Las Vegas Wash Vegetation Monitoring Report, 2024

SOUTHERN NEVADA WATER AUTHORITY

LVWCC

Las Vegas Wash
Vegetation Monitoring Report, 2024

SOUTHERN NEVADA WATER AUTHORITY
Las Vegas Wash Project Coordination Team

Prepared for:

Las Vegas Wash Coordination Committee

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ABSTRACT

For more than 20 years, native revegetation along the Las Vegas Wash (Wash) has helped to meet the goals of the Las Vegas Wash Coordination Committee, and that restoration is vigorously monitored. Beginning in 2024, the vegetation monitoring protocol was revised to better suit long-term management. This revision included modifying site boundaries, reducing the total number of revegetation sites and updating field and remote survey methods. Field monitoring for this report took place in September and October 2024 following the new timed meander survey protocol. Seventeen upland and riparian sites located on the north side of the Wash and grant-funded sites with five or less growing seasons were surveyed. Since the boundaries for most sites were modified prior to surveys, it is difficult to compare 2024 results with prior years. Direct comparisons will begin in the fall of 2027 for the sites monitored in this report. The total vegetative cover for the remaining 57 sites was calculated using aerial imagery and Light Detection and Ranging (LiDAR) data. Sites that were monitored in the field had total cover, noxious species cover, species richness and Wetland Prevalence Index documented. The wetland designations of all field-monitored sites were reviewed and updated as needed. Two of the 17 field-monitored sites and two additional sites are good candidates for enhancement under the Las Vegas Wash Long-Term Revegetation Management Plan. There are an additional two sites that are possible candidates for enhancement following additional monitoring. No sites that were surveyed qualified for targeted invasive and other undesirable species removal. Grants play a significant role in the Wash revegetation program, funding many of the revegetation sites. A new database was created that includes all permitted and grant-funded areas along the Wash beginning in 2024. All information regarding past grants and permitted areas can be found in the legacy database on SharePoint.

ACKNOWLEDGMENTS

I would like to thank all of those who have helped make the Wash vegetation monitoring program a success. Specifically, I would like to thank Aaron Ambos for his assistance in monitoring revegetation sites. Thank you to Tamra O'Halloran and Megan Singleton for their continued support and help updating and modifying the vegetation monitoring app. Megan also helped create the maps used in this report and was integral to the process of updating the vegetation monitoring protocol. A special thank you goes to Jason Eckberg for his guidance, expertise and help throughout the monitoring season and especially while writing this report. Thank you, Keiba Crear, for being a central figure in advocating for monitoring and management. Additional appreciation goes to the many people who reviewed this document and provided valuable comments. Finally, I would like to thank the members of the Las Vegas Wash Coordination Committee and Research and Environmental Monitoring Study Team for continuing to support this program and the implementation of the Las Vegas Wash Comprehensive Adaptive Management Plan.

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ASBBS	Archery and Silver Bowl Bank South
ASBN	Archery and Silver Bowl North
ASBS	Archery and Silver Bowl South
AW	Archery Weir
BBN	Bostick Bank North
BBS	Bostick Bank South
BK	Bostick Kiosk
BN	Bostick North
BS	Bostick South
BW	Bostick Weir
CCNW	Cottonwood Cell Non-Wetland
CCW	Cottonwood Cell Wetland
CCWRD	Clark County Water Reclamation District
CRW	Calico Ridge Weir
DCCW	Duck Creek Confluence Weir
DUD-1	DU Wetlands No. 1 Drop
DUN	DU North
DUS	DU South
DUW-1	DU Wetlands No. 1 Weir
DUW-2	DU Wetlands No. 2 Weir
HLEN	Historic Lateral Expansion North
HLES	Historic Lateral Expansion South
HLS	Historic Lateral South
HLW	Historic Lateral Weir
HW	Homestead Weir
LNBN	Lower Narrows Bank North
LNBS	Lower Narrows Bank South
LNN	Lower Narrows North
LNS	Lower Narrows South
LNSGU	Lower Narrows South Green-Up
LNW	Lower Narrows Weir
MW	Monson Weir
NDEP	Nevada Division of Environmental Protection
NDSP	Nevada Division of State Parks
PLB	Powerline Bank
PLCW	Powerline Crossing Weir
PLN	Powerline North

PLS	Powerline South
PNB	Pabco North Bank
PRW	Pabco Road Weir
PS	Pabco South
PSB	Pabco South Bank
RGW	Rainbow Gardens Weir
SBW	Silver Bowl Weir
SMN	Sunrise Mountain North
SMS-1	Sunrise Mountain South-1
SMS-2	Sunrise Mountain South-2
SMW	Sunrise Mountain Weir
SNPLMA IV	Southern Nevada Public Land Management Act IV
SNPLMA V	Southern Nevada Public Land Management Act V
TBN	Tropicana Bank North
TBS	Tropicana Bank South
TKW	Three Kids Weir
TN	Tropicana North
TW	Tropicana Weir
UDB	Upper Diversion Bank
UDD-1	Upper Diversion Drop No. 1
UDD-2	Upper Diversion Drop No. 2
UDD-3	Upper Diversion Drop No. 3
UDI-1	Upper Diversion Island-1
UDI-2	Upper Diversion Island-2
UDN	Upper Diversion North
UDS	Upper Diversion South
UDW	Upper Diversion Weir
UNBN	Upper Narrows Bank North
UNBS	Upper Narrows Bank South
UNN	Upper Narrows North
UNNS	Upper Narrows North Stockpile
UNS	Upper Narrows South
UNSF	Upper Narrows South Fill
UNW	Upper Narrows Weir
VCW	Visitor Center Weir

1.0 INTRODUCTION

1.1 Background

In 1997, a citizens advisory committee was assembled by the Southern Nevada Water Authority (SNWA) to evaluate water quality issues in the Las Vegas Wash (Wash), Las Vegas Bay and Lake Mead. From this, the Las Vegas Wash Coordination Committee (LVWCC), a 28-member stakeholder group consisting of federal, state and local agencies; the University of Nevada, Las Vegas; private businesses; environmental groups; and citizens, was formed. In 2000, the LVWCC created the Las Vegas Wash Comprehensive Adaptive Management Plan (CAMP; LVWCC 2000) to help guide stabilization and enhancement efforts along the Wash. The Wash, located within the Clark County Wetlands Park is the primary drainage channel for the Las Vegas Valley, carrying highly treated wastewater, shallow groundwater, urban runoff and stormwater to Lake Mead (Figure 1). On-the-ground activities have been carried out to implement the goals of the CAMP, including constructing erosion control structures (weirs) in the stream channel and armoring the banks with rock. Wetland, riparian and upland vegetation has been planted to help further protect the Wash from erosion, as well as to improve the functional attributes of the ecosystem.

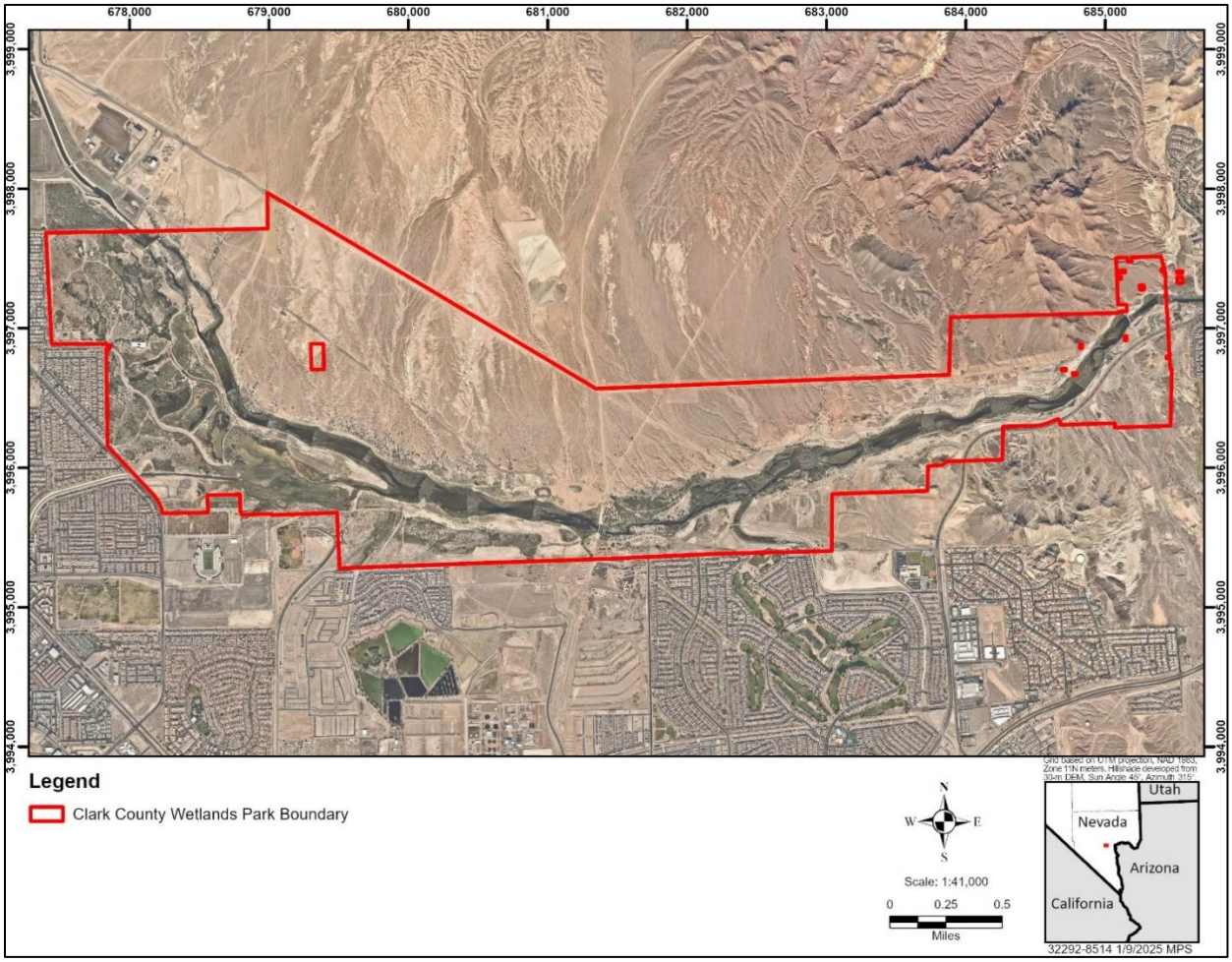

Figure 1. Las Vegas Wash location and general study area map.

For more than 25 years, the main goal of the revegetation program was to help stabilize and enhance the Wash. This was achieved by planting tens of thousands of native plants across several hundred acres along the channel. The plants act as soil anchors during flood events, binding their roots to soil particles on the surface, subsurface and in the deep subsurface horizon. In addition, a variety of wildlife species benefit from these revegetation efforts (Great Basin Bird Observatory 2024, Lantow 2020, Van Dooremolen et al. 2025).

At the time the erosion control project began, few native plants were found along the Wash's banks, especially wetland and riparian species (LVWCC 2000). Salt cedar (*Tamarix ramosissima*; a.k.a., tamarisk), an exotic species, had successfully established in the area and become the dominant species. At its peak, salt cedar covered approximately 1,500 acres along the channel. The plants used to restore the Wash to a natural-type condition include a variety of species native to upland, wetland and riparian areas in the region.

1.2 Purpose and Scope

This report documents the status of SNWA's revegetation efforts along the Wash by reporting 2024 data as part of a comprehensive vegetation monitoring program. Vegetation monitoring results from 2002 through 2023 have been previously documented (SNWA 2005, Eckberg and Shanahan 2008, Eckberg 2014a, Eckberg 2014b, Eckberg 2015, Eckberg 2016, Eckberg 2018, Eckberg 2019a, Eckberg 2019b, Eckberg 2020, Eckberg 2022, Lantow 2023, Lantow 2024a, Lantow 2024b); therefore, they are not described in detail in this report. Since 2003, monitoring activities have been conducted on progressively larger land areas. Approximately 38 acres were monitored in 2003 and about 615 acres were monitored in 2024. All revegetation sites are located within or bordering the Clark County Wetlands Park (Figure 1).

1.3 Need for Revegetation and Vegetation Monitoring

Revegetation projects along the Wash are conducted to meet permitting requirements and because of their environmental benefits. Clean Water Act (CWA) Section 404 permits issued by the U.S. Army Corps of Engineers (Corps) to SNWA for erosion control projects occurring in jurisdictional waters of the U.S. required revegetation as compensatory mitigation for wetlands impacted. Section 404 of the CWA established a program to regulate the discharge of dredged or fill material into waters of the U.S. This includes wetlands associated with Wash erosion control projects. Section 404 permits required that revegetation projects are monitored for success; consequently, several performance indicators are monitored so performance criteria can be achieved. The primary criterion is that mitigation areas provide the functional attributes of a natural wetland system.

The Nevada Division of Environmental Protection (NDEP), which derives its authority from state and federal implementing regulations (i.e., Chapter 445A of the Nevada Revised Statutes and Section 402 of the CWA), also requires revegetation to occur for Wash construction projects. NDEP issued general stormwater permits for Wash construction activities, and permits require that final site stabilization is achieved. Vegetative cover serves as a form of final stabilization, defined by NDEP as "…perennial vegetative cover with a density of 70% of the native background vegetative cover…establishing at least 70% of the natural cover of the native vegetation…e.g., if the native vegetation covers 50% of the ground, 70% of 50% would require 35% total cover."

In addition to permit-required revegetation, SNWA has received multiple federal, state and local grants to help fund the erosion control program as well as ecological enhancements along the Wash. Granting agencies, such as the Bureau of Reclamation (BOR), require that revegetation projects are successful; therefore, specific criteria are measured during monitoring to ensure compliance with these requirements.

Also, stakeholders such as the LVWCC and Las Vegas Valley Watershed Advisory Committee (LVVWAC) need to be kept aware of the status of projects along the Wash including the revegetation program. Many stakeholder meetings were held to establish the goals of the Wash program and providing regular updates ensures members are informed of progress. In addition, the LVVWAC, which provides funding and oversight for the LVWCC's activities, needs to know how funds are spent and that efforts are successful.

Finally, data from revegetation efforts along the Wash informs future decisions. Information on which species are regularly successful and which ones rarely survive without substantial human intervention helps project managers decide what species should be used in future restoration efforts. This increases revegetation project success and helps ensure funds are used effectively.

1.4 Program Funding

Beginning July 2022, the Wash program transitioned from capital construction to the Las Vegas Wash Long-Term Operating Plan (LTOP; LVWCC 2020). The LTOP lays out 36 actions to sustain program assets, including revegetation, and is funded by LVVWAC member agencies. State and federal grants continue to be important components of the budget for revegetation activities.

1.5 Typical Revegetation Establishment Activities

1.5.1 Planning

Most revegetation sites along the Wash were established in association with the construction of weirs. Plant selection and irrigation design were done in conjunction with the engineering plans for the site. Hydroseeding was included in the construction of the erosion control structures, as the final step in the construction process and the initial step in most revegetation projects. Species with the highest likelihood of success were selected for each weir site. Procedures were described in construction plans to include tackifier, mulch and fertilizer along with the seeds themselves.

1.5.2 Plant Procurement

After plants are selected, procurement activities take place in order to have material in time for planting at the sizes needed to have a successful restoration site. Plants are either ordered from government or commercial nurseries or grown by the Las Vegas Wash Project Coordination Team (Wash Team). Local and regional nurseries, such as the Nevada Division of Forestry and Mountain States Wholesale Nursery, have provided most of the plants for this work. Plants grown by the Wash Team involve collecting seed or cuttings, establishing the seedlings, transplanting them into larger containers, irrigating them and delivering them back to the Wash for final planting. With revegetation activities taking place for more than 20 years, there are now sufficient native species

established along the Wash to procure seeds and cuttings without going to surrogate areas. Plant propagation for the Wash Team takes place at the SNWA-owned and -operated Warm Springs Natural Area propagation facility in Moapa, NV.

1.5.3 Invasive and Other Undesirable Species Removal

Prior to revegetation efforts, most of the sites described in this report were covered in part or entirely by salt cedar, an invasive species that is prolific, spreads easily and can encroach on revegetation sites if removal does not take place. Some other invasive species that are found on sites and require constant monitoring are tall whitetop (*Lepidium latifolium*), silverleaf nightshade (*Solanum elaegnifolium*) and giant reed (*Arundo donax*). Without their removal, the native species used in revegetation would not be able to grow, germinate and become self-sustaining. Consequently, considerable effort is given to surveying sites for encroachment, identifying invasive species and planning for their removal as soon as possible.

Other species that are closely monitored because of their ability to grow vigorously and outcompete revegetated plants are common reed (*Phragmites australis*) and quailbush (*Atriplex lentiformis*). Quailbush is a native species, and the Wash has both native and non-native common reed as well as hybrids of the two (Saltonstall et al. 2016). The goal with these species is not to completely remove them, but to selectively thin them so that other vegetation can establish.

1.5.4 Irrigation

Non-wetland revegetation sites along the Wash require irrigation for the first 1–3 growing seasons to become established. Sites are irrigated with infrastructure components that are easily moved to new sites as they are planted. Irrigation water is pumped out of the Wash using gasoline- or biodiesel-powered pumps to a single mainline and then to multiple lateral lines that are fitted with drip irrigation tubing. Past efforts included spray irrigation.

Over the years, the sizes of the sites that are irrigated have ranged from under one acre to almost 60 acres. Regular checks and maintenance of irrigation system components are critical to ensure the water is reaching the plants. On average, southern Nevada gets less than five inches of rain annually, so a break in the irrigation system could be detrimental to the plants' health and the overall success of the site. Irrigation maintenance includes fixing leaks, tightening connections and fixing or replacing broken pipes or emitters.

1.5.5 Trash Removal

Trash along the Wash is prevalent and caused by flood events, wind and illegal dumping. South Hollywood Blvd., located just north of the Wash, is a common site for the latter, and when flood events occur, this trash is likely to end up in the Wash. If this trash or debris moved by wind or flood events ends up at a newly planted revegetation site, it can hinder the site's success. Following storm events, sites should be assessed to ensure there is no trash or debris that could hinder plant growth and site success.

1.5.6 Herbivore Control

Fencing was installed on some revegetation sites to help reduce the damage caused by beavers and rabbits. Some sites had a single fence that went around the site's entirety while other sites had individual fences for each plant. Both situations require continual inspection for damage, repairs and adjustments to spacing to reduce plant damage. Once a site is considered fully established, the fencing is typically removed. Only a few locations at the Wash still have fencing; these sites should be inspected, and if deemed appropriate, all fencing should be removed.

1.5.7 Long-Term Management

The Las Vegas Wash Long-Term Revegetation Management Plan (RMP; Eckberg 2019c) was created to help identify activities that would improve revegetation sites along the Wash after initial establishment. Initial establishment activities were completed in the spring of 2022. In general, the RMP focuses on how to improve the ecological function of revegetation sites, including diversifying plant structure types and species, increasing wildlife benefits in the form of food and shelter, and removing undesirable species and trash from sites.

