   | 0   | obs      | obs | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Muhlenbergia asperifolia</i>    | Scratchgrass              | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 7   | 0   | 0   | 0   | <1   |
| <i>Oenothera longissima</i>        | Longstem evening primrose | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |
| <i>Opuntia polyacantha</i>         | Plains pricklypear        | obs                            | obs   | 6     | obs   | obs   | 0     | 1        | 0   | obs | 4   | obs | obs | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Panicum capillare</i>           | Witchgrass                | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |
| <i>Pascopyrum smithii</i>          | Western wheatgrass        | 0                              | 2     | 0     | 0     | 0     | 2     | 1        | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0        | 0   | 4   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Penstemon palmeri</i>           | Palmer's penstemon        | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | obs | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | <1   |
| <i>Phalaris arundinacea</i>        | Reed canarygrass          | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs      | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Phlox hoodii</i>                | Spiny phlox               | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |
| <i>Phlox longifolia</i>            | Longleaf phlox            | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |
| <i>Phragmites australis</i>        | Common reed               | 0                              | 7     | 0     | 0     | obs   | obs   | 1        | 0   | 0   | 0   | 0   | 0   | 0   | 11  | 17  | 0        | 0   | 14  | 0   | obs | obs | obs | 0   | 3    |
| <i>Physaria acutifolia</i>         | Sharpleaf twinpod         | 0                              | obs   | 0     | 0     | 0     | 0     | <1       | obs | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |
| <i>Pinus edulis</i>                | Twoneedle pinyon          | 0                              | 0     | 0     | 0     | obs   | 0     | <1       | 0   | 0   | obs | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | <1   |
| <i>Plantago patagonica</i>         | Woolly plantain           | 0                              | 2     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |
| <i>Pleuraphis jamesii</i>          | James' galleta            | 0                              | 0     | 22    | 0     | 0     | 0     | 4        | 0   | 0   | 54  | obs | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 3    |

Table A-1. Complete Dataset for 2021 Dolores River Restoration Monitoring, Lease Tract C-SR-13 (continued)

| Reference Area or Monitoring Point    |                          | REF 1                          | REF 2 | REF 3 | REF 4 | REF 5 | REF 6 | REF Mean | 3A  | 6A  | 8   | 10  | 11  | 11B | 13  | 14  | 14Middle | 14N | 15a | 25p | 26  | 27  | 28  | 31a | Mean |    |
|---------------------------------------|--------------------------|--------------------------------|-------|-------|-------|-------|-------|----------|-----|-----|-----|-----|-----|-----|-----|-----|----------|-----|-----|-----|-----|-----|-----|-----|------|----|
| Scientific Name                       | Common Name (USDA)       | Relative Cover (%) (continued) |       |       |       |       |       |          |     |     |     |     |     |     |     |     |          |     |     |     |     |     |     |     |      |    |
| <i>Poa palustris</i>                  | Fowl bluegrass           | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | obs  | <1 |
| <i>Polygonum aviculare</i>            | Prostrate knotweed       | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 4   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | <1 |
| <i>Polypogon monspeliensis</i>        | Annual rabbitsfoot grass | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Populus angustifolia</i>           | Narrowleaf cottonwood    | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | obs | 0   | 0   | 0   | 0   | <1   |    |
| <i>Populus fremontii</i>              | Fremont cottonwood       | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | obs | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | obs | obs | 0   | 0   | 0   | <1   |    |
| <i>Portulaca oleracea</i>             | Little hogweed           | obs                            | 0     | 0     | 5     | 0     | 0     | 0        | 14  | 0   | 0   | 0   | obs | obs | obs | 10  | obs      | obs | 0   | 0   | 0   | 0   | 5   | obs | 2    |    |
| <i>Psathyrostachys juncea</i>         | Russian wildrye          | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Quercus gambelii</i>               | Gambel oak               | 0                              | 0     | obs   | 0     | obs   | 0     | 0        | 0   | obs | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Rhus trilobata</i>                 | Skunkbush sumac          | obs                            | 7     | obs   | obs   | 26    | obs   | 5        | obs | 0   | 0   | 26  | obs | 4   | 0   | obs | obs      | obs | obs | obs | 0   | 5   | obs | obs | 2    |    |
| <i>Ribes inerme</i>                   | Whitestem gooseberry     | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Rosa woodsii</i>                   | Woods' rose              | 0                              | obs   | 0     | 0     | 4     | obs   | 1        | 0   | obs | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Rumex crispus</i>                  | Curly dock               | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | obs | obs | 0   | 0   | 0   | <1   |    |
| <i>Salix amygdaloides</i>             | Peachleaf willow         | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Salix exigua</i>                   | Narrowleaf willow        | 0                              | 26    | 0     | 14    | 13    | 80    | 22       | 0   | obs | 0   | 0   | 0   | obs | 0   | 0   | 0        | 0   | 8   | 58  | obs | obs | 15  | obs | 5    |    |
| <i>Salsola tragus</i>                 | Prickly Russian thistle  | 0                              | 0     | 0     | obs   | 0     | 0     | 0        | 0   | obs | 17  | obs | 5   | obs | 0   | obs | 0        | 0   | 0   | 0   | 7   | obs | 0   | 0   | 2    |    |
| <i>Sarcobatus vermiculatus</i>        | Greasewood               | 11                             | 0     | obs   | 0     | 0     | 0     | 2        | obs | obs | obs | 9   | obs | obs | 3   | obs | 0        | obs | obs | 0   | obs | 5   | 15  | obs | 2    |    |
| <i>Schizachyrium scoparium</i>        | Little bluestem          | 0                              | 0     | 0     | obs   | 0     | 0     | <1       | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | obs | 0   | 0   | 0   | 0   | <1  |      |    |
| <i>Schoenoplectus tabernaemontani</i> | Softstem bulrush         | 0                              | 0     | 0     | 0     | 0     | obs   | <1       | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs | obs      | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Senecio flaccidus</i>              | Threadleaf ragwort       | 0                              | obs   | 0     | 9     | 0     | 0     | 2        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Shepherdia argentea</i>            | Silverleaf buffaloberry  | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs      | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Sisymbrium altissimum</i>          | Tall tumbled mustard     | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Solanum triflorum</i>              | Cutleaf nightshade       | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Solidago</i> sp.                   | Goldenrod                | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Sorghastrum nutans</i>             | Indiangrass              | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Spartina gracilis</i>              | Alkali cordgrass         | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Sphaeralcea coccinea</i>           | Scarlet globemallow      | obs                            | 0     | 0     | obs   | 0     | 0     | 0        | 0   | obs | obs | obs | obs | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Sporobolus airoides</i>            | Alkali sacton            | 57                             | obs   | 47    | 0     | 2     | 0     | 18       | 11  | obs | 0   | 6   | 0   | 0   | 3   | 0   | 0        | 0   | 0   | 0   | 50  | 0   | obs | 0   | 4    |    |
| <i>Sporobolus contractus</i>          | Spike dropseed           | 0                              | 0     | 0     | 0     | 9     | 0     | 1        | 0   | obs | 0   | 0   | 0   | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Sporobolus cryptandrus</i>         | Sand dropseed            | 0                              | obs   | obs   | 14    | 6     | obs   | 3        | 7   | obs | 17  | 0   | 38  | 25  | obs | 7   | 22       | 5   | 0   | 0   | 29  | obs | obs | 0   | 9    |    |
| <i>Stanleya pinnata</i>               | Desert princesplume      | obs                            | 0     | 0     | 0     | 0     | 0     | 0        | obs | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | obs | 0   | 0   | 0   | 0   | obs | obs | <1   |    |
| <i>Suaeda moquinii</i>                | Mojave seablite          | 7                              | 0     | 0     | 0     | 0     | 0     | 1        | 0   | obs | 0   | 0   | 0   | 0   | 27  | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 2    |    |
| <i>Symphotrichum frondosum</i>        | Short-rayed alkali aster | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Tamarix ramosissima</i>            | Saltcedar                | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0   | 0        | 0   | 0   | obs | obs | 0   | 0   | obs | <1   |    |
| <i>Tetradymia canescens</i>           | Spineless horsebrush     | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | obs | <1   |    |
| <i>Thelypodium integrifolium</i>      | Entireleaved thelypody   | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Toxicodendron rydbergii</i>        | Western poison ivy       | 0                              | obs   | 0     | 0     | obs   | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Tragopogon dubius</i>              | Yellow salsify           | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | *    |    |
| <i>Tribulus terrestris</i>            | Puncturevine             | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | obs | obs | 0   | 0   | obs      | 0   | 0   | 0   | 0   | 0   | 0   | 0   | <1   |    |
| <i>Ulmus pumila</i>                   | Siberian elm             | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | obs | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    |    |



Table A-1. Complete Dataset for 2021 Dolores River Restoration Monitoring, Lease Tract C-SR-13 (continued)

| Reference Area or Monitoring Point |                    | REF 1                          | REF 2 | REF 3 | REF 4 | REF 5 | REF 6 | REF Mean | 3A  | 6A  | 8   | 10  | 11  | 11B | 13  | 14  | 14Middle | 14N | 15a | 25p | 26  | 27  | 28  | 31a | Mean |   |
|------------------------------------|--------------------|--------------------------------|-------|-------|-------|-------|-------|----------|-----|-----|-----|-----|-----|-----|-----|-----|----------|-----|-----|-----|-----|-----|-----|-----|------|---|
| Scientific Name                    | Common Name (USDA) | Relative Cover (%) (continued) |       |       |       |       |       |          |     |     |     |     |     |     |     |     |          |     |     |     |     |     |     |     |      |   |
| <i>Verbascum thapsus</i>           | Common mullein     | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | * |
| <i>Vulpia octoflora</i>            | Sixweeks fescue    | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | * |
| <i>Xanthium strumarium</i>         | Rough cocklebur    | 0                              | obs   | 0     | 0     | 0     | 0     | <1       | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0 |
| <i>Yucca baccata</i>               | Banna yucca        | 0                              | 0     | 0     | 0     | 0     | 0     | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0        | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | * |
| <b>Species Richness</b>            |                    | 20                             | 33    | 14    | 29    | 22    | 24    | 24       | 21  | 20  | 20  | 23  | 28  | 29  | 16  | 32  | 20       | 14  | 18  | 21  | 18  | 16  | 20  | 21  | 21   |   |
| <b>Herbaceous height (cm)</b>      |                    | 32                             | 54    | 23    | 29    | 39    | 59    | 39       | 25  | 21  | 34  | 26  | 25  | 27  | 26  | 59  | 25       | 26  | 101 | 27  | 46  | 38  | 12  | 40  | 35   |   |
| <b>Woody height (cm)</b>           |                    | 91                             | 141   | 76    | 49    | 118   | 195   | 112      | 117 | 105 | 22  | 83  | 64  | 172 | 73  | 119 | 0        | 0   | 552 | 94  | 0   | 141 | 118 | 0   | 104  |   |
| <b>Slope (%)</b>                   |                    | 1                              | 1     | 3     | 0     | 3     | 1     | 2        | 2   | 3   | 10  | 7   | 2   | 1   | 7   | 2   | 2        | 0   | 1   | 0   | 0   | 4   | 3   | 0   | 3    |   |
| <b>Azimuth (0-360)</b>             |                    | 2                              | 340   | 204   | 262   | 122   | 130   | -        | 59  | 70  | 288 | 194 | 140 | 288 | 134 | 84  | 158      | 315 | 272 | 138 | 239 | 19  | 103 | 44  | -    |   |

**Notes:**

Orange highlight indicates State of Colorado List B noxious weeds.

Blue highlight indicates State of Colorado List C noxious weeds.

Purple highlight indicates State of Colorado noxious Watch List species.

Green highlight indicates undesirable, invasive species not listed by the State of Colorado.

\* Indicates species observed in previous years but not during the 2020 monitoring.

**Abbreviations:**

cm = centimeters

obs = observed

USDA = U.S. Department of Agriculture