# Oyster Creek Stabilization Project

## *Post-construction Monitoring Report – Year 1*

**Prepared for:**

## El Dorado Irrigation District

**Prepared by:**
Horizon Water and Environment
Contact: Robin Hunter
(510) 986-1854
robin@horizonh2o.com

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# 1. INTRODUCTION

The El Dorado Irrigation District (EID) completed construction of the Oyster Creek Stabilization Project (Project) in October 2019. The Project used biotechnical techniques to stabilize a portion of Oyster Creek and its North Tributary.

The Project site is located in eastern El Dorado County, California (**Figure 1**). **Figure 2** provides an overview of the Project area. The Project includes two sites, the Oyster Creek and North Tributary restoration sites. Five years of post-construction monitoring are required by the Oyster Creek Monitoring Maintenance and Reporting Plan (MMRP) (EID 2014). This *Year-1 Monitoring Report* documents conditions at the Project sites, including plant survival, vegetation cover, erosion, and photographic documentation during the summer of 2020. The monitoring activities comply with the requirements of the MMRP.

# 2. METHODS

Year-1 monitoring activities were conducted on July 10, 2020 and August 28, 2020 by Horizon Water and Environment (Horizon) biologist Robin Hunter and EID environmental review analyst Michael Baron. Post-construction monitoring was conducted per the Oyster Creek Monitoring Maintenance and Reporting Plan (EID 2014). Reference sites were established in 2019 near the restoration sites (Figure 2).

## 2.1 VEGETATION ASSESSMENT

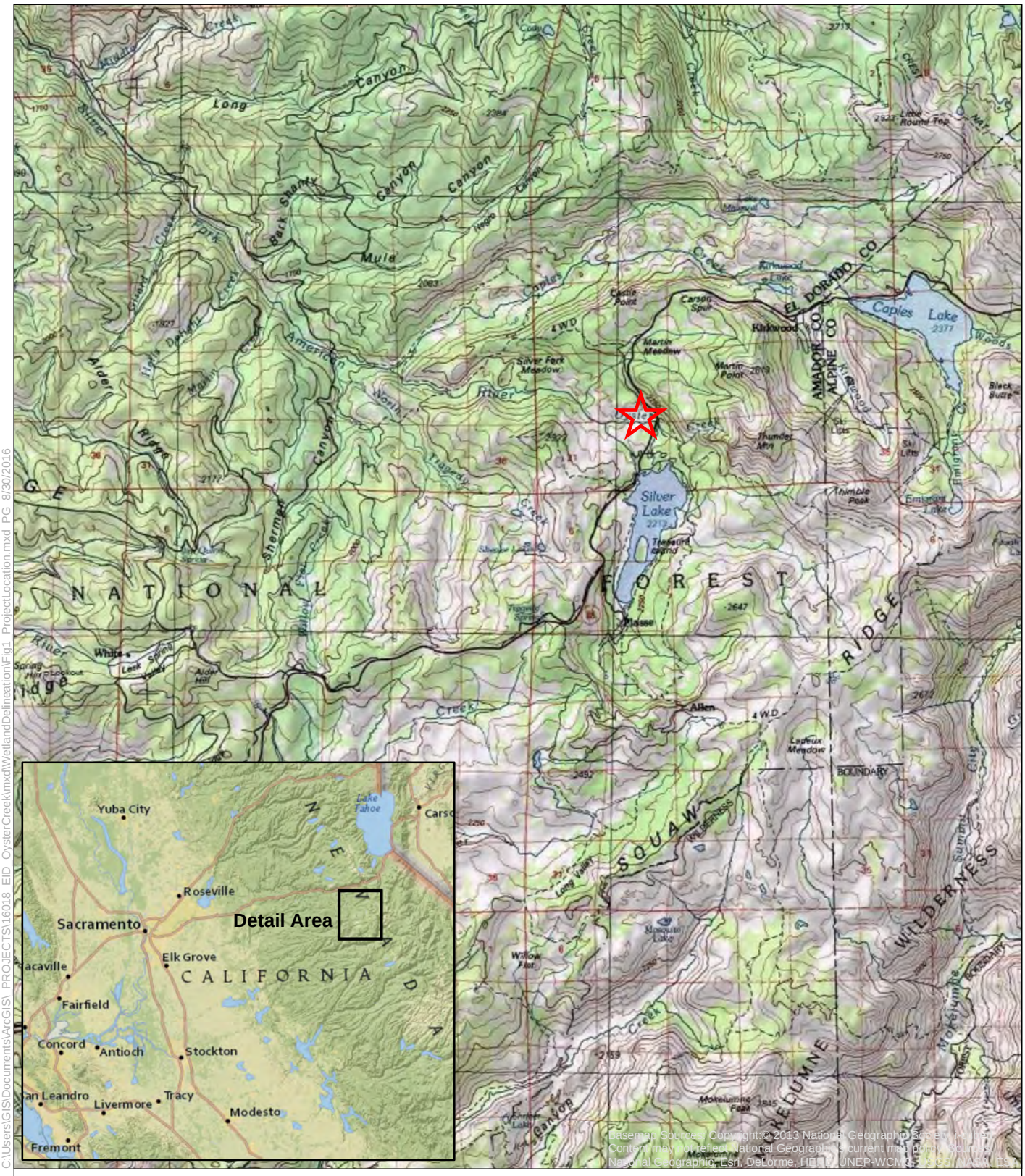
Plant survival was recorded within the Oyster Creek and North Tributary restoration sites for each willow cutting and container plant. Plants were numbered and tagged, and their condition was assessed. Survival of willow fascines was assessed by linear foot of fascine with signs of growth (such as leaves or buds). Vegetation cover was recorded by strata (i.e., herbaceous cover and shrub/tree cover) at both the restoration sites and reference sites.

## 2.2 EROSION ASSESSMENT

Monitoring included measurement of erosion pins placed in the banks of Oyster Creek in 2019 at the restoration site and reference site. If restoration sites experience similar erosion rates as reference sites or less (within 25 percent), the restoration will be considered successful. The stability of the three headcuts in the North Tributary were measured and visually assessed, and compared to the reference site headcut. The base of the headcuts were marked in 2019 and compared to 2020 conditions.

## 2.3 PHOTO-DOCUMENTATION

Photographs were taken from representative point locations established during Project implementation. The photographs document and compare annual vegetative growth and conditions at each site. Photo point locations are shown on Figures 2. Photographs are provided in **Attachment A**.

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N

0 2.5 5
Miles

Project Location

**Figure 1**
**Project Location**

Oyster Creek
Stabilization Project

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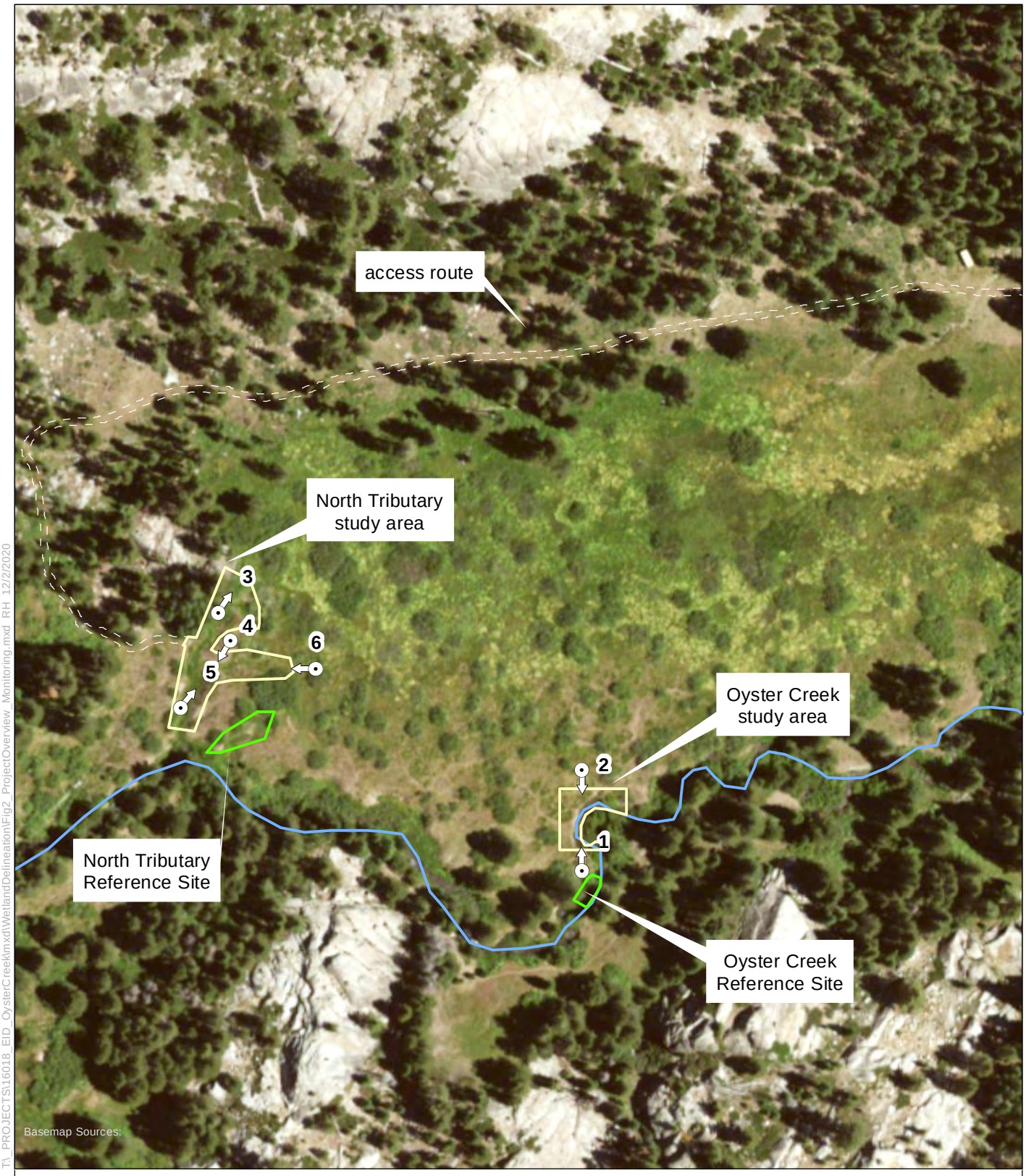


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N

0 100 200
Feet

Study Area
Reference Sites
Access Route
Photo Points
Oyster Creek

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**Figure 2**
**Project Overview**

Oyster Creek
Stabilization Project

# 3. RESULTS

## 3.1 VEGETATION ASSESSMENT

***Oyster Creek***

Revegetation of the Oyster Creek restoration site included planting of locally-harvested Lemmon's willow *(Salix lemmonii*) poles and mountain alder (*Alnus incana* spp. *tenuifolia*) container plants. A diverse assemblage of naturally recruited herbaceous species also contribute to plant cover. **Table 1** shows the vegetation percent cover at the Oyster Creek restoration and reference sites, according to stratum. **Table 2** lists the species installed in 2019 and the number of living plants observed in the Year 1 monitoring event**.**

**Table 1. Vegetation percent cover within Oyster Creek restoration and reference sites.**

| Stratum | Performance Standard (Percent Cover) | Year-1 (Percent Cover) | | |
|---|---|---|---|---|
| | | Restoration | Reference | Restoration Compared to Reference |
| **Herbaceous** | Restoration +/- 25% of Reference | 25 | 30 | -5 |
| **Shrub/Tree** | | 5 | 20 | -15 |
| **Total** | | **30** | **50** | **-20** |

**Table 2. Plant species and abundance at the Oyster Creek restoration site.**

| Species | Performance Standard | Number Installed | Number of Living Plants (Year-1) |
|---|---|---|---|
| Mountain Alder *Alnus incana* spp. *tenuifolia* | 60% survival | 10 | 8 |
| Lemmon's Willow *Salix lemmonii* | | 121 | 107 |
| **Total** | | **131** | **115** |
| | | **Percent Survival** | **88%** |

Planted mountain alder and Lemmon's willow are currently surviving well at the Oyster Creek restoration site. Natural recruitment of herbaceous vegetation is also occurring. The Oyster Creek restoration site is meeting its percent survival performance standard. While vegetation percent cover at the restoration site is currently 20 percent less than the vegetation cover values at the reference site, the vegetation cover conditions at the Oyster Creek restoration site is meeting the performance standard. The higher vegetation cover at the reference site is mainly due the presence of a mature pine tree at the northern edge of the site, raising the overall shrub/tree stratum cover. As the planted willows and alders in the restoration site continue to grow and mature, it is anticipated that the percent cover within the shrub/tree stratum will increase

***North Tributary***

Revegetation of the North Tributary restoration site included planting Lemmon's willow poles, mountain alder container plants, and quaking aspen (*Populus tremuloides*) seedlings harvested from adjacent to the restoration site. A diverse assemblage of naturally recruited herbaceous species also contribute to plant cover. **Table 3** shows the vegetation percent cover at the North Tributary restoration and reference sites, according to stratum. **Table 4** lists the species installed in 2019 and the number of living plants observed in the Year 1 monitoring event**.**

**Table 3. Vegetation percent cover within North Tributary restoration and reference sites.**

| Stratum | Performance Standard (Percent Cover) | Year-1 (Percent Cover) | | |
|---|---|---|---|---|
| | | Restoration | Reference | Restoration Compared to Reference |
| **Herbaceous** | Restoration +/- 25% of Reference | 70 | 70 | Equal |
| **Shrub/Tree** | | 15 | 10 | +5 |
| **Total** | | **85** | **80** | **+5** |

**Table 4. Plant species and abundance at the North Tributary restoration site**

| Species | Performance Standard | Number Installed | Number of Living Plants (Year-1) |
|---|---|---|---|
| Mountain Alder *Alnus incana* spp. *tenuifolia* | 60% survival | 5 | 1 |
| Lemmon's Willow (poles) *Salix lemmonii* | | 111 | 87 |
| Lemmon's Willow (fascines)[1] | | 250 | 218 |
| Quaking Aspen *Populus tremuloides* | | 7 | 2 |
| **Total** | | **373** | **308** |
| | | **Percent Survival** | **83%** |

[1] Willow fascines measured as linear feet.

At the North Tributary restoration site, vegetation in the herbaceous stratum is dominated by various grasses and sedges, as well as corn lily (*Veratrum californicum*). Vegetation in the shrub/tree stratum is dominated by Lemmon's willow and quaking aspen. Vegetation composition in the reference site is similar, although quaking aspen is not present at this site. Vegetation at the restoration site was five percent greater than at the reference site and is meeting the vegetation cover performance standard.

Planted Lemmon's willow poles and fascines are currently surviving well at the North Tributary restoration site. Willows installed in the brush pack portion of the restoration appeared most vigorous. Tree cages

were installed on approximately half of the installed willow poles in 2019 to protect against herbivore browsing. Survival of willow poles was greater in poles that were not caged (82 percent), compared to 71 percent survival for caged willow poles. Mountain alder and quaking aspen plantings showed poor survival. It is possible that soil conditions at the North Tributary site are not well suited to mountain alder, resulting in low survival. Transplanted aspen seedlings were not fully dormant at the time of transplantation, which may have resulted in their poor survival. The North Tributary restoration site is meeting its percent survival performance standard.

## 3.2 EROSION ASSESSMENT

***Oyster Creek Erosion Pin Monitoring***

Erosion pins were installed at various bank elevations in 2019 at the Oyster Creek restoration and reference sites. The erosion pins were measured to determine the rate of erosion at the reference and restoration sites. If restoration sites experience similar erosion rates as reference sites or less (within 25 percent), the restoration will be considered successful. Table 5 provides results from Year 1 erosion pin monitoring. Erosion pin numbers are from upstream to downstream. Photo 13 in Attachment A shows a reference site erosion pin.

**Table 5. Oyster Creek Erosion Pins**

| | Length at Installation (Inches) | Year 1 | |
|---|---|---|---|
| | | Length (Inches) | Length Change (Inches) |
| **Restoration Site** | | | |
| Erosion Pin 1 | 5.75 | N/A | N/A |
| Erosion Pin 2 | 5.00 | 5.25 | +0.25 |
| Erosion Pin 3 | 6.10 | 4.00 | -2.10 |
| Erosion Pin 4 | 6.00 | 5.00 | -1.00 |
| | | **Average** | -0.95 |
| **Reference Site** | | | |
| Erosion Pin 5 | 6.00 | 4.00 | -2.00 |
| Erosion Pin 6 | 6.00 | 5.00 | -1.00 |
| | | **Average** | -1.50 |

Erosion control pin 1 was not able to be located during Year 1 monitoring. It appears that slumping of the upper portion of the bank in that location has buried the pin such that it is not visible. Transportation of unconsolidated material from the upper portions of the banks to lower portions of the banks has resulted in less of erosion pins 2-6 being exposed, which would not be considered erosion. The average length of exposed erosion pins decreased more at the reference site, compared to the restoration site. The restoration site is currently meeting the performance standard, as on average no erosion occurred. Overall change in erosion pin lengths was minor during Year 1 monitoring.

The coir roll installed at the toe of the Oyster Creek bank has remained in place. It is collecting material on its upslope side, and herbaceous vegetation has colonized this area (see Photos 2 and 4 in Attachment A).

***North Tributary Headcut Monitoring***

Table 6 shows Year 1 Monitoring results for the base of the three North Tributary headcuts, and the reference site headcut.

**Table 6. North Tributary Headcuts**

| Headcut Location | Performance Standard | Headcut Advancement Year 1 (feet) |
|---|---|---|
| **Restoration Site** | | |
| Main Portion North Tributary (Brush Pack) | Headcuts do not advance more than 2 feet | 0.0 |
| Upstream Tributary | | 0.5 |
| Downstream Tributary | | 1.0 |
| **Reference Site** | | |
| Reference | | 1.0 |

No upstream advancement has occurred in the headcut in the main portion of the North Tributary, where the brush pack was installed. The brush pack has remained stabled since installation (Photos 5 and 6 in Attachment A), and no erosion has occurred at that location. The smaller headcuts in the upstream and downstream tributaries have advanced in the upstream direction by 0.5 and 1.0 feet, respectively. The biotechnical stabilization methods used in these portions of the North Tributary do not provide as much immediate erosion control as the brush pack does, as the root systems of plantings are still becoming established. The reference site headcut has advanced by 1.0 feet. North Tributary headcuts are meeting the performance standard, and headcut advancement is less than or equal to headcut advancement at the reference headcut.

# 4. DISCUSSION AND RECOMENDATIONS

This section discusses the results of the monitoring in the context of the performance standards and conditions listed in the MMRP.

## VEGETATION ASSESSMENT

The MMRP stipulates a 60 percent survivability target for plantings throughout the five-year monitoring period. It also stipulates that the restoration sites shall provide similar vegetative cover as the reference sites (+/- 25 percent). If the survival and/or cover requirements are not achieving these goals, adaptive management techniques (e.g., replacement plantings, additional watering) may be necessary to meet the success criteria.

Both the Oyster Creek and North Tributary restoration sites are meeting the success criteria for plant survivorship and vegetative cover. During the August monitoring visit, signs of drought stress were observed in the North Tributary willows. Supplemental watering was recommended to improve soil moisture conditions for plantings and thus improve survivorship chances. Supplemental watering was conducted by hand on September 16, 2020. Monthly watering of the plantings in the North Tributary in July, August, and September is recommended in future years. Willow poles installed in the brush pack at the North Tributary showed more vigorous growth than willow poles installed throughout the rest of the North Tributary. It is possible that the herbaceous vegetation present in the North Tributary is shading out the willow poles there. It is recommended that minor vegetation clearing around the North Tributary willow poles occurs during the 2021 monitoring event. This may be accomplished through targeted hand-clipping of adjacent herbaceous vegetation. The use of string trimmers (weed whackers) is not recommended, due to the potential for accidental harm to the plantings.

## EROSION ASSESSMENT

Some slumping of the top of bank has occurred at the Oyster Creek restoration site. However, the toe of the bank has remained stable. Sediment is accumulating behind the coir log at the toe of the slope. Erosion rates at the restoration site are currently meeting the performance standard. Overall change in erosion pin lengths was minor during Year 1 monitoring.

The performance standard for erosion at the North Tributary is that headcuts do not advance headward (upstream) by more than two feet into the meadow following completion the Project. The brush pack in the main portion of the North Tributary is stable and has prevented any movement of the main headcut upstream. Although the two smaller headcuts did advance, North Tributary headcuts are currently meeting the performance standard, and headcut advancement is less than or equal to headcut advancement at the reference headcut.

No corrective measures are recommended at this time.

## SUMMARY OF YEAR-1 FINDINGS AND RECOMMENDATIONS:

- The Oyster Creek and North Tributary restoration sites are meeting standards for plant survival and vegetative cover.
- Monthly watering of the plantings in the North Tributary in July, August, and September is recommended.
- Minor vegetation clearing around the North Tributary willow poles is recommended during the 2021 monitoring event.
- Oyster Creek is currently meeting erosion standards.
- The North Tributary is meeting erosion standards.

## REFERENCES

El Dorado Irrigation District. 2014. Oyster Creek Monitoring Maintenance and Reporting Plan. December.

# Attachment A

Photographs

# Appendix A: Photographs

| Photo No. 1 | Date: 10/24/2019 |
|---|---|
| **Description:** Oyster Creek post-construction, facing north. |  |

| Photo No. 2 | Date: 8/28/2020 |
|---|---|
| **Description:** Oyster Creek during year 1 Monitoring, facing north. |  |

# Appendix A: Photographs

| Photo No. 3 | Date: 10/24/19 |
|---|---|

**Description:**
Oyster Creek post-construction, facing south.

| Photo No. 4 | Date: 8/28/2020 |
|---|---|

**Description:**
Oyster Creek during year 1 Monitoring, facing south.

# Appendix A: Photographs

| Photo No. 5 | Date: 10/24/2019 |
|---|---|

**Description:** North tributary, main head cut, post-construction. Facing northeast.

| Photo No. 6 | Date: 8/28/2020 |
|---|---|

**Description:** North tributary, main head cut during Year 1 monitoring. Facing northeast.

# Appendix A: Photographs

| Photo No. 7 | Date: 10/24/2019 |
|---|---|

**Description:**
North tributary, pre-construction, facing southeast.

| Photo No. 8 | Date: 8/28/2020 |
|---|---|

**Description:**
North tributary, during Year 1 monitoring, facing southeast.

# Appendix A: Photographs

| Photo No. 9 | Date: 10/24/2019 |
|---|---|

**Description:**
North tributary, pre-construction, downstream extent of project, facing upstream.

| Photo No. 10 | Date: 8/28/2020 |
|---|---|

**Description:**
North tributary during Year 1 monitoring, downstream extent of project, facing upstream.

# Appendix A: Photographs

| Photo No. 11 | Date: 10/24/2019 |
|---|---|
| **Description:** North tributary, post-construction, facing east. |  |

| Photo No. 12 | Date: 8/28/2020 |
|---|---|
| **Description:** North tributary during Year 1 monitoring, facing east. |  |

# Appendix A: Photographs

| Photo No. 13 | Date: 8/28/2020 |
|---|---|
| **Description:** Oyster Creek reference site. Erosion control pin location is circled in red. |  |