2.0 MATERIALS AND METHODS

Beginning in 2024, the vegetation monitoring protocol was revised. The goal of this revision was to make monitoring better align with long-term management needs, simplify the survey process and reduce the total number of revegetation sites. No new sites have been added along the Wash since long-term management began in 2022; revegetation efforts now focus on enhancing already established sites. In total, more than 600 acres have been revegetated along the Wash. This acreage will not change, but beginning in 2023, total enhanced acreage within these sites has been tracked annually.

2.1 Modifying Site Boundaries

At the conclusion of the 2023 monitoring period, there were 158 revegetation sites that had a median growing season age of 15. With long-term management recently beginning and most sites not experiencing much change year to year, it was time to modify site boundaries, reducing the total number of sites and ultimately reducing the total number of surveys. Where needed and possible, sites were modified to create more obvious boundaries (roads, paths, etc.). Sites were merged that had similar vegetation, Wetland Prevalence Index (WPI) numbers and were either next to or near one another. All monitoring areas within previous sites were typically merged to create one large site. Wetland sites or portions of sites not designated as vegetation to remain in the Las Vegas Wash Facilities Inventory and Vegetation Management Plan (IVMP; WSP 2019) are now part of the waterway polygons, which also include parts of bank and emergent revegetation sites. More information regarding these polygons can be found in Section 2.3. Upon completion of these modifications, the number of revegetation sites was reduced to 74, including wetland, non-wetland, weirs and drop structures (Figure 2). Total acreage has not changed and all sites from previous iterations have been included. Sites that are grant funded will not be merged with other sites until after the fifth survey season. Most grants require five consecutive years of monitoring so keeping grant-funded sites separate will allow for better tracking to ensure goals are met. Following the site's fifth survey season, site boundaries can be modified if deemed appropriate.

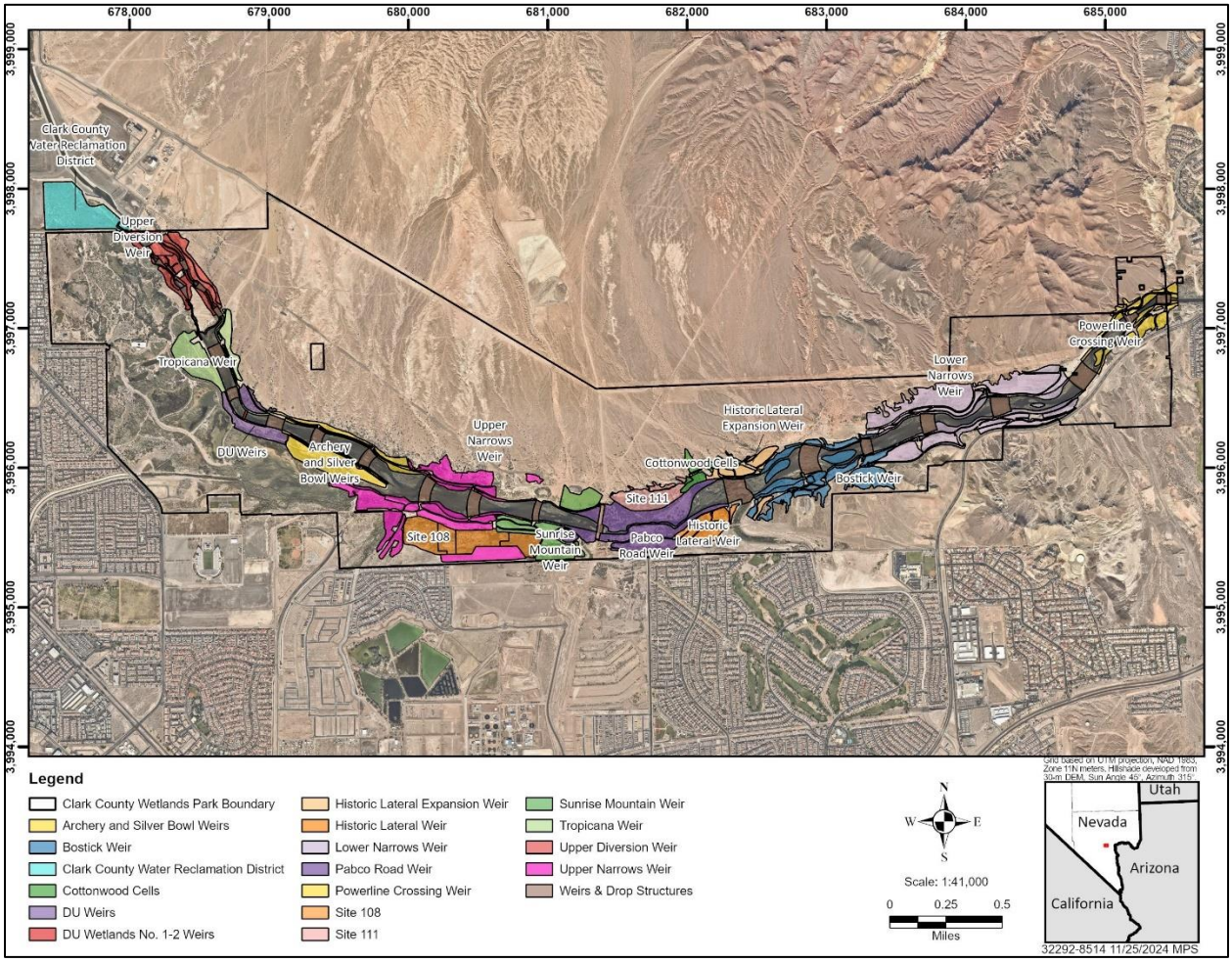

Figure 2. Location of 2024 Las Vegas Wash revegetation sites.

Site names were chosen based on the weir the site was closest to and whether the site was located on the north or south side of the Wash. Names were not changed if the site was grant funded and still within its first five growing seasons. A visual representation of these changes can be found in the maps below (Figures 3–34). The top map represents the previous site boundaries, and the bottom map represents the new site boundaries. Any wetland and island sites missing from the new maps are now included in the waterway polygons map found in Section 2.3. The map order in this report goes from upstream to downstream. Moving forward, boundaries and acreages for sites should not change unless modifications are made to grant-funded sites following their fifth growing season.

Figure 3. Aerial photograph of the previous Clark County Water Reclamation District revegetation site boundary.

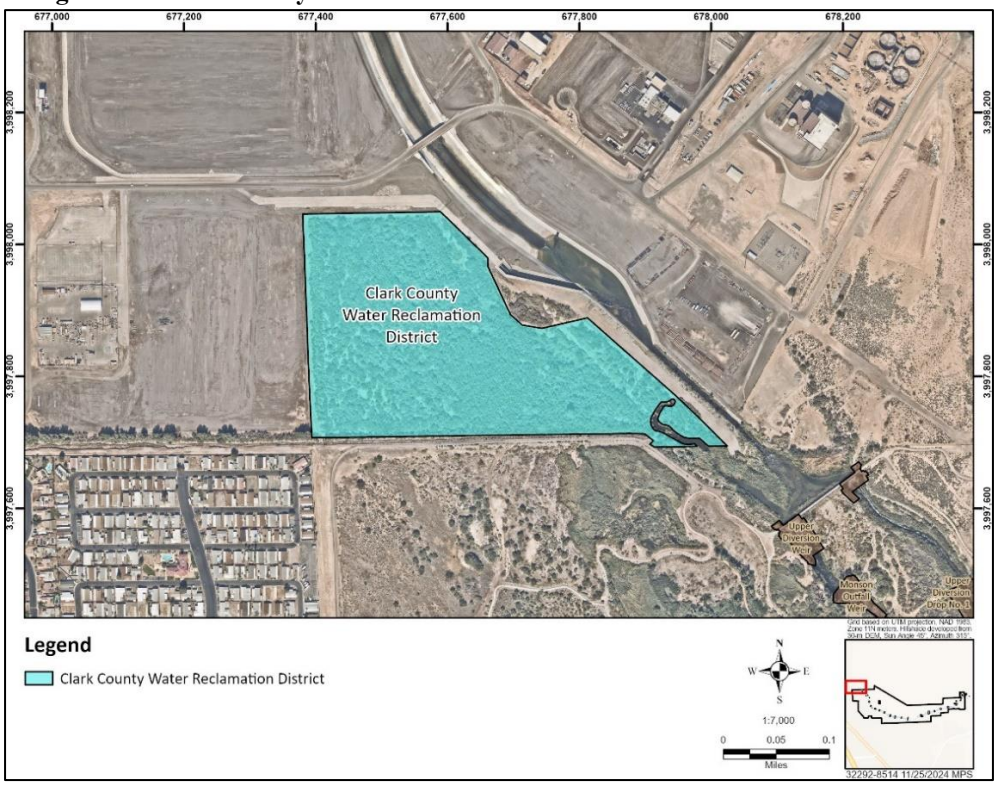

Figure 4. Aerial photograph of the new Clark County Water Reclamation District revegetation site boundary.

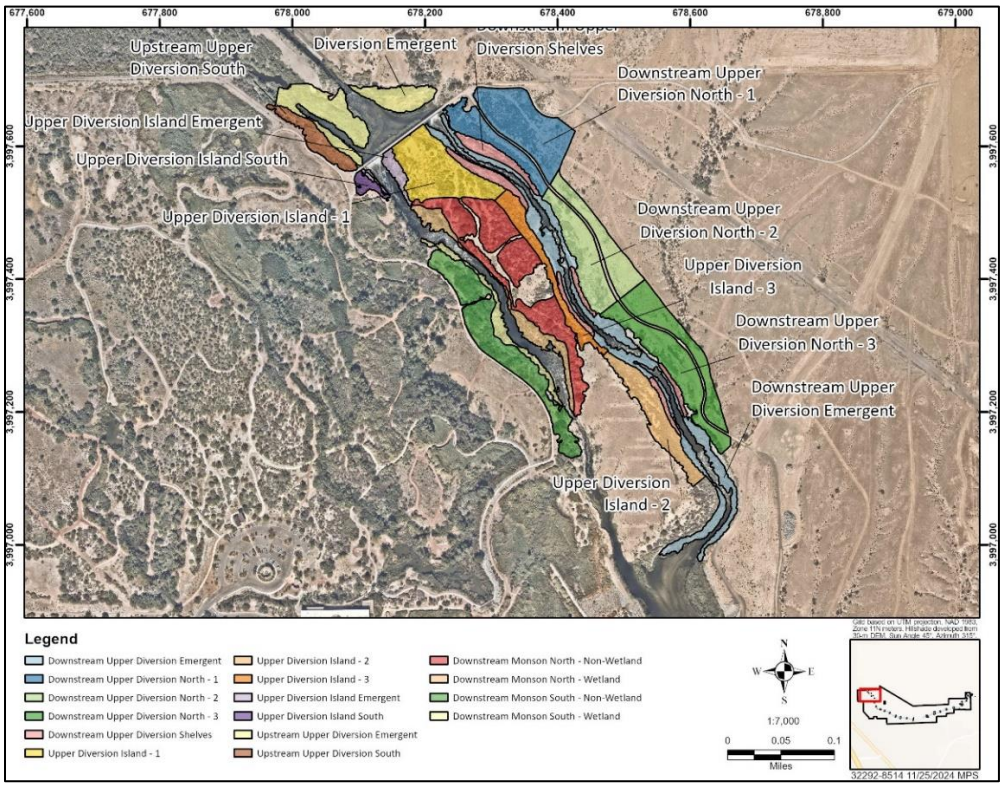

Figure 5. Aerial photograph of the previous Upper Diversion Weir revegetation site boundaries.

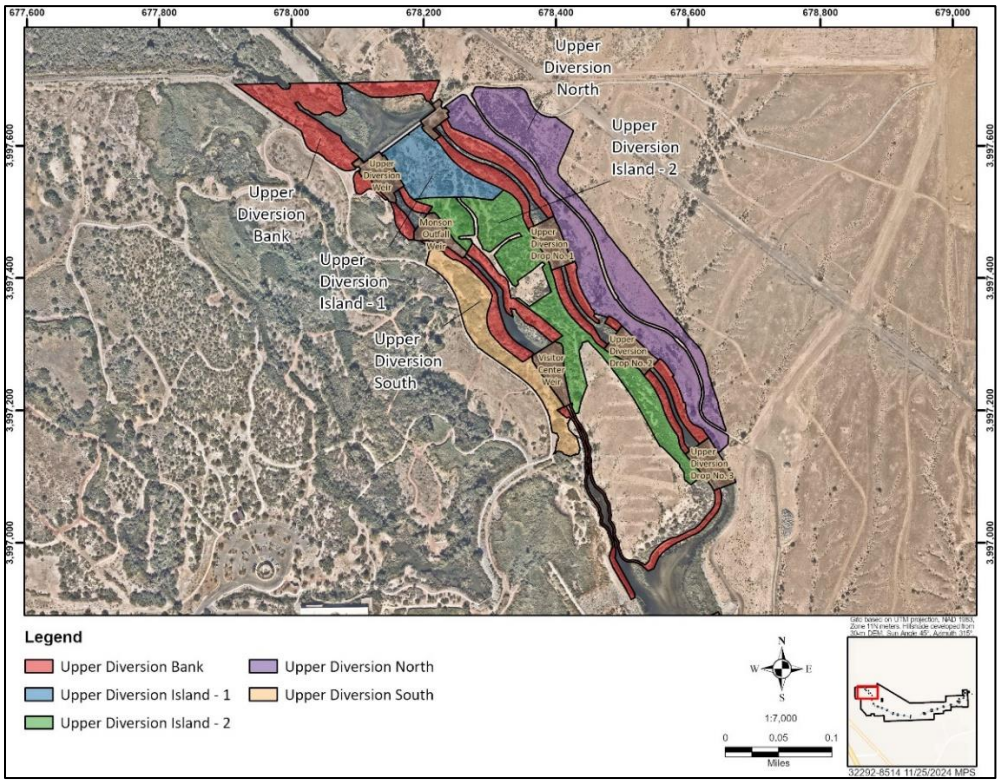

Figure 6. Aerial photograph of the new Upper Diversion Weir revegetation site boundaries.

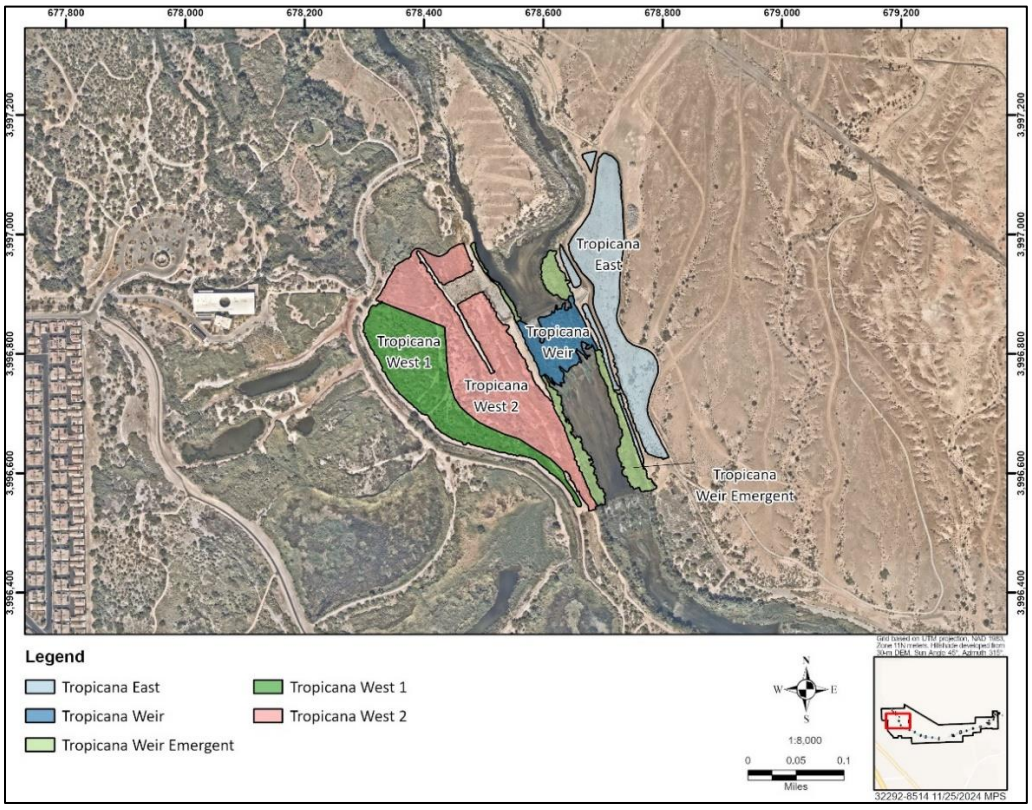

Figure 7. Aerial photograph of the previous Tropicana Weir revegetation site boundaries.

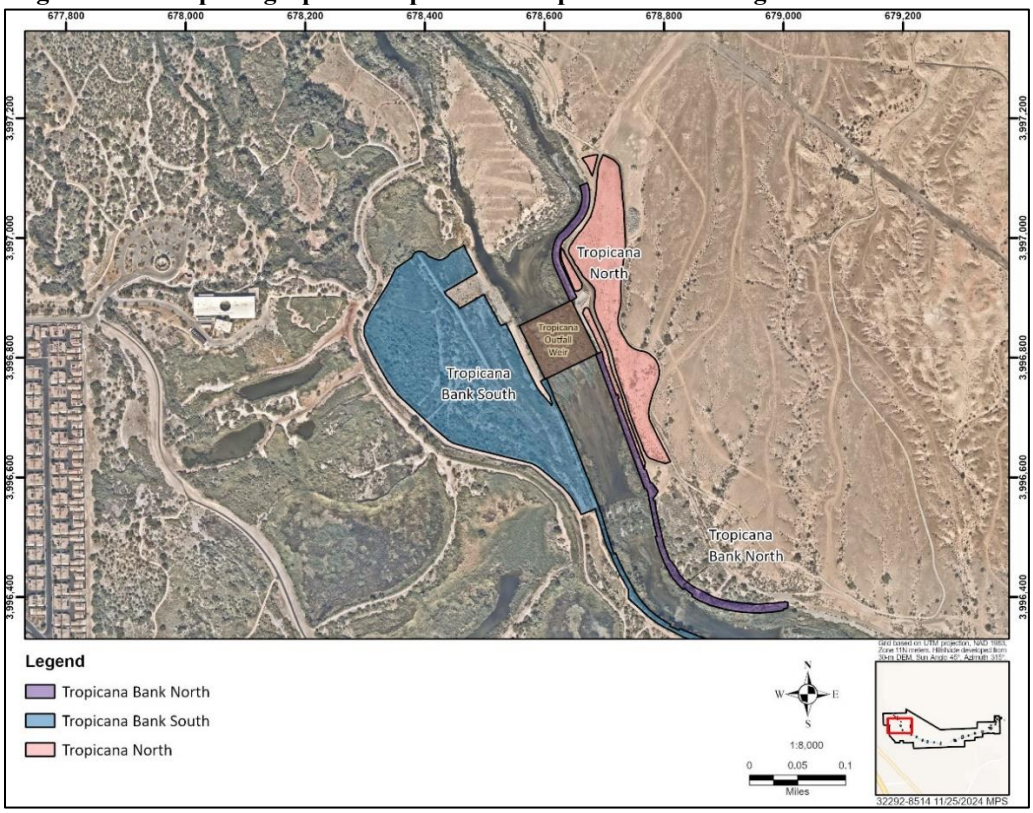

Figure 8. Aerial photograph of the new Tropicana Weir revegetation site boundaries.

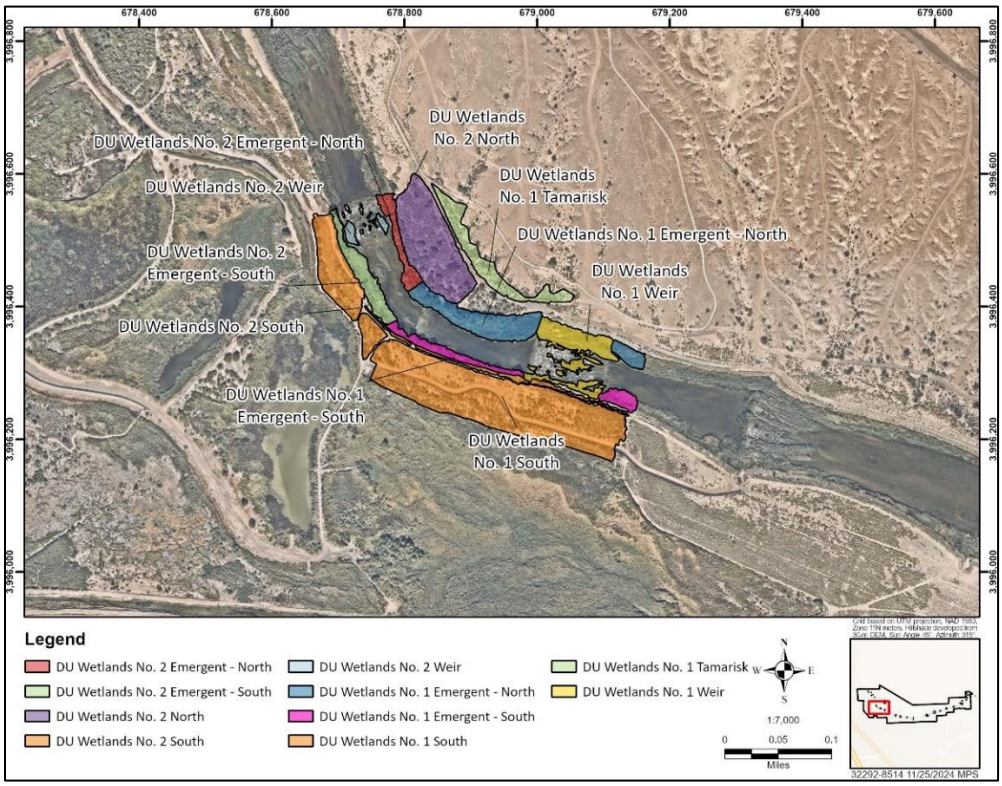

Figure 9. Aerial photograph of the previous DU Wetlands No. 2 and No. 1 weirs revegetation site boundaries.

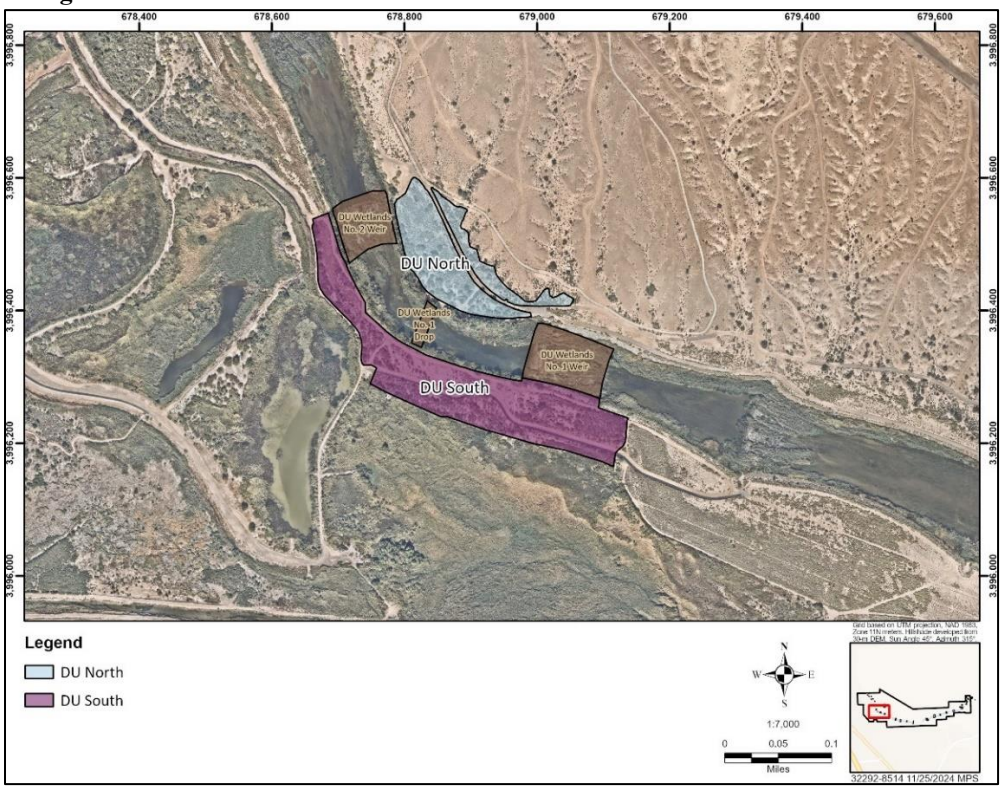

Figure 10. Aerial photograph of the new DU Wetlands No. 2 and No. 1 weirs revegetation site boundaries.

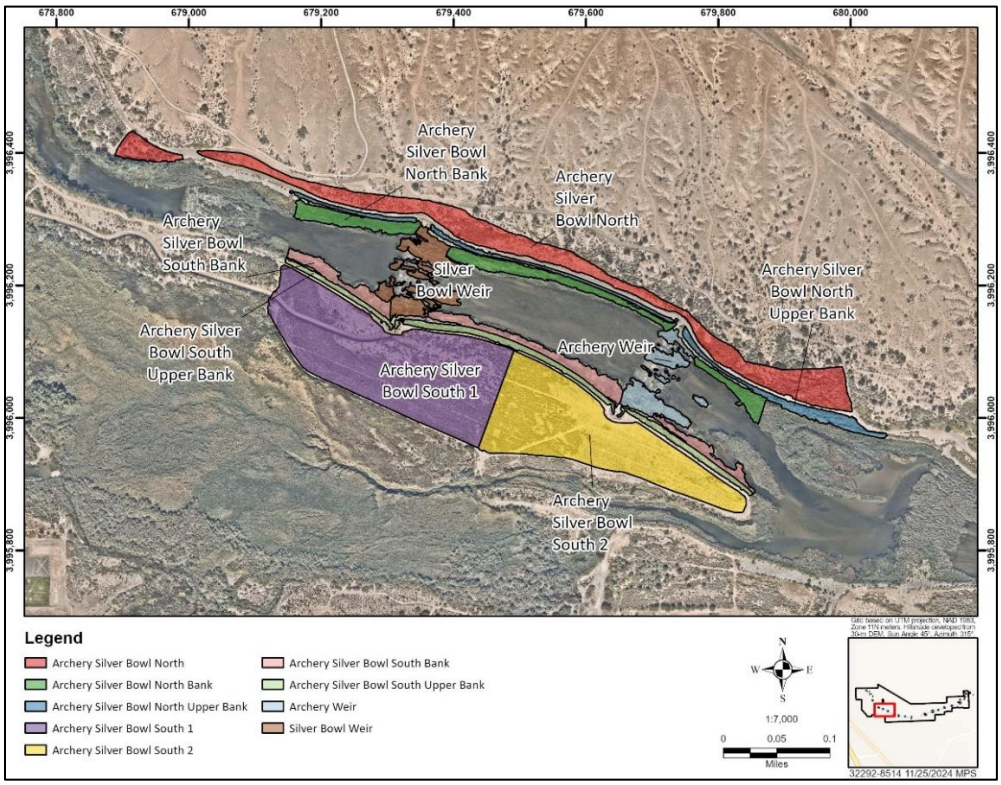

Figure 11. Aerial photograph of the previous Archery and Silver Bowl weirs revegetation site boundaries.

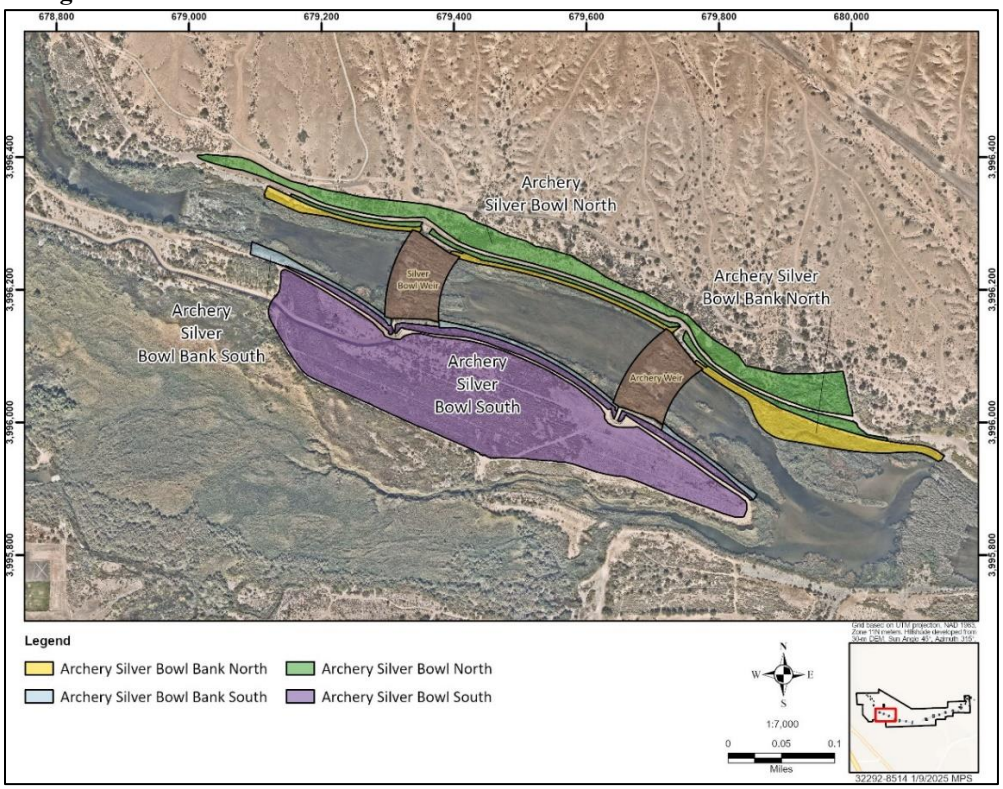

Figure 12. Aerial photograph of the new Archery and Silver Bowl weirs revegetation site boundaries.

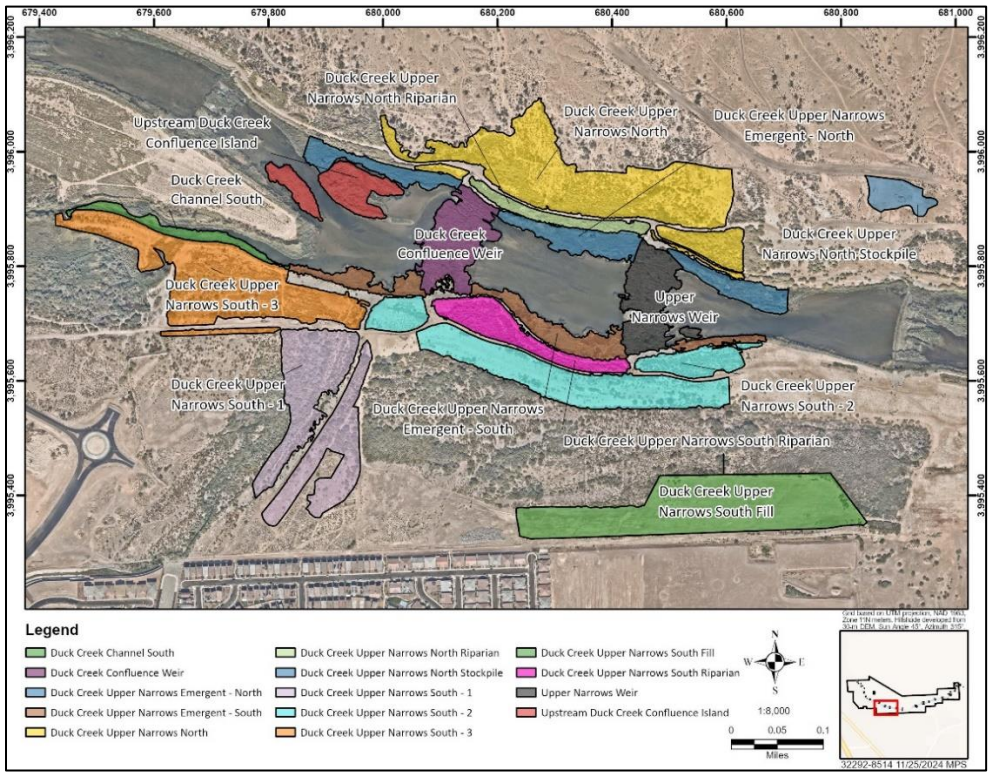

Figure 13. Aerial photograph of the previous Duck Creek Confluence and Upper Narrows weirs revegetation site boundaries.

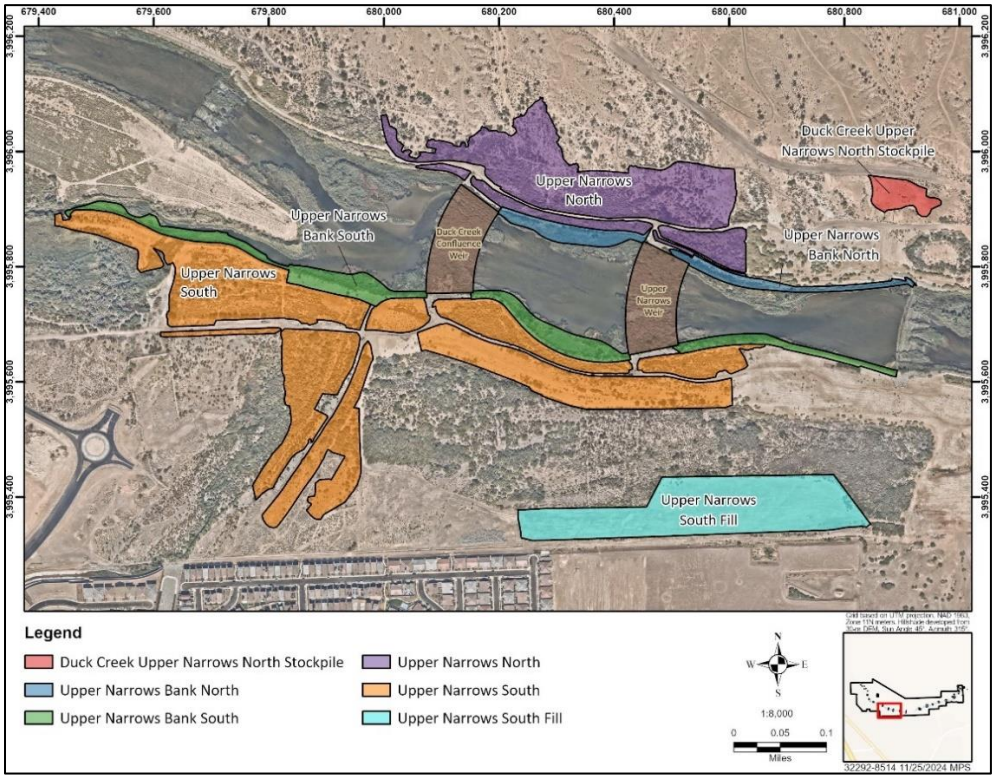

Figure 14. Aerial photograph of the new Duck Creek Confluence and Upper Narrows weirs revegetation site boundaries.

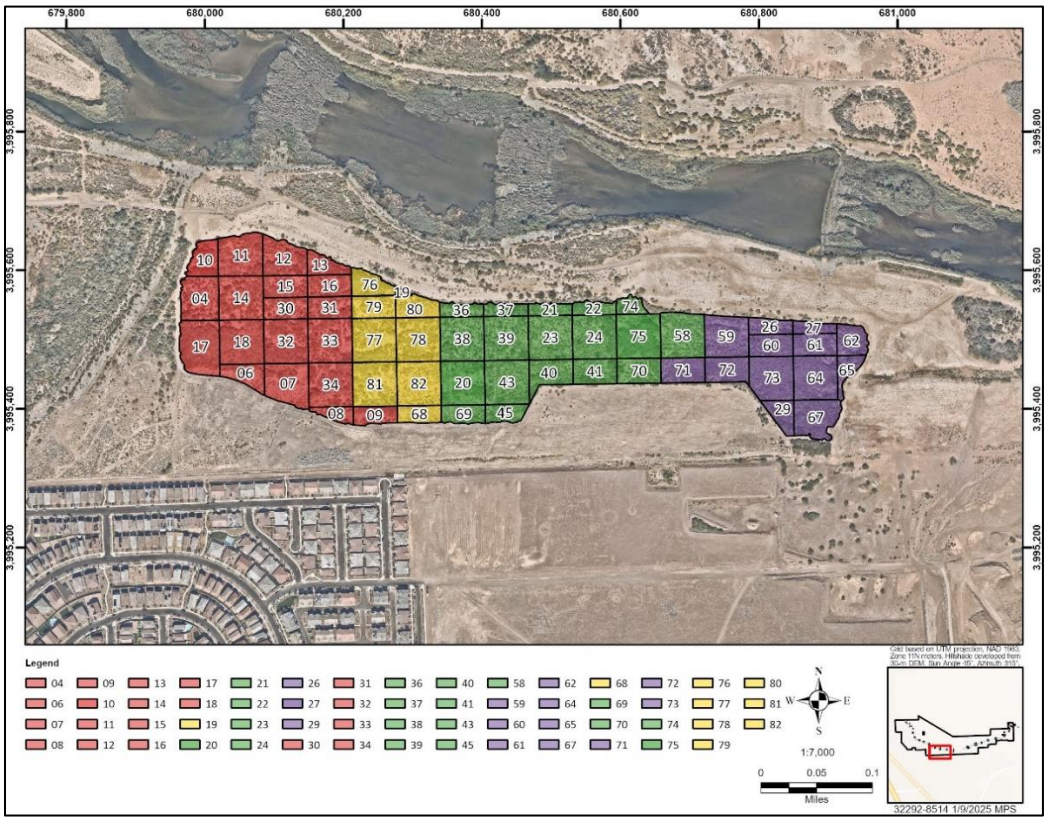

Figure 15. Aerial photograph of the previous Site 108 revegetation site boundaries.

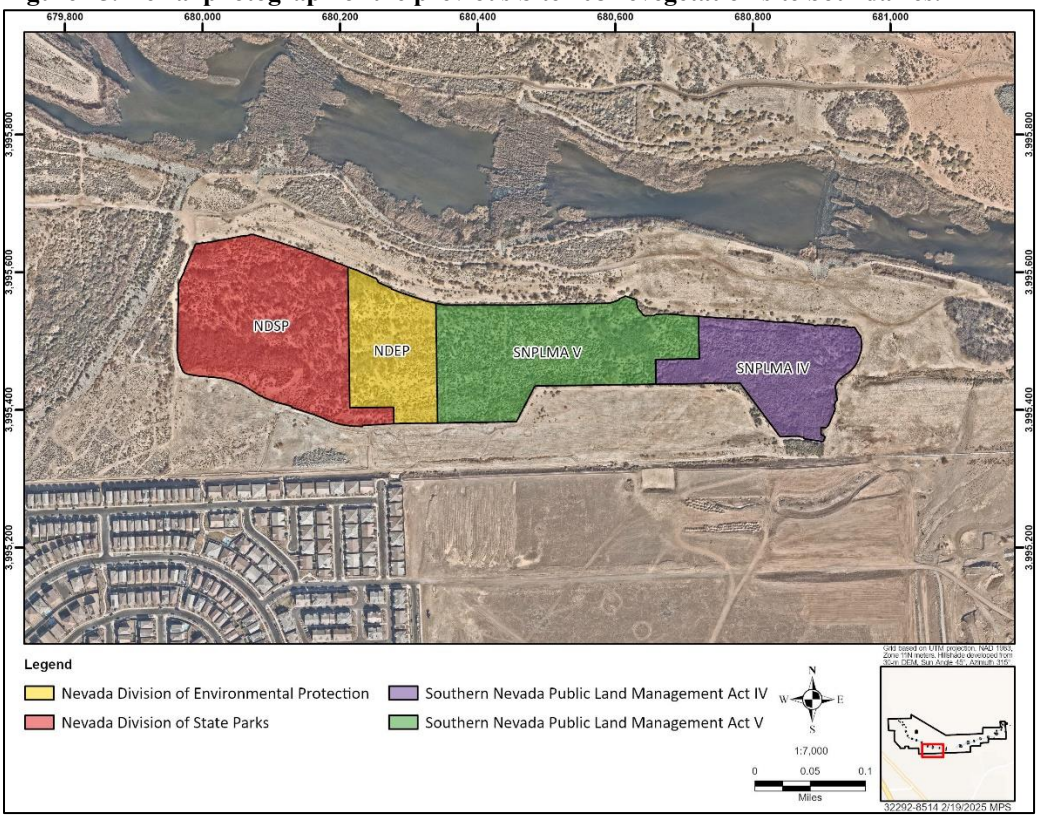

Figure 16. Aerial photograph of the new Site 108 revegetation site boundaries.

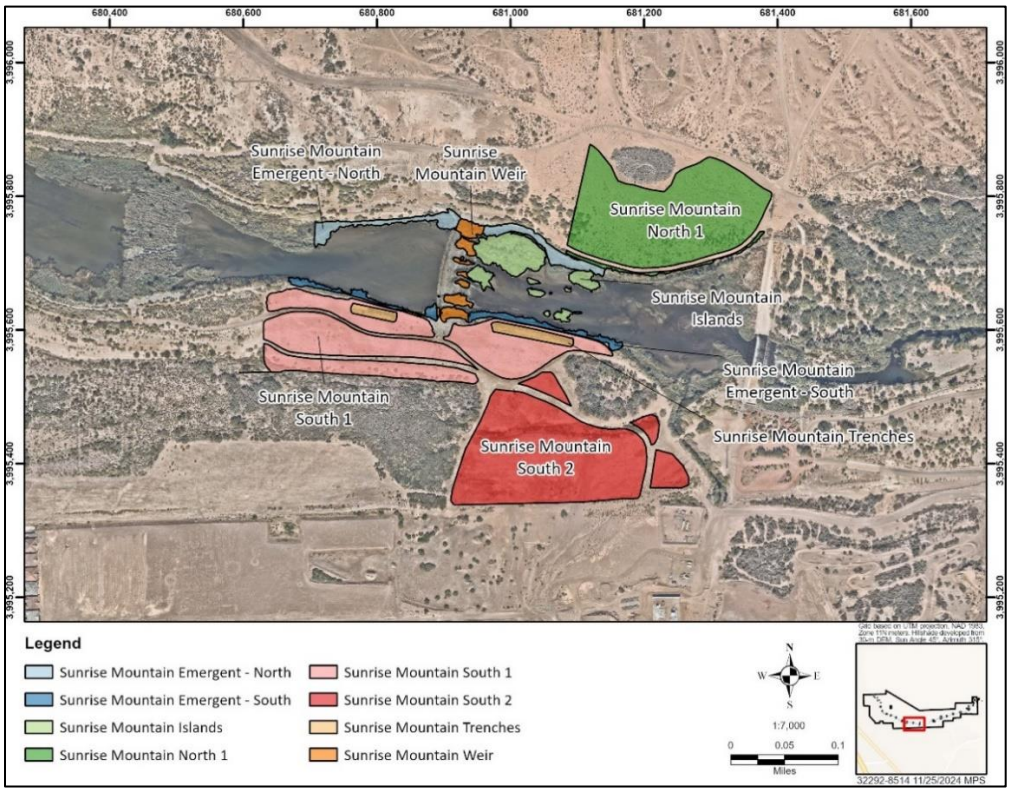

Figure 17. Aerial photograph of the previous Sunrise Mountain Weir revegetation site boundaries.

Figure 18. Aerial photograph of the new Sunrise Mountain Weir revegetation site boundaries.

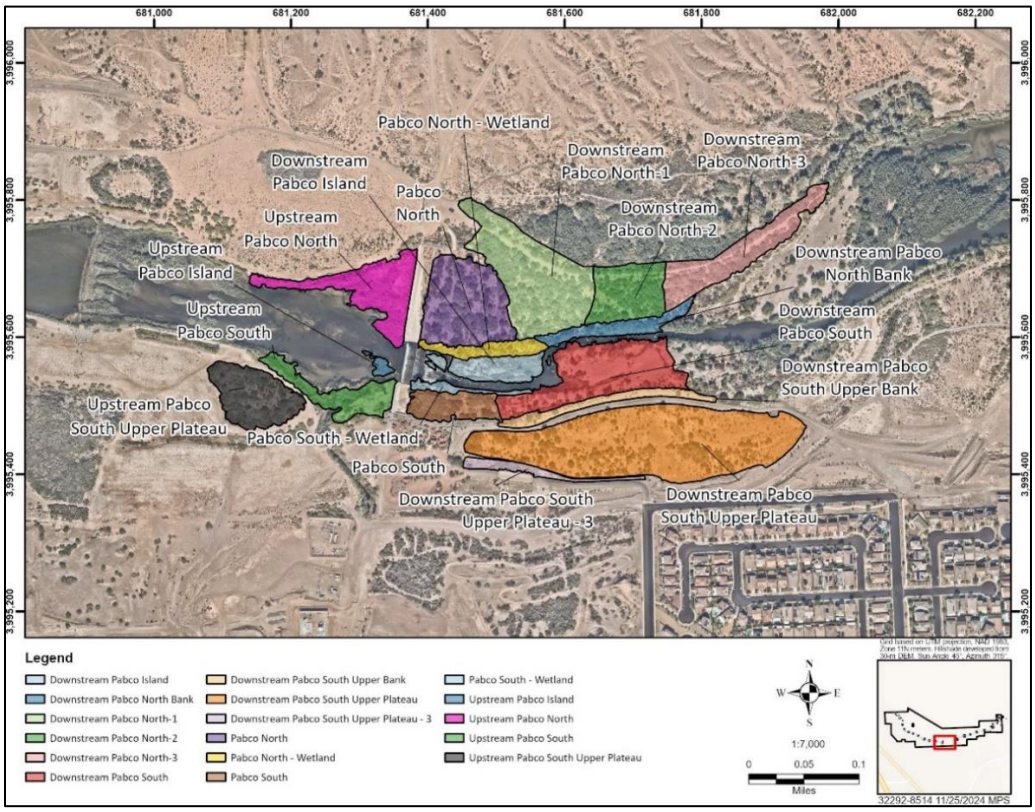

Figure 19. Aerial photograph of the previous Pabco Road Weir revegetation site boundaries.

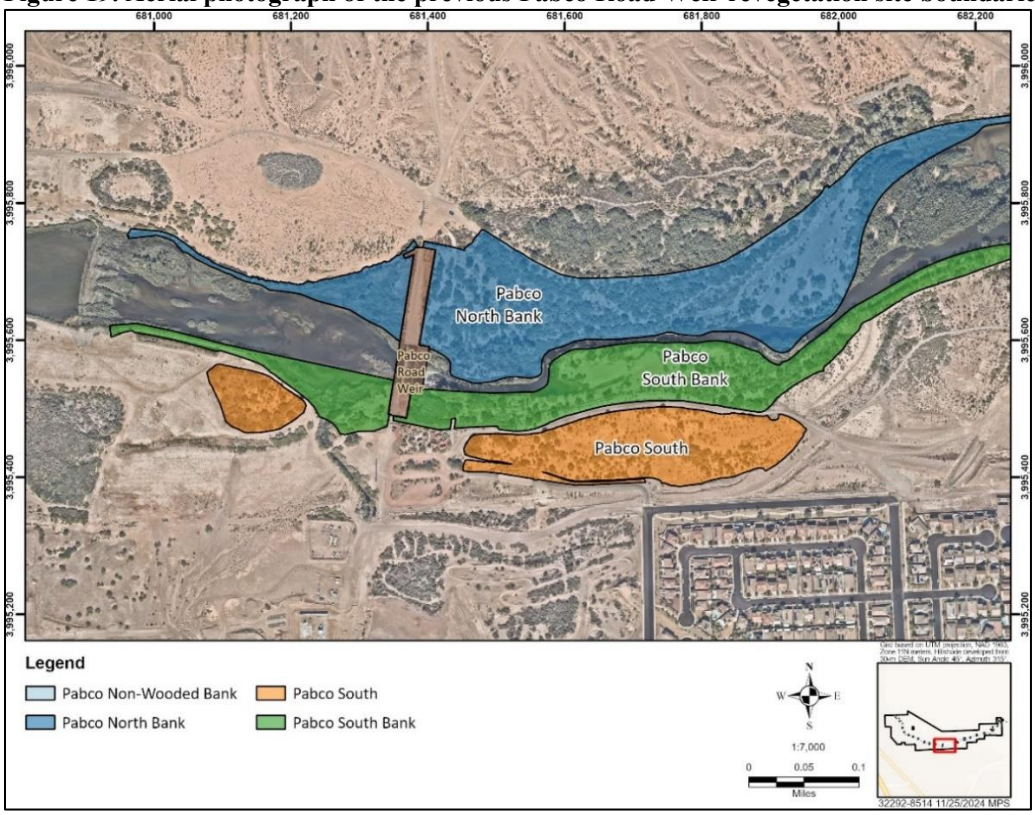

Figure 20. Aerial photograph of the new Pabco Road Weir revegetation site boundaries.

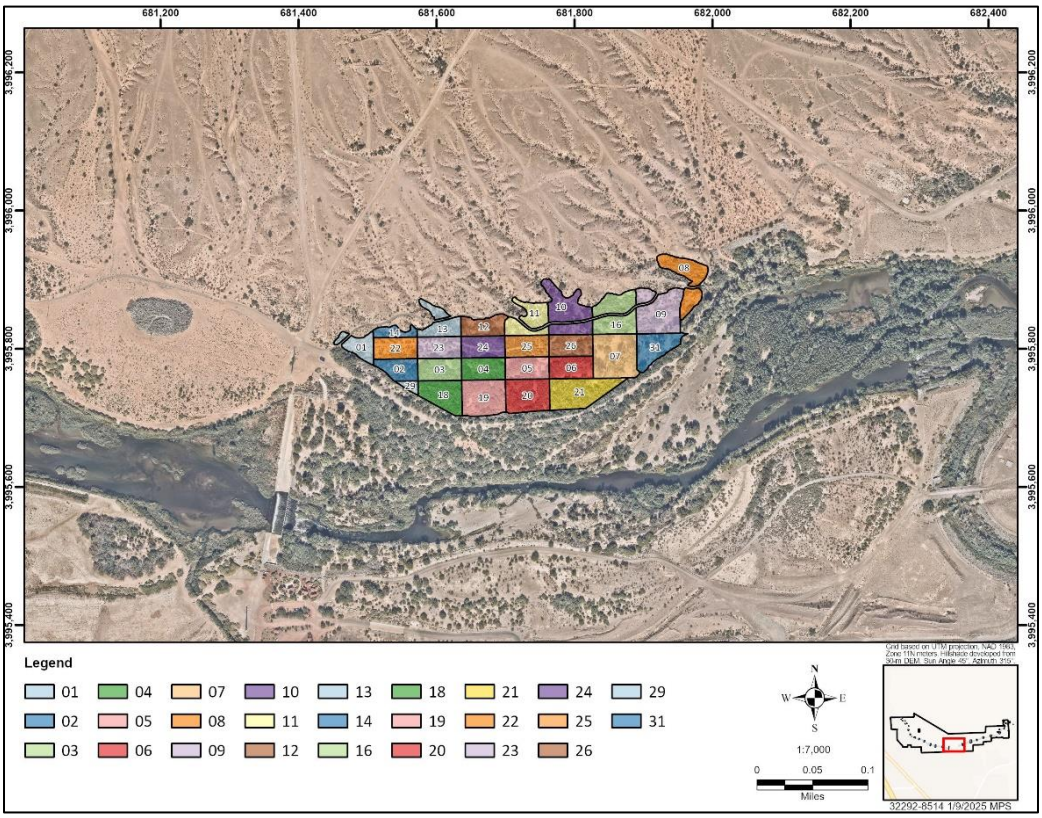

Figure 21. Aerial photograph of the previous Site 111 revegetation site boundaries.

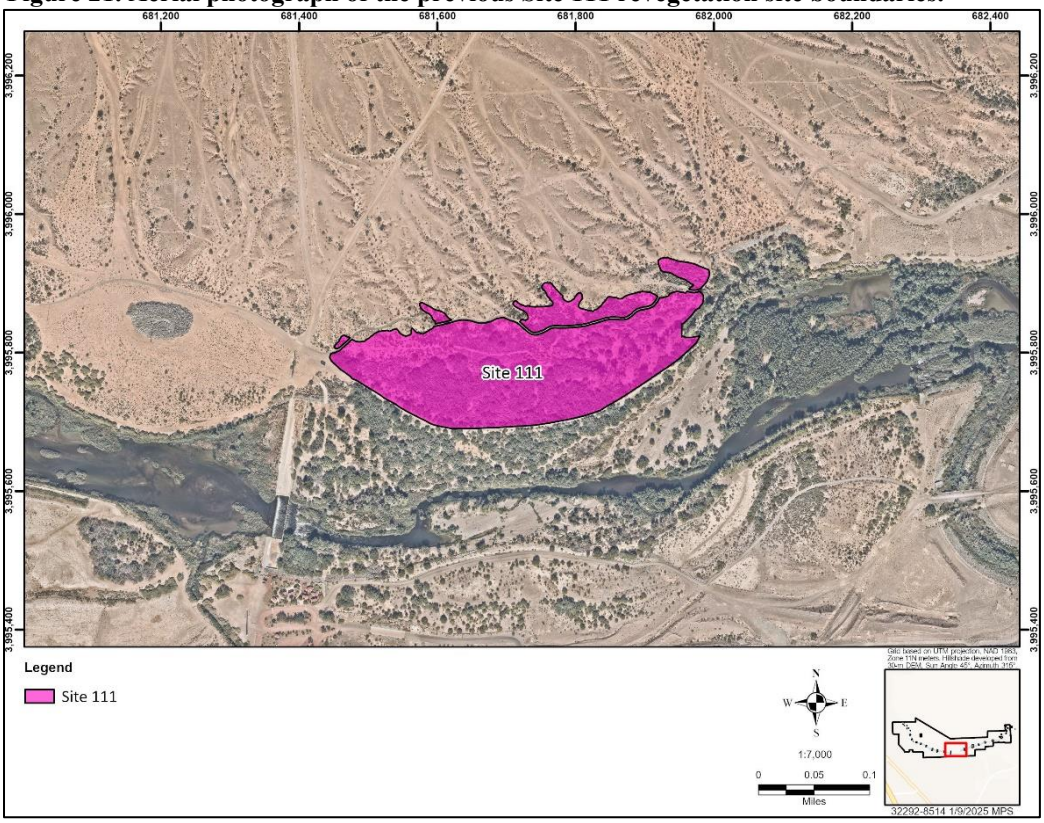

Figure 22. Aerial photograph of the new Site 111 revegetation site boundaries.

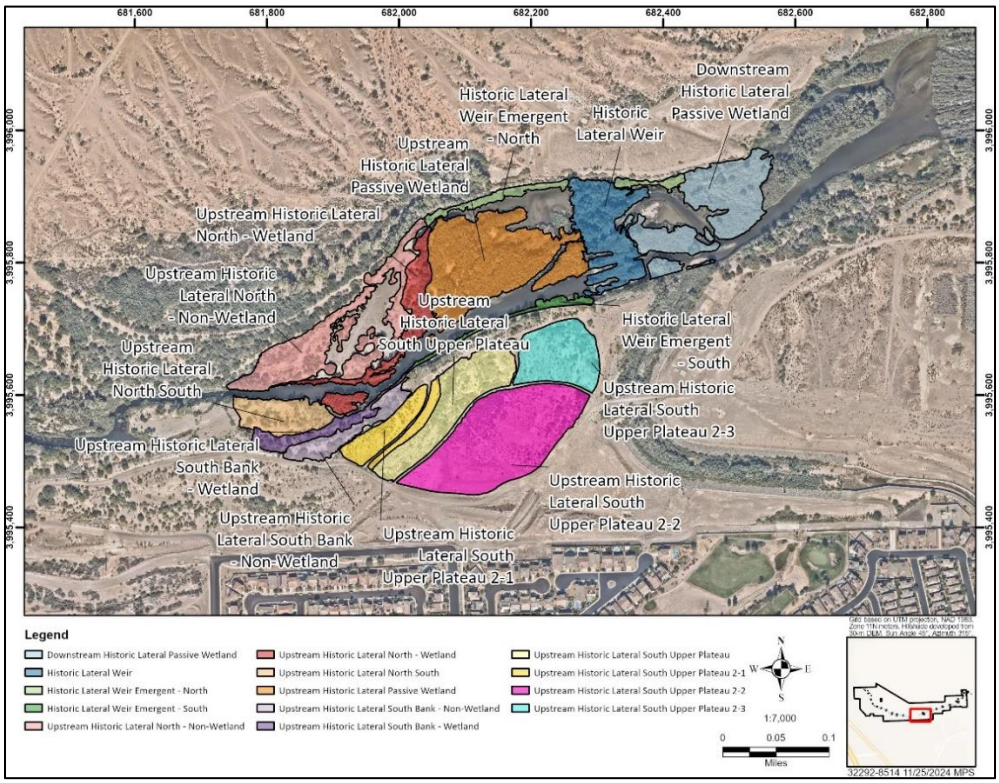

Figure 23. Aerial photograph of the previous Historic Lateral Weir revegetation site boundaries.

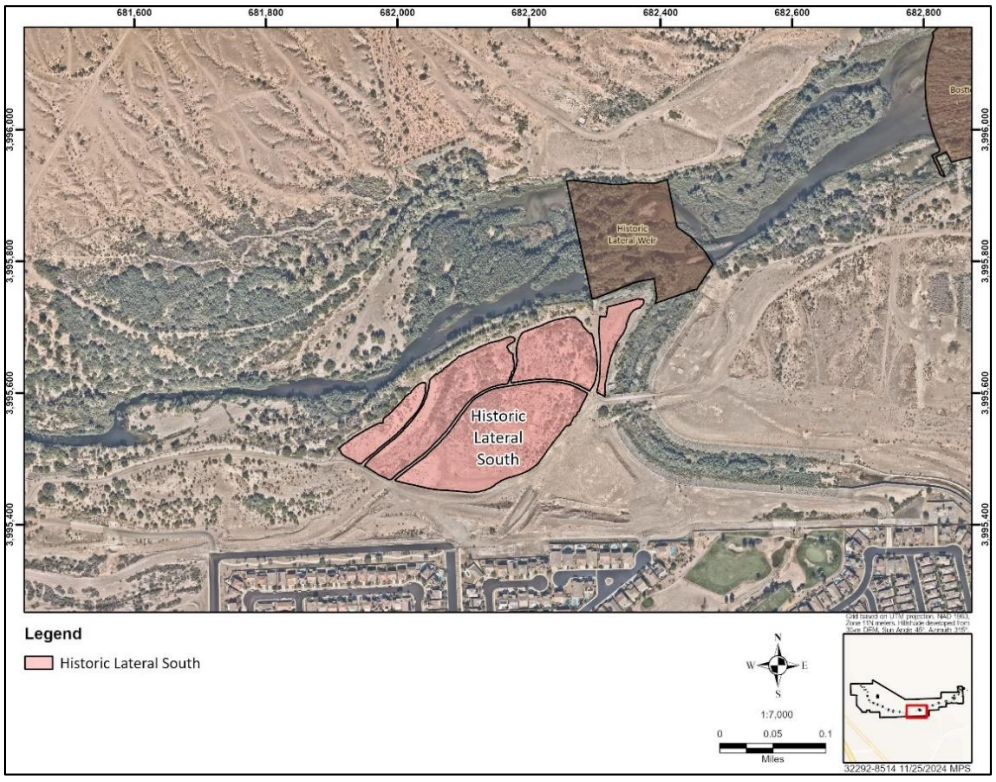

Figure 24. Aerial photograph of the new Historic Lateral Weir revegetation site boundaries.

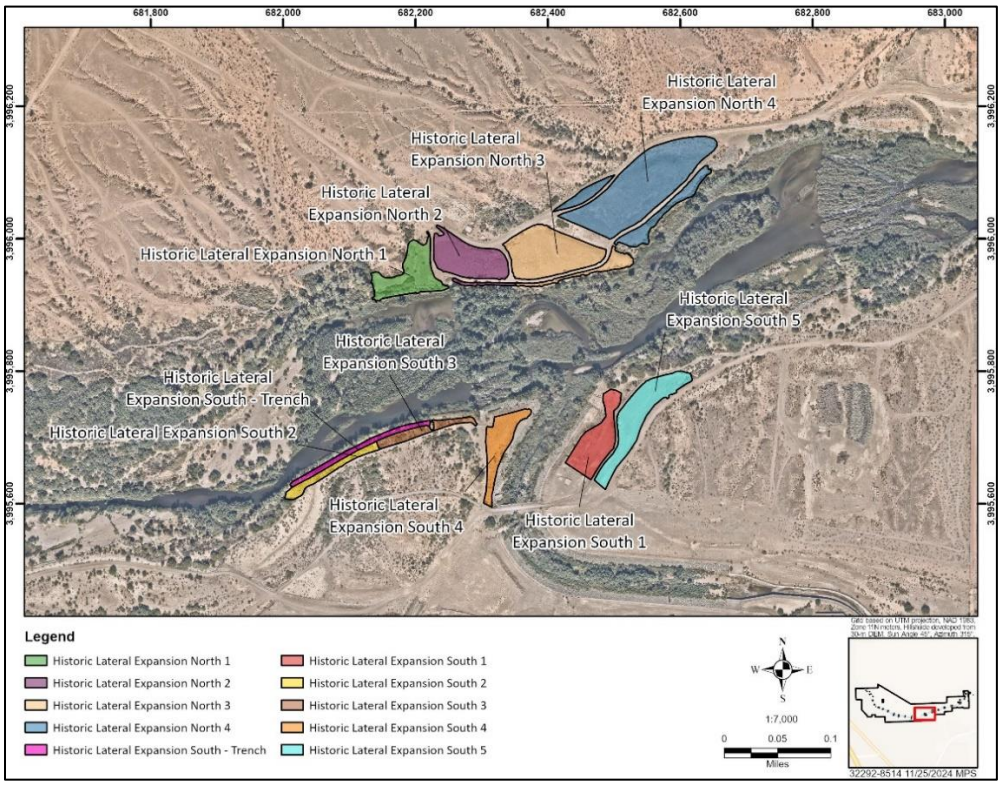

Figure 25. Aerial photograph of the previous Historic Lateral Expansion revegetation site boundaries.

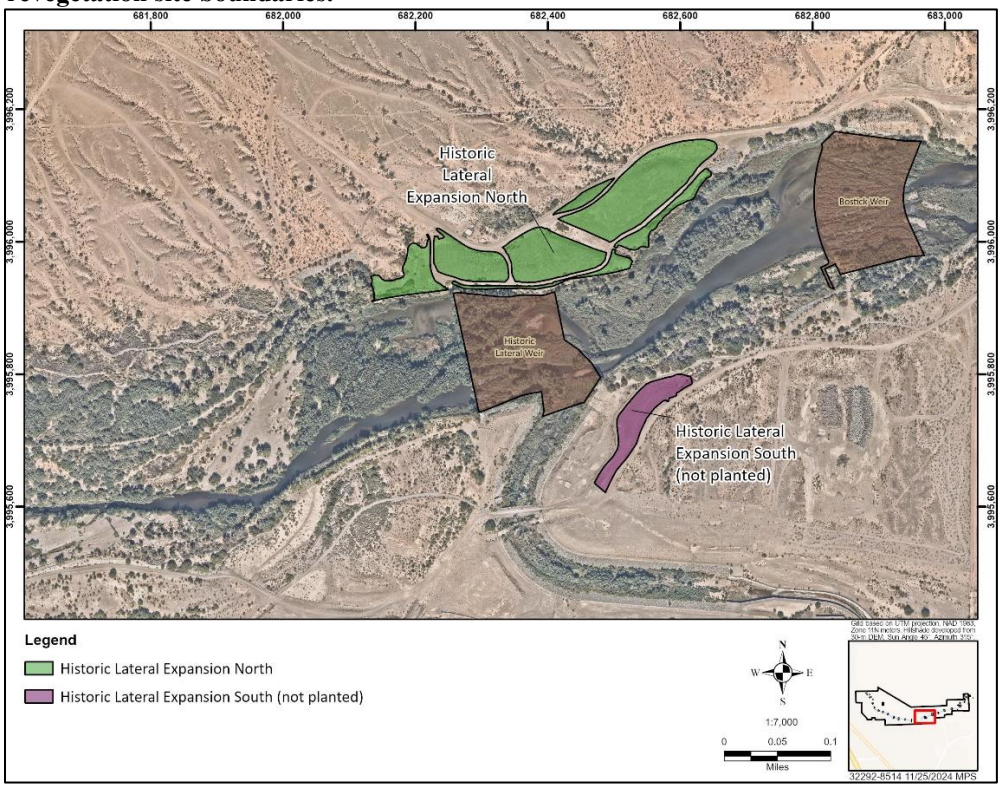

Figure 26. Aerial photograph of the new Historic Lateral Expansion revegetation site boundaries.

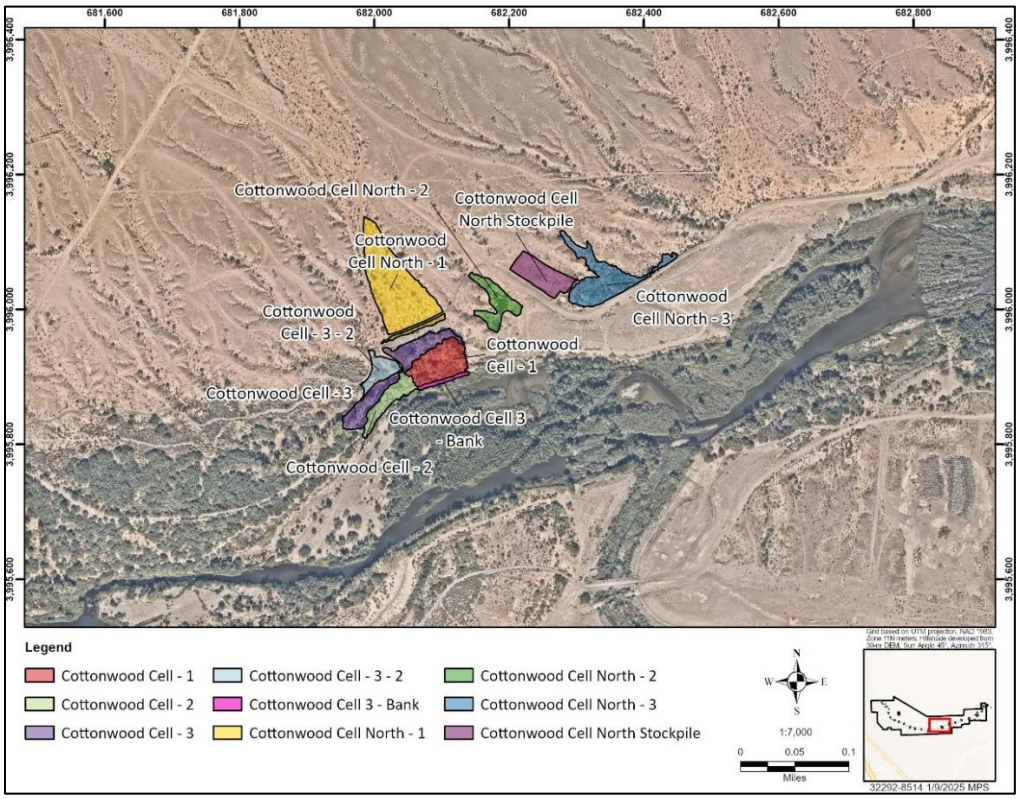

Figure 27. Aerial photograph of the previous Cottonwood Cells revegetation site boundaries.

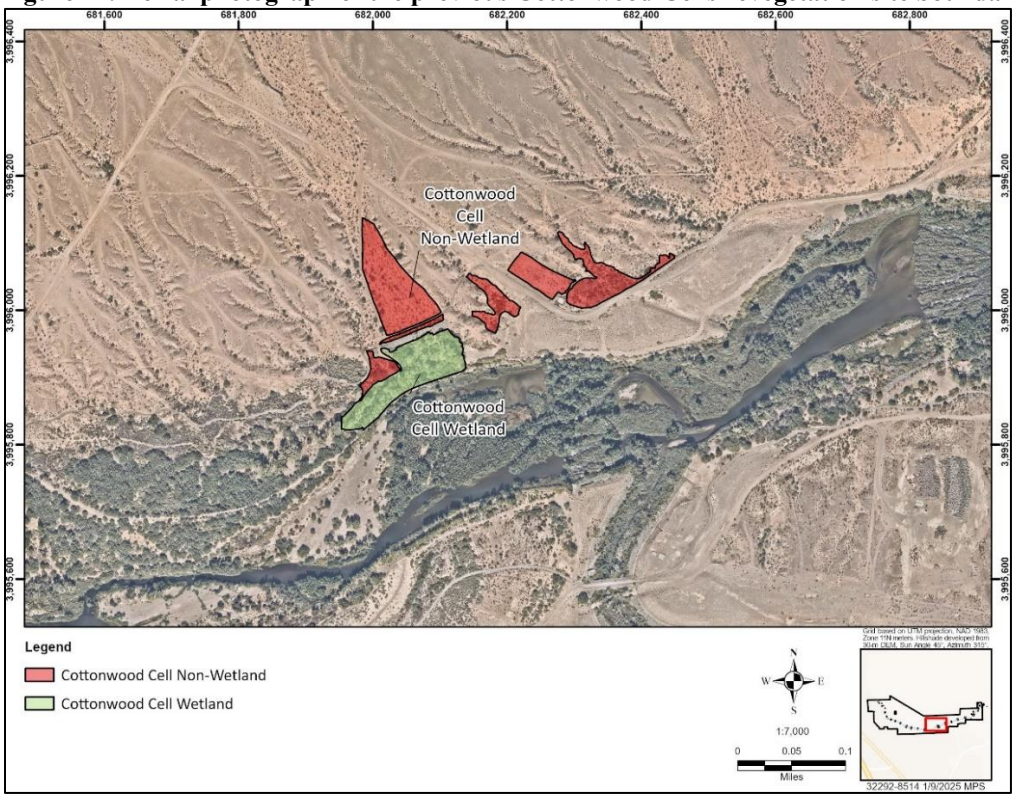

Figure 28. Aerial photograph of the new Cottonwood Cells revegetation site boundaries.

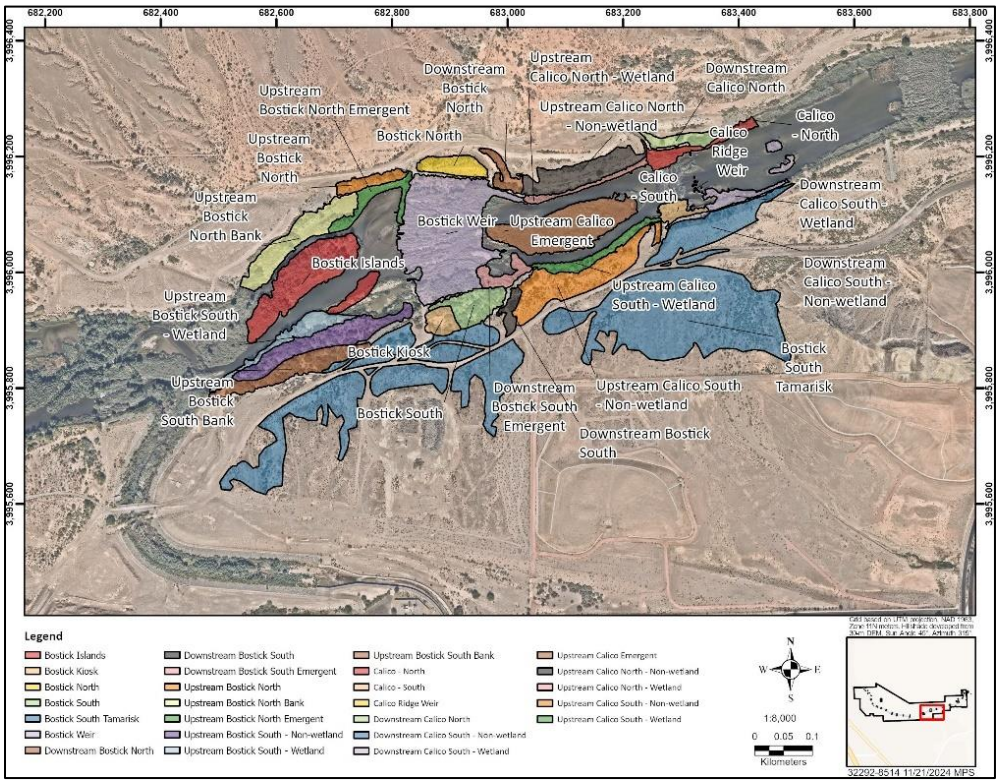

Figure 29. Aerial photograph of the previous Bostick and Calico Ridge weirs revegetation site boundaries.

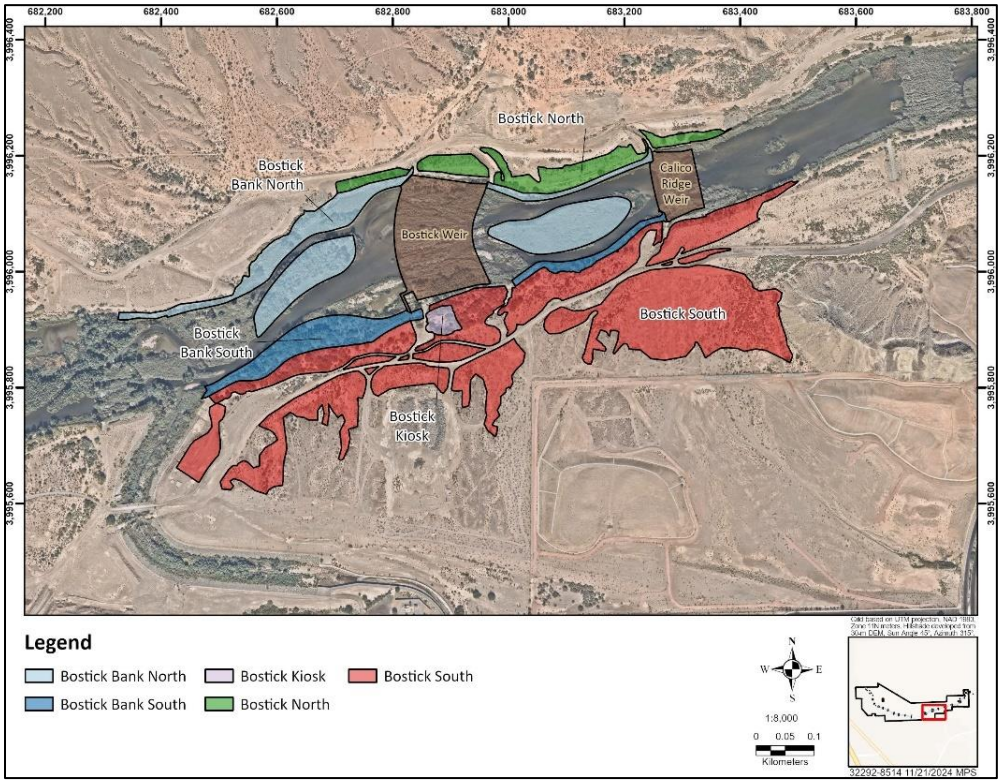

Figure 30. Aerial photograph of the new Bostick and Calico Ridge weirs revegetation site boundaries.

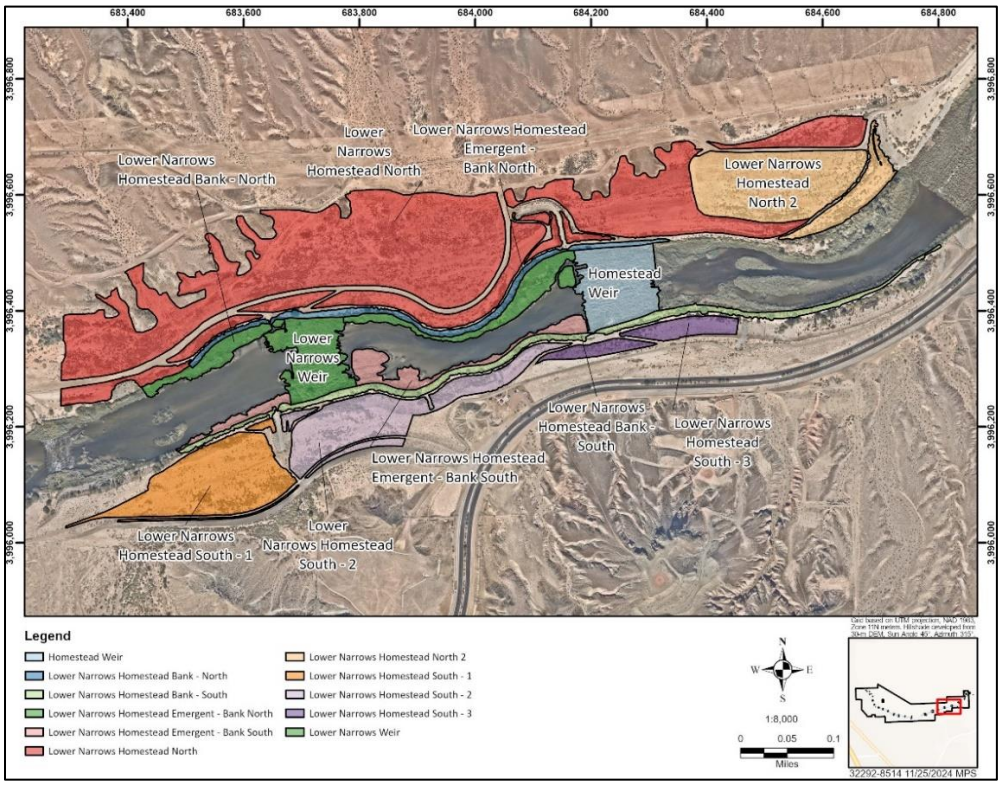

Figure 31. Aerial photograph of the previous Lower Narrows and Homestead weirs revegetation site boundaries.

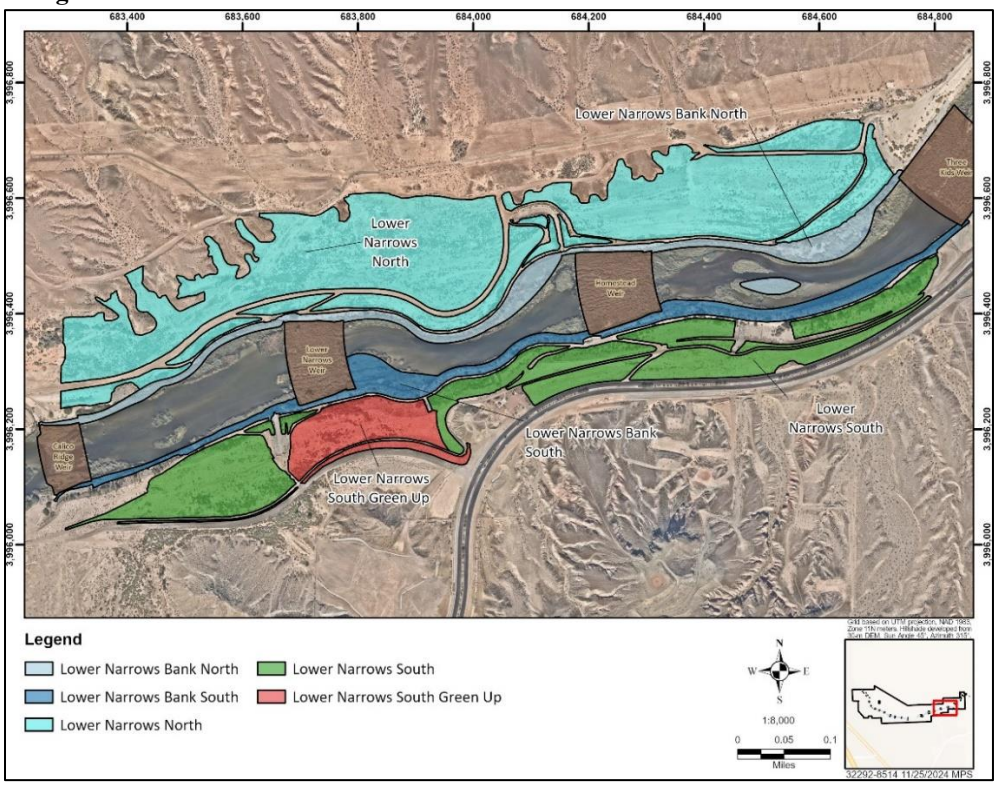

Figure 32. Aerial photograph of the new Lower Narrows and Homestead weirs revegetation site boundaries.

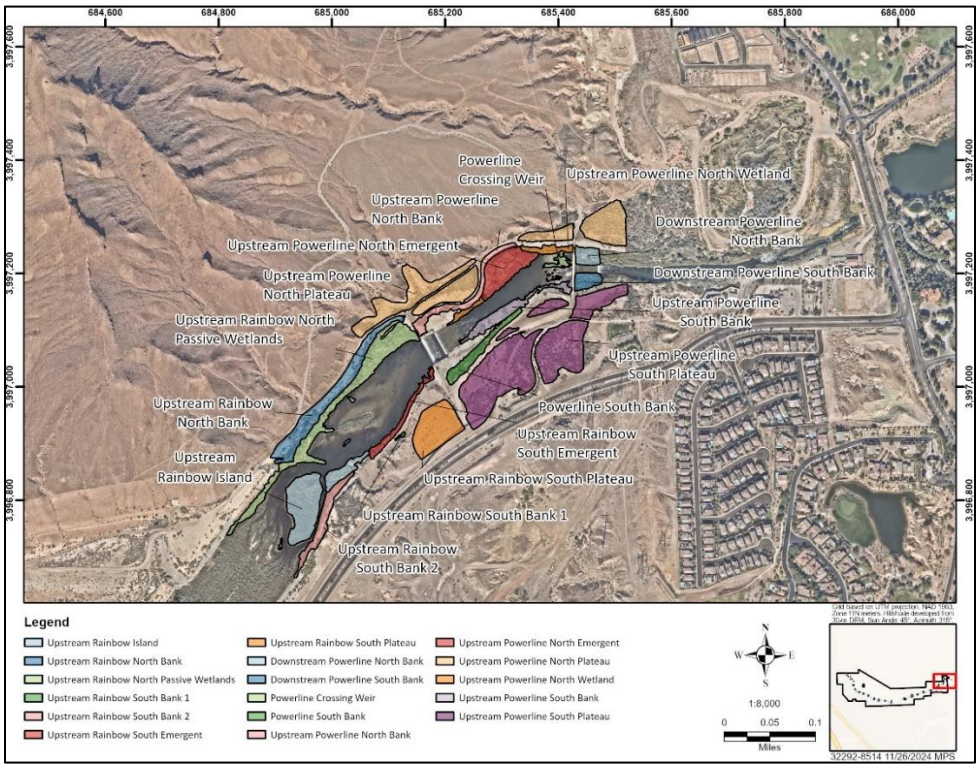

Figure 33. Aerial imagery of the previous Rainbow Gardens and Powerline Crossing weirs revegetation site boundaries.

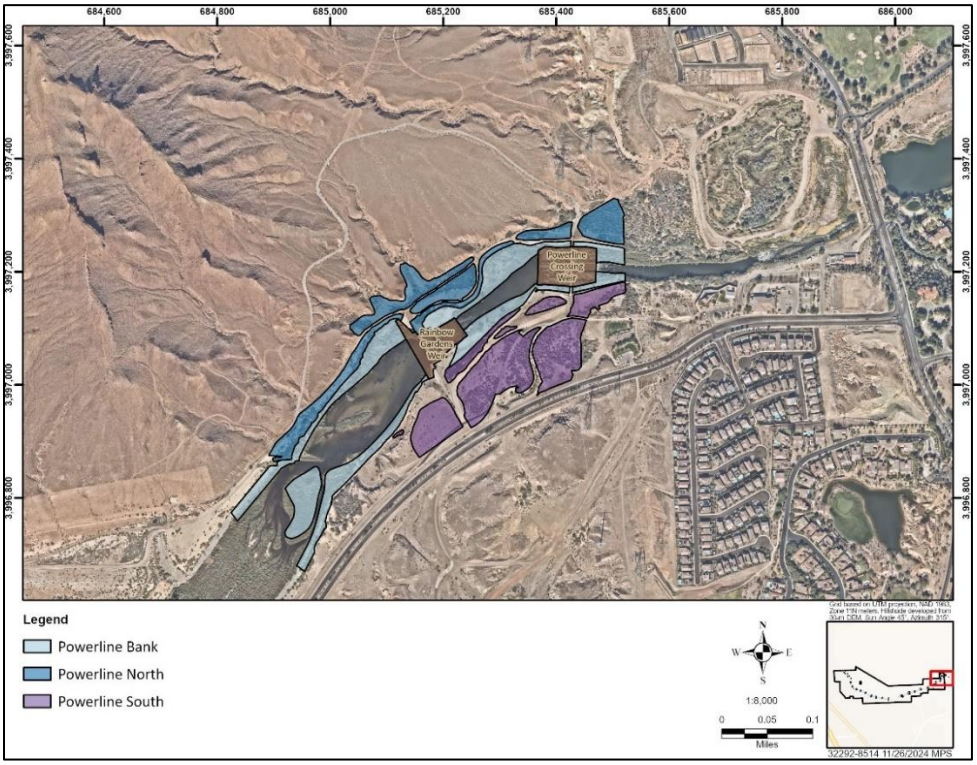

Figure 34. Aerial imagery of the new Rainbow Gardens and Powerline Crossing weirs revegetation site boundaries.

2.2 Weir and Drop Structure Monitoring

In past surveys, all weirs except Bostick Weir were surveyed annually for total cover using ArcGIS due to the lack of accessibility and safety concerns. When determining total cover, each weir's polygon was modified to include only vegetation within the area, resulting in the highest total cover class (75–100%) every year. Moving forward, permanent polygons for each weir including the apron, crest and chute will be used to determine total cover. These polygons were created using the IVMP (WSP 2019; Figure 35). Under the revised monitoring protocol, these sites will no longer vary year to year, and the total vegetative cover of each site, including Bostick Weir, will be calculated annually. More information regarding the process of obtaining total vegetative cover can be found in Section 2.3. Total cover on drop structures has not been documented previously in vegetation monitoring reports but will now be included and updated annually. Drop structures differ from weirs slightly and tend to only be a concern when access to the peninsula is needed to work on the Monson and Visitor Center weirs.

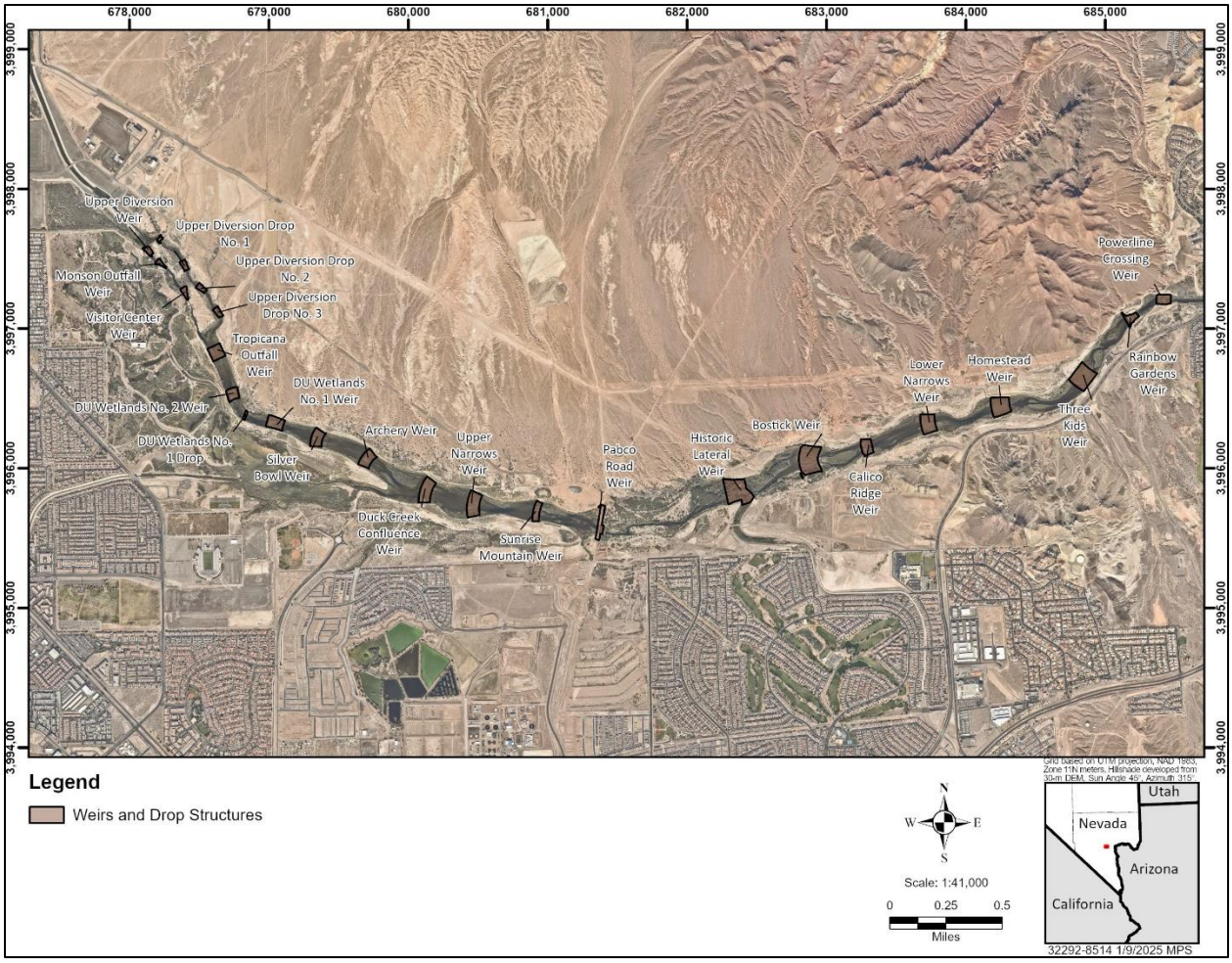

Figure 35. Map of weir and drop structure polygons.

In addition to obtaining annual total vegetative cover using ArcGIS for all weir and drop structure polygons, every third year beginning in the fall of 2026, a visual survey of the weirs will be conducted. This survey will be used to determine the total woody vegetative cover on each weir.

As described in Eckberg (2019c), two species are of most concern on the weirs: Fremont's cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*). Where possible, crews can be used to manually remove individuals of these species. However, if hand crews cannot reach the trees, or if the trees grow larger than hand tools can remove, large equipment will be needed from specialized contractors and agencies. Removal by hand crews is the preferred method. The large equipment method results in greater disturbance, is more expensive and typically results in weir repairs being needed, further increasing costs.

2.3 Creating a Vegetative Cover Map

Using high-resolution (resolution = 3 inches per pixel) aerial imagery and Light Detection and Ranging (LiDAR; resolution = 1 foot per pixel) data (Singleton 2024), a vegetative cover map of the Wash was created. Aerial imagery is acquired on a biennial basis between May and June and LiDAR data is acquired on an as-needed basis both during leaf-on conditions. Upon receiving the aerial imagery and LiDAR data, the LiDAR point cloud data was processed into a canopy height model and then joined with the aerial imagery. A supervised classification was subsequently performed to map trees, shrubs and grasses along the Wash. The results are polygons representing each tree, shrub and grass (Figure 36). Finally, area calculations were performed in ArcGIS Pro based on the fraction of vegetative cover per total site area. Utilizing this method will save time since analysis can now be calculated collectively for all sites as opposed to individually per site.

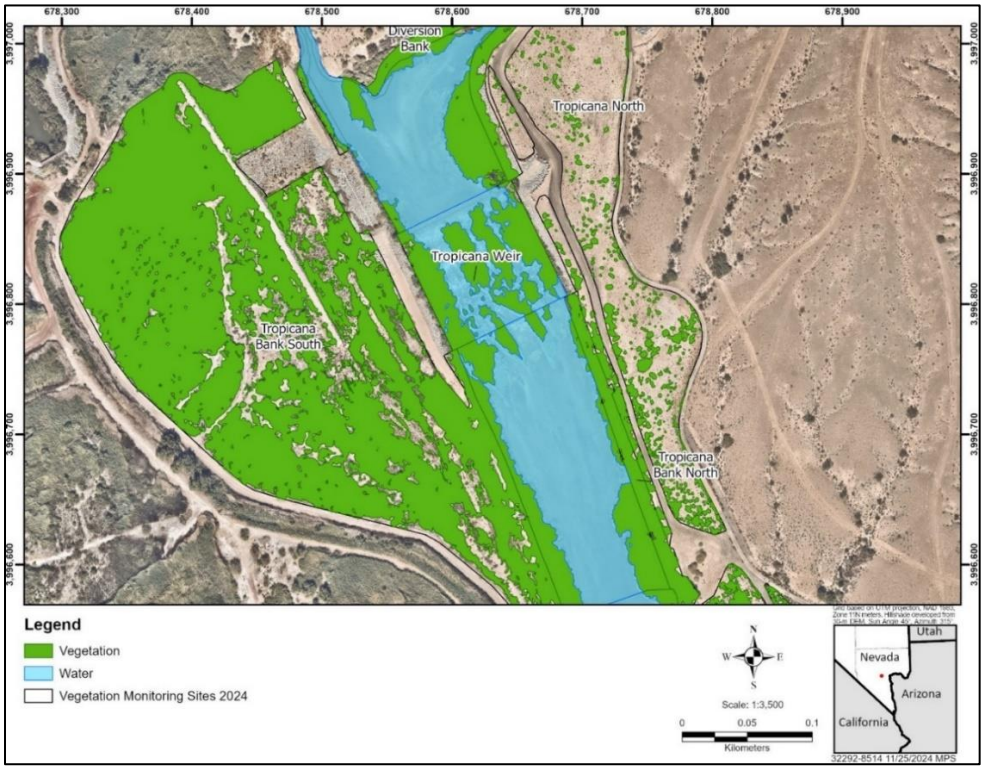

Figure 36. An example of what the total vegetative cover results looks like using aerial imagery and Light Detection and Ranging (LiDAR) data at the Tropicana Weir revegetation sites.

Clark County Water Reclamation District (CCWRD) and Upper Narrows South Fill (UNSF) are the only two non-wetland sites that are no longer field monitored. This will continue moving

forward but could change if access improves to CCWRD and/or additional planting efforts occur at DCUNSF. Using the same technique described above, the total vegetative cover of these sites will be documented annually.

Permanent polygons for the waterway within the Wash channel were created following the IVMP (WSP 2019; Figure 37). These polygons include the wetland sites that were not designated in the IVMP as vegetation to remain, which includes parts of bank and emergent revegetation sites. Each year, a vegetative cover map will be used to calculate the total percentage of vegetation within these polygons.

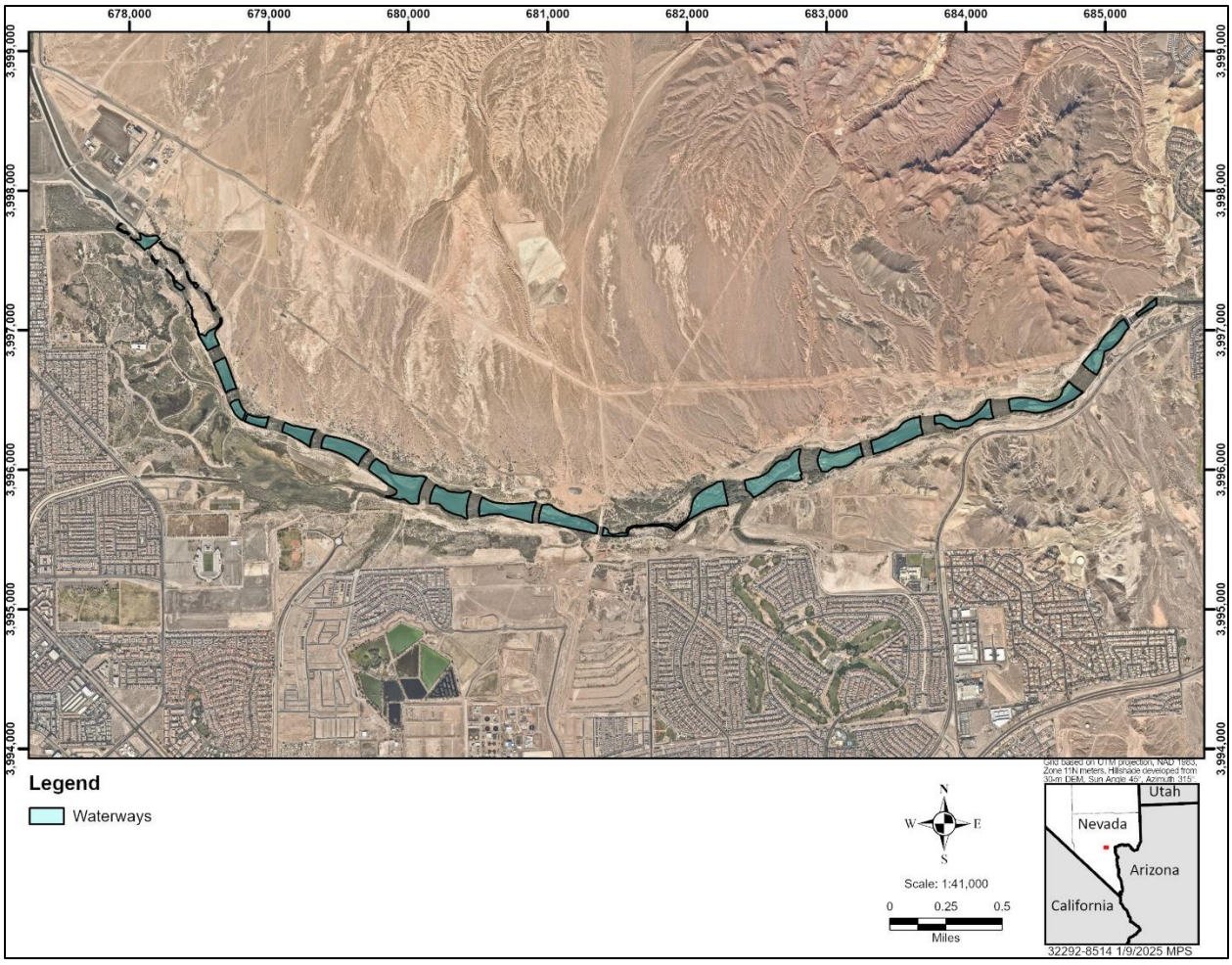

Figure 37. Aerial photograph of waterway polygons.

2.4 Timed Meander Surveys

The timed meander survey (TMS) method described here is designed to provide a qualitative assessment of plant community conditions. Many studies have used some version of this method successfully (Minnesota Pollution Control Agency 2014; Galatowitsch and Bohnen 2016). A TMS consists of meandering around a site and recording all species that are present. Each survey begins with a base time of 20 minutes; once the base time elapses, if there are less than three new species identified within the final 10 minutes, then the survey concludes. If there are three or more new species identified, then an additional 5 minutes will be added. Five-minute increments are added until less than three species are recorded within a time increment. Sites that are larger than 25 acres will have a second TMS completed; all other sites will have one. Each survey will record if any, and how many, additional 5-minute increments were added. The meander can stop before the base time expires if the entire site has been adequately surveyed in less than the allotted time. The timer will be paused when necessary to identify species or when moving from one area to the next within a site. Upon completion of the meander, the areal cover is estimated by cover class for all species and total site cover is recorded. Slight modifications have been made to the cover class ranges used previously to help better identify those sites with complete or almost complete total vegetative cover (Table 1).

Previous Iterations			Current Iteration		
Cover Class	Cover Class Range	Midpoint	Cover Class	Cover Class Range	Midpoint
5	75–100%	87.5%	7	95–100%	97.5%
4	50–75%	62.5%	6	75–95%	85
3	25–50%	37.5%	5	50–75%	62.5%
2	5–25%	15%	4	25–50%	37.5%
1	1-5%	3%	3	5–25%	15%
T	T	0.5%	2	1–5%	3%
R	R	0.1%	1	0–1%	0.5%

Table 1. Cover classes, cover class ranges and midpoint percentages used to determine cover for all species identified within each site for previous and current vegetation monitoring methods.

The data that is collected during each TMS is stored on the Survey123 app. This app also has GPS capabilities that can track the route taken for each TMS. For this to occur, at the start of each survey, the tracking toggle needs to be switched on. The survey is then conducted and upon completion, the toggle will then be switched off. From this, a map of each survey route is created.

2.5 Wetland and Non-Wetland Site Updates

All sites along the Wash have a wetland status of either wetland or non-wetland that was the result of a jurisdictional determination conducted according to the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987). Each year, the WPI is calculated for each site which helps determine if the current wetland designation is accurate. The WPI is a weighted-average wetland indicator status of all, or nearly all, species at each site. The WPI has a range of 1–5: all sites that score ≤3.0 are considered wetland and sites that score 3.1–5 are considered non-wetland. Although the WPI is calculated each field survey year, wetland statuses have not been re-evaluated since designation. Much has changed over the years, and some sites no longer have appropriate designations. Therefore, all sites that were monitored in the field during the 2024 season have their WPI and current wetland status documented in the Results and Discussion section below.

2.6 Criteria to Qualify for Enhancement or Invasive and Other Undesirable Species Removal

Following field monitoring surveys each year, sites that meet the requirements will be placed into one of three categories:

1. Candidate for enhancement – Site(s) with fewer than six species and/or less than 30% total vegetative cover.
2. Possible candidate for enhancement – Site(s) with 30–50% total vegetative cover.
3. Candidate for invasive and other undesirable species removal – Site(s) with greater than 5% noxious species cover.

Sites that are within their first five growing seasons are exempt from this designation process because the plants are in the process of becoming established and continuing to grow each year.

3.0 RESULTS AND DISCUSSION

Monitoring was conducted in September and October 2024 following the new TMS protocol. All upland and riparian sites located on the north side of the Wash and those grant-funded sites with five or less growing seasons were surveyed (Table 2). In total, 206.53 acres across 17 sites were monitored in the field. Lower Narrows North (LNN) was the only site that required a second TMS.

The route taken for all TMS was created through the tracking capabilities of the app. However, prior to exportation of these maps they were deleted based on the retention policies of ESRI's ArcGIS Online. Although no maps are available for this report, all surveys went in an upstream to downstream direction, and therefore, the next round of surveys for these sites should go from a downstream to upstream direction.

Site Name	Acreage	Number of Meanders
Upper Diversion North	10.15	1
Tropicana North	7.13	1
DU Wetlands North	4.97	1
Archery and Silver Bowl North	8.16	1
Upper Narrows North	16.15	1
Sunrise Mountain North	9.12	1
Site 111	17.28	1
Cottonwood Cell – Wetland	2.55	1
Cottonwood Cell – Non-Wetland	5.59	1
Historic Lateral Expansion North	9.59	1
Bostick North	4.23	1
Lower Narrows North	50.77	2
Powerline North	6.13	1
Grant-funded Sites		
Sunrise Mountain South – 1	9.12	1
Sunrise Mountain South – 2	10.21	1
Powerline South	8.22	1
Lower Narrows Homestead South – 2	5.81	1
Total	**206.53**	**18**

Table 2. Sites that were monitored in the field during the 2024 survey season including their total acreage and the number of meander surveys completed.

Cumulatively, 297.36 acres of wetlands have been created which far exceeds the 53.07 acres required by mitigation permits (Table 3). Included in the 297.36 acres is 3.17 acres associated with the Cottonwood Cells, which were fully funded by grants from the BOR, and 5.99 acres created at CCWRD, which had its permit held by the property owners. Since site boundaries have recently changed, the wetland area created is now given as a cumulative amount for the entire Wash (Table 3).

Mitigation Project	Mitigation Permit Number	Mitigation Required
Archery and Silver Bowl Weirs	SPK-2011-00796-SG	0[a]
Bostick Weir	200125114	7.88
Calico Ridge Weir	200450004	3.80
Clark County Water Reclamation District	SPK-2009-00227-SG	6.79
Cottonwood Cells	N/A	—
Demonstration Weir	199825148	0.90
Duck Creek Confluence and Upper Narrows Weirs	SPK-2009-00042	1.33
DU Wetlands No. 1 Weir	SPK-2010-00285-SG	1.22
DU Wetlands No. 2 Weir	2007-1961-SG	0.05
Historic Lateral Weir	199825148	4.90
Historic Lateral Expansion	SPK-2014-01108	0[a]
Lower Narrows and Homestead Weirs	SPK-2008-01417-SG	6.25
Monson and Visitor Center Weirs	200250111	4.81
Pabco Road Weir	199725375	2.20
Powerline Crossing Weir	200450454	4.87
Rainbow Gardens Weir	200250054	1.00
Sunrise Mountain Weir	SPK-2014-01108	0[a]
Three Kids Weir	SPK-2012-01138-SG	0[a]
Tropicana Weir	SPK-2016-00293	0[a]
Upper Diversion Weir	200550514	0.01
Bank Protection Projects	—	7.06
TOTAL		**53.07**
Total Wetland Area Created		**279.36**

[a]Permits authorized under Nationwide Permit Number #27 after 2012 have no mitigation requirements.

Table 3. Mitigation requirements and wetland areas established as of October 2024.

3.1 Clark County Water Reclamation District

In 2020, it was determined that it was too difficult to access interior areas of the site, and therefore, total cover using ArcGIS was the only survey method to be utilized moving forward. Although vegetation is visible along the perimeter, that vegetation is not an accurate representation of the entire site. Using aerial imagery and LiDAR data, the vegetative cover for CCWRD was calculated at 85.10% in 2024 (Table 4).

If funding becomes available, removing weeds such as salt cedar, which has reestablished on the site, as well as larger undesirable species such as quailbush, would be a priority. Removing these plants should allow for better access to the interior of the site. The wetland status of the site was previously documented as both wetland and non-wetland. Until field monitoring is possible, the wetland status of this site will not change.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
CCWRD	29.62	Both	nm	nm	nm	nm	85.10	–

[1]CCWRD=Clark County Water Reclamation District
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 4. Vegetation monitoring results for the Clark County Water Reclamation District revegetation site in 2024.

3.2 Upper Diversion Weir

This section includes all revegetation sites near the Upper Diversion Weir. Downstream Upper Diversion North-1, Downstream Upper Diversion North-2 and Downstream Upper Diversion North-3 were merged to create Upper Diversion North (UDN, Figure 6). UDN was the only site surveyed in the field in 2024 (Table 5). In previous reports, the three original monitoring areas' data were combined, making it possible to compare results from previous field survey seasons. UDN increased in total cover from 49.2% to 62.5%. The site lacks diversity with only 6 species identified in 2024 but does not qualify as a candidate for enhancement under the RMP.

Over the past 10 years, UDN has had a WPI of 4.74 or higher and results from this year show a WPI of 4.84. Since the WPI is greater than 3.0, the site's wetland status remains non-wetland. The total vegetative cover for all sites not monitored in the field was calculated using high-resolution aerial imagery and LiDAR data. All sites in Table 5 that do not list a field survey year are sites not previously included in the vegetation monitoring program. These sites will receive a vegetative cover percentage annually but will not be surveyed in the field (Table 5).

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
UDN	10.15	NW	50–75%	3.0%	6	4.84	nm	2024
UDB	10.07	nm	nm	nm	nm	nm	74.75%	2026
UDI-1	2.49	nm	nm	nm	nm	nm	52.11%	2025
UDI-2	6.18	nm	nm	nm	nm	nm	79.32%	2025
UDS	2.90	nm	nm	nm	nm	nm	69.29%	2025
UDW	0.98	nm	nm	nm	nm	nm	37.33%	2026
MW	0.55	nm	nm	nm	nm	nm	35%	-
VCW	0.69	nm	nm	nm	nm	nm	28.68%	-
UDD-1	0.23	nm	nm	nm	nm	nm	39.74%	-
UDD-2	0.24	nm	nm	nm	nm	nm	52.70%	-
UDD-3	0.09	nm	nm	nm	nm	nm	60.66%	-

[1]UDN= Upper Diversion North, UDB= Upper Diversion Bank, UDI-1= Upper Diversion Island-1, UDI-2= Upper Diversion Island-2, UDS= Upper Diversion South, UDW= Upper Diversion Weir, MW=Monson Weir, VCW=Visitor Center Weir, UDD-1=Upper Diversion Drop No. 1, UDD-2=Upper Diversion Drop No. 2 and UDD-3=Upper Diversion Drop No. 3
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 5. Vegetation monitoring results for Upper Diversion Weir revegetation sites in 2024.

3.3 Tropicana Weir

There are four sites associated with Tropicana Weir: Tropicana North (TN), Tropicana Bank North, Tropicana Bank South (TBS) and Tropicana Weir (Figure 8). TBS was created by combining Tropicana West 1, Tropicana West 2, Tropicana Weir Emergent West, DU Wetlands No. 1 Emergent – South and part of DU Wetlands No. 2 Emergent – South. Previously known as Tropicana East, TN was renamed to align with the new naming structure. Although the site's name has changed, its boundaries have not. TN was the only site monitored in the field in 2024 (Table 6). This site had a good variety of species, with 17 documented during surveys and a total cover class range of 50–75%. The site also showed very low noxious species cover at 0.5%. The calculated WPI for this site was greater than 3.0, keeping its designation as a non-wetland. Total vegetative cover for the other sites was calculated using high-resolution aerial imagery and LiDAR data. All three sites had a vegetative cover greater than 50% (Table 6).

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]

TN	7.13	NW	50–75%	0.5%	17	3.82	nm	2024
TBN	2.40	nm	nm	nm	nm	nm	83.88%	2026
TBS	19.23	nm	nm	nm	nm	nm	77.11%	2026
TW	2.38	nm	nm	nm	nm	nm	58.24%	2026

[1]TN=Tropicana North, TBN=Tropicana Bank North, TBS=Tropicana Bank South and TW=Tropicana Weir
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 6. Vegetation monitoring results for Tropicana Weir revegetation sites in 2024.

3.4 DU Weirs

DU Wetlands No. 1 Tamarisk, DU Wetlands No. 2 North and part of Archery and Silver Bowl North (ASBN) were combined to create DU North (DUN, Figure 10). DUN was the only site monitored in the field in 2024 (Table 7). It had a total cover class range of 50–75% and 13 species were identified. The calculated WPI was 3.59 which classifies the site as a non-wetland. Combining DU Wetlands No. 2 South and DU Wetlands No. 1 South created DU South (DUS). DUS is scheduled to be monitored in the field in the fall of 2025, with the remaining sites being monitored in the field in 2026. Using aerial imagery and LiDAR data, these sites' vegetative cover ranged from 34.12% to 61.07% (Table 7).

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
DUN	4.97	NW	50–75%	3.0%	13	3.59	nm	2024
DUS	10.13	nm	nm	nm	nm	nm	61.07%	2025
DUW-2	1.66	nm	nm	nm	nm	nm	37.14%	2026
DUD-1	0.27	nm	nm	nm	nm	nm	34.12%	2026
DUW-1	2.43	nm	nm	nm	nm	nm	52.84%	2026

[1]DUN=DU North, DUS=DU South, DUW-2=DU Wetlands No. 2 Weir, DUD-1=DU Wetlands No. 1 Drop and DUW-1=DU Wetlands No. 1 Weir
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 7. Vegetation monitoring results for DU Weirs revegetation sites in 2024.

3.5 Archery and Silver Bowl Weirs

Combining the remaining part of the original ASBN site with Archery and Silver Bowl Upper Bank created the new ASBN (Figure 12). The resulting 8.16-acre site had a 3.56 WPI calculated from the 19 species identified during field monitoring, making the site a non-wetland (Table 8, Figure 38). There was tamarisk on the site, which had 3% noxious species cover. The remaining

five sites' vegetative cover was calculated using aerial imagery and LiDAR data, and all will be monitored in the field in 2025 or 2026 (Table 8).

Figure 38. A photo of the vegetative landscape at Archery and Silver Bowl North.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
ASBN	8.16	NW	50–75%	3.0%	19	3.56	nm	2024
ASBBN	3.48	nm	nm	nm	nm	nm	91.85%	2026
ASBS	21.75	nm	nm	nm	nm	nm	61.07%	2025
ASBBS	1.35	nm	nm	nm	nm	nm	10.63%	2026
SBW	2.44	nm	nm	nm	nm	nm	76.93%	2026
AW	2.44	nm	nm	nm	nm	nm	60.47%	2026

[1]Archery and Silver Bowl North=ASBN, Archery and Silver Bowl Bank North=ASBBN, Archery and Silver Bowl South=ASBS, Archery and Silver Bowl Bank South=ASBBS, Silver Bowl Weir=SBW and Archery Weir=AW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 8. Vegetation monitoring results for Archery and Silver Bowl weirs revegetation sites in 2024.

3.6 Duck Creek Confluence and Upper Narrows Weirs

By combining Duck Creek Upper Narrows North with Duck Creek Upper Narrows North Riparian, a 16.15-acre site known as Upper Narrows North (UNN) was created (Figure 14). UNN's calculated WPI was 3.77, with a cover class range of 50–75% (Table 9). More than half of this site is comprised of two species; quailbush and desert saltbush (*Atriplex polycarpa*). Both Upper Narrows North Stockpile (UNNS) and Upper Narrows South Fill (UNSF) will not be monitored

in the field unless additional planting efforts occur within these sites. Both sites had less than 10% total vegetative cover and are great candidates for enhancement under the RMP.

Site Code [1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
UNN	16.15	NW	50–75%	3.0%	12	3.77	nm	2024
UNNS	1.31	nm	nm	nm	nm	nm	2.21%	-
UNBN	3.06	nm	nm	nm	nm	nm	92.20%	2026
UNS	33.99	nm	nm	nm	nm	nm	60.14%	2025
UNSF	11.53	nm	nm	nm	nm	nm	9.20%	-
UNBS	6.79	nm	nm	nm	nm	nm	77.99%	2026
DCCW	3.57	nm	nm	nm	nm	nm	93.09%	2026
UNW	3.79	nm	nm	nm	nm	nm	87.51%	2026

[1]Upper Narrows North=UNN, Upper Narrows North Stockpile=UNNS, Upper Narrows Bank North=UNBN, Upper Narrows South=UNS, Upper Narrows South Fill=UNSF, Upper Narrows Bank South=UNBS, Duck Creek Confluence Weir=DCCW and Upper Narrows Weir=UNW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 9. Vegetation monitoring results for Duck Creek Confluence and Upper Narrows weirs revegetation sites in 2024.

3.7 Site 108

Site 108 was planted in phases in the spring and fall of 2006 with grant funding from NDEP, Nevada Division of State Parks and Southern Nevada Public Land Management Act Rounds IV and V. Previously broken up into 59 monitoring areas, Site 108 is now separated by funding source into four sites (Figure 16). Total vegetative cover for the sites was calculated using aerial imagery and LiDAR data in 2024 (Table 10). All sites are scheduled to be monitored in the field in the fall of 2025.

Site Code [1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
NDSP	13.65	nm	nm	nm	nm	nm	81.68%	2025
NDEP	5.87	nm	nm	nm	nm	nm	72.55%	2025
SNPLMA V	11.92	nm	nm	nm	nm	nm	73.69%	2025
SNPLMA IV	7.60	nm	nm	nm	nm	nm	85.05%	2025
Total	39.04	nm	nm	nm	nm	nm	-	-

[1]Nevada Division of State Parks=NDSP, Nevada Division of Environmental Protection=NDEP, Southern Nevada Public Land Management Act V=SNPLMA V and Southern Nevada Public Land Management Act IV=SNPLMA IV
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 10. Vegetation monitoring results for Site 108 revegetation sites in 2024.

3.8 Sunrise Mountain Weir

Three of the four sites near Sunrise Mountain Weir were monitored in the field in 2024 (Table 11). Sunrise Mountain North (SMN), Sunrise Mountain South-1 (SMS-1) and Sunrise Mountain South-2 (SMS-2) were all grant funded and within their first five growing seasons, and therefore field monitoring was required (Figure 18). SMS-1 will complete its fifth monitoring season in 2025, while SMN and SMS-2 will complete theirs in 2026. After completion of the fifth season, these sites will be field monitored every third year like other sites. All three sites had a low cover class range of 50% or less. These sites are relatively young, so total cover may increase over the next few years. If total cover remains low, then these sites would be good candidates for enhancement under the RMP. The wetland designation status for both SMN and SMS-1 remains non-wetland since both sites received a WPI of greater than 3.0. However, SMS-2 had a previous wetland status of non-wetland, but results from this survey show a WPI of 2.89, making it a wetland.

Figure 39. Some of the vegetative species found at Sunrise Mountain South-2.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
SMN	9.12	NW	25–50%	3.0%	21	3.13	nm	2024, 2025, 2026
SMS-1	9.12	NW	5–25%	0.5%	20	3.12	nm	2024, 2025
SMS-2	10.21	W	25–50%	0.5%	25	2.88	nm	2024, 2025, 2026
SMW	1.65	nm	nm	nm	nm	nm	49.86%	2026

[1]Sunrise Mountain North=SMN, Sunrise Mountain South-1=SMS=1, Sunrise Mountain South-2=SMS-2 and Sunrise Mountain Weir=SMW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 11. Vegetation monitoring results for Sunrise Mountain Weir revegetation sites in 2024.

3.9 Pabco Road Weir

No sites at Pabco Road Weir were monitored in the field in 2024. Pabco South will be monitored in the field in 2025, while Pabco North Bank (PNB), Pabco South Bank (PSB) and Pabco Road Weir (PRW) will all be monitored in the field in 2026. The vegetative cover using aerial imagery and LiDAR data ranged from 13.13% for PRW to 68.30% for PNB (Table 12).

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
PNB	27.66	nm	nm	nm	nm	nm	68.30%	2026
PS	12.52	nm	nm	nm	nm	nm	43.99%	2025
PSB	16.98	nm	nm	nm	nm	nm	55.23%	2026
PRW	2.02	nm	nm	nm	nm	nm	13.13%	2026

[1]Pabco North Bank=PNB, Pabco South=PS, Pabco South Bank=PSB and Pabco Road Weir=PRW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 12. Vegetation monitoring results for Pabco Road Weir revegetation sites in 2024.

3.10 Site 111

This site previously had 26 monitoring areas. Beginning in 2024, these monitoring areas were removed and the site is now monitored as a single site (Figure 22). Additionally, the northern sections of Downstream Pabco North-1, Downstream Pabco North-2 and Downstream Pabco North-3 were added to this site making the total acreage 17.28. This was done because a road ran through these sites, but now this road will be used as the southern boundary for Site 111. This site does not experience much change year to year and had a total cover class range of 75–95%, only 0.5% of which was identified as noxious species (Table 13). With a calculated WPI of 3.87, this site's wetland designation remains non-wetland.

Site Code	Acreage	Wetland Status[1]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[2]	Vegetative Cover[3]	Field Survey Year[4]
Site 111	17.28	NW	75–95%	0.5%	16	3.87	nm	2024

[1]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[2]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[3]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[4]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 13. Vegetation monitoring results for the Site 111 revegetation site in 2024.

3.11 Historic Lateral Weir

Historic Lateral South (HLS) is a 15.10-acre site combining Upstream Historic Lateral South Upper Plateau, Upstream Historic Lateral South Upper Plateau 2-1, Upstream Historic Lateral South Upper Plateau 2-2, Upstream Historic Lateral South Upper Plateau 2-3 and Historic Lateral Expansion South 4 (Figure 24). This site is scheduled to be monitored in the field in 2025. Using aerial imagery and LiDAR data, the vegetative covers for HLS and Historic Lateral Weir were 32.21% and 71.59%, respectively (Table 14). The percentage for HLS is low and if field monitoring in the fall of 2025 results in a similar cover, then this site should be considered a good candidate for enhancement under RMP.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
HLS	15.10	nm	nm	nm	nm	nm	32.21%	2025
HLW	6.83	nm	nm	nm	nm	nm	71.59%	2026

[1]Historic Lateral South=HLS and Historic Lateral Weir=HLW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using erial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 14. Vegetation monitoring results for Historic Lateral Weir revegetation sites in 2024.

3.12 Historic Lateral Weir Expansion

Sites previously known as Historic Lateral Expansion South 2, Historic Lateral Expansion South 3 and Historic Lateral Expansion South – Trench are now a part of PSB (Section 3.9), and Historic Lateral Expansion South 1 was combined with Bostick South (BS; Section 3.14), leaving only the Historic Lateral Expansion North (HLEN) sites and Historic Lateral Expansion South 5 (HLES-5) site in this group (Figure 26). The four monitoring areas that previously made up HLEN were combined, creating a single 9.59-acre site. This site was planted in the fall of 2019 with funding from NDEP, and 2024 marks its fifth consecutive field monitoring season. Moving forward, the site will be monitored every third year. Monitoring results for this year show that the cover class range was 25–50% with 18 species identified (Table 15). Receiving a WPI of 3.19, this site's wetland designation remains non-wetland. If the cover range does not improve, then this site should be considered for enhancement under the RMP. HLES-5 became HLES, a 1.57-acre site that has not yet been planted and received a 2.25% vegetative cover in 2024 which qualifies it for enhancement under the RMP. This site has not been, and will not be, monitored in the field until after planting occurs.

Figure 40. Rush Milkweed found at Historic Lateral Expansion North.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
HLEN	9.59	NW	25–50%	0.5%	18	3.19	nm	2024
HLES	1.57	nm	nm	nm	nm	nm	2.25%	-

[1]Historic Lateral Expansion North=HLEN and Historical Lateral Expansion South=HLES
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 15. Vegetation monitoring results for Historic Lateral Weir Expansion revegetation sites in 2024.

3.13 Cottonwood Cells

Previously nine different sites, the revegetation sites within and surrounding the Cottonwood Cells were merged into just two sites (Figure 28). Cottonwood Cell – 1, Cottonwood Cell – 2, and Cottonwood Cell – 3 were merged to create Cottonwood Cell Wetland (CCW). Cottonwood Cell North – 1, Cottonwood Cell North – 2, Cottonwood Cell North – 3, Cottonwood Cell North Stockpile and Cottonwood Cell 3-2 were merged to create Cottonwood Cell Non-Wetland (CCNW; Figure 39). The final site, Cottonwood Cell 3-Bank is now a part of the waterway polygon. Both CCW and CCNW were monitored in the field in 2024. CCNW is a 5.59-acre site

that had a total cover class range of 25–50% and WPI of 4.08. CCW is a 2.55-acre site that had a cover class range of 50–75% and WPI of 2.24 (Table 16). Due to its low total cover, CCNW is a possible candidate for enhancement under the RMP.

Figure 41. Landscape view of the plant species found at Cottonwood Cell Non-Wetland.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
CCNW	5.59	NW	25–50%	3.0%	15	4.08	nm	2024
CCW	2.55	W	50–75%	3.5%	19	2.24	nm	2024

[1]Cottonwood Cell Non-Wetland=CCNW and Cottonwood Cell Wetland=CCW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 16. Vegetation monitoring results for Cottonwood Cells revegetation sites in 2024.

3.14 Bostick and Calico Ridge Weirs

Site boundaries near the Bostick and Calico Ridge weirs were modified, and there are now seven sites associated with these locations (Figure 30). Bostick North (BN) was the only site monitored in the field in 2024. This site was created by combining Upstream Bostick North, the original BN site, Downstream Bostick North, Upstream Calico North-Non-Wetland and Downstream Calico North. BN had a cover class range of 25–50% on its 4.23 acres (Table 17). Due to its low cover range, this site is a good candidate for enhancement under the RMP. BN received a WPI of 4.18, making it a non-wetland. BS is scheduled to be monitored in the field in 2025, while the remaining

sites will be monitored in 2026. Bostick Kiosk will continue to only be monitored for vegetative cover using aerial imagery and LiDAR data.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
BN	4.23	NW	25–50%	0.5%	14	4.18	nm	2024
BBN	10.67	nm	nm	nm	nm	nm	91.65%	2026
BS	30.65	nm	nm	nm	nm	nm	24.24%	2025
BBS	4.47	nm	nm	nm	nm	nm	75.71%	2026
BK	0.57	nm	nm	nm	nm	nm	77.30%	-
BW	6.77	nm	nm	nm	nm	nm	69.78%	2026
CRW	2.07	nm	nm	nm	nm	nm	40.33%	2026

[1]Bostick North=BN, Bostick Bank North=BBN, Bostick South=BS, Bostick Bank South=BBS, Bostick Kiosk=BK, Bostick Weir=BW and Calico Ridge Weir=CRW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed
Table 17. Vegetation monitoring results for Bostick and Calico Ridge Weirs revegetation sites in 2024.

3.15 Lower Narrows and Homestead Weirs

LNN was created by combining Lower Narrows Homestead North with Lower Narrows Homestead North 2, creating a 50.77-acre site (Figure 32). The site was field monitored in 2024 and, due to its large size, required a second TMS. The cover range of 25–50% was calculated by taking the weighted average of both surveys (Table 18). Overall vegetative cover improved moving downstream, with values increasing from 5–25% during the first survey to 50–75% during the second. Since the average total vegetative cover is 25–50%, this site is a possible candidate for enhancement following the RMP. Ten species were identified. LNN has a wetland designation of non-wetland since it received a WPI of 3.87.

Planted in the spring of 2024, the Lower Narrows South Green Up (LNSGU) site was monitored in the field in 2024 for its first of five consecutive field monitoring seasons (Table 18). This site was chosen as a Green-Up site because it lacked diversity and was a good candidate for enhancement under the RMP. All but 1.71 acres of this site were revegetated during the Green-Up (Figure 40). Results from field monitoring showed that this site now has good species diversity with 25 species identified. Although the cover range for this site is low (25–50%), it is expected to increase as the plants grow and become established. The WPI for LNSGU is 2.32, making it a wetland.

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
LNN	50.77	NW	25–50%	0.5%	10	3.87	nm	2024
LNBN	8.20	nm	nm	nm	nm	nm	82.62%	2026
LNS	21.35	nm	nm	nm	nm	nm	19.89%	2025
LNBS	8.19	nm	nm	nm	nm	nm	70.53%	2026
LNSGU	5.81	W	25–50%	0.5%	25	2.32	nm	2024, 2025, 2026
LNW	3.38	nm	nm	nm	nm	nm	80.26%	2026
HW	4.11	nm	nm	nm	nm	nm	76.78%	2026
TKW	5.39	nm	nm	nm	nm	nm	54.26%	2026

[1]Lower Narrows North=LNN, Lower Narrows Bank North=LNBN, Lower Narrows South=LNS, Lower Narrows Bank South=LNBS, Lower Narrows South Green-Up=LNSGU, Lower Narrows Weir=LNW, Homestead Weir=HW and Three Kids Weir=TKW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 18. Vegetation monitoring results for Lower Narrows and Homestead weirs revegetation sites in 2024.

Figure 42. The spring 2024 Green-Up site filled with new plants and irrigation for watering.

3.16 Rainbow Gardens and Powerline Crossing Weirs

Powerline North (PLN) was created by merging Upstream Rainbow North Bank, Upstream Powerline North Plateau and Upstream Powerline North Bank. This site was monitored in the field along with Powerline South (PLS) in 2024 (Figure 34). PLS includes what was previously known

as Upstream Rainbow South Plateau, and it was the first site planted for enhancement under the RMP, during the spring 2023 Green-Up. One of the species planted during this event was alkali sacaton (*Sporobolus airoides)*. Data suggests that this species does not do well when planted in upland areas and only a few green leaves remain on each plant (Figure 41). Both PLN and PLS had a cover class range of 25–50% and a WPI greater than 3.0 (Table 19). Vegetative cover at PLS should continue to increase as the Green-Up plants grow, and PLN is a good candidate for enhancement under the RMP. The latter site not only had a low cover class range but was dominated by just two species: desert saltbush and bush seepweed (*Suaeda nigra*).

Site Code[1]	Acreage	Wetland Status[2]	Cover Class Range	Noxious Species Cover	Number of Species	WPI[3]	Vegetative Cover[4]	Field Survey Year[5]
PLN	6.13	NW	25–50%	0.5%	14	3.30	nm	2024
PLS	8.22	NW	25–50%	0%	13	3.56	nm	2024, 2025, 2026
PLB	8.91	nm	nm	nm	nm	nm	67.55%	2026
RGW	1.39	nm	nm	nm	nm	nm	13.78%	2026
PLCW	1.70	nm	nm	nm	nm	nm	46.13%	2026

[1]Powerline North=PLN, Powerline South=PLS, Powerline Bank=PLB, Rainbow Gardens Weir=RGW and Powerline Crossing Weir=PLCW
[2]Wetland status determined by the Wetland Prevalence Index value: W=wetland and NW=non-wetland
[3]Wetland Prevalence Index (WPI) value: WPI≤3.0=wetland and WPI≥3.1=non-wetland
[4]Vegetative cover calculated using aerial imagery and Light Detection and Ranging (LiDAR) data
nm=this attribute was not monitored
[5]Field Survey Year: Initial year a site will be surveyed in the field. An En Dash represents sites that will not be field surveyed

Table 19. Vegetation monitoring results for Rainbow Gardens and Powerline Crossing weirs revegetation sites in 2024.

Figure 43. Bundles of alkali sacaton and other native species planted during the spring 2023 Green-Up event.

3.17 Waterway

Total vegetative cover for the waterway polygons was calculated using aerial imagery and LiDAR data. The waterway polygons are comprised of 103.96 acres, 55.81 acres of which were covered with vegetation in 2024. This acreage was broken down into 11 sites separated by weirs (Table 20). The sites near Tropicana Weir and Sunrise Mountain Weir had the lowest vegetative cover

and the highest vegetative cover was found near Bostick and Calico Ridge weirs. No field surveys are scheduled for the waterway polygons, and only total vegetative cover will be calculated and reported.

Weir	Acreage
Upper Diversion Weir	1.95
Tropicana Weir	0.94
DU Weirs	3.01
Archery and Silver Bowl Weirs	3.69
Duck Creek Confluence and Upper Narrows Weirs	7.84
Sunrise Mountain Weir	1.87
Pabco Road Weir	3.37
Historic Lateral Weir	8.58
Bostick and Calico Ridge Weirs	12.15
Lower Narrows and Homestead Weirs	9.53
Rainbow Gardens and Powerline Crossing Weirs	2.88
TOTAL	**55.81**

Table 20. Total vegetative cover separated by weir for the waterway polygons of the Wash.

4.0 CONCLUSIONS

For comprehensive environmental programs such as the one along the Wash, there are various goals and multiple facets of each goal. This monitoring report is designed to describe how the Wash program is performing in relation to select quantitative measurements of native plant restoration. For the revegetation program as a whole and for individual sites, success occurs when there is an increase in native plant cover up to a self-sustaining level, high survivorship of planted plants and ongoing control or reduction of noxious weeds. More difficult-to-measure goals include providing wildlife habitat and increasing the overall ecological health of the system. Wildlife surveys and the summation of other measurements, however, should indicate to managers and stakeholders whether these goals are being met as well.

Seventeen sites consisting of all upland and riparian sites located on the north side of the Wash and those grant-funded sites with five or less growing seasons were surveyed in the field in 2024. Since site boundaries for almost all sites were modified prior to surveys, it is difficult to compare past with present results. Comparisons will begin in the fall of 2027 for the sites monitored in the field during 2024.

This report determined that, under the RMP, there are two sites that are good candidates for enhancement of the 17 monitored in the field in 2024 (Table 21). Both UNNS and UNSF are not scheduled to be monitored in the field until additional plantings occur at each site but qualify for enhancement and therefore have been added to the list. There are also two sites that are possible candidates for enhancement following additional monitoring. No sites that were surveyed in the field in 2024 qualified for targeted invasive and other undesirable species removal. It is anticipated

that this table will change annually and will be used as a tool to guide future revegetation efforts along the Wash.

Site Code	Candidate for Enhancement	Possible Candidate for Enhancement Following Additional Monitoring
UNNS	X	
UNSF	X	
CCNW		X
BN	X	
LNN		X
PLN	X	

Table 21. Vegetation sites that are good candidates or possible candidates for enhancement following the Las Vegas Wash Long-Term Revegetation Management Plan.

Since long-term management began in July 2022, there was a need to review the vegetation monitoring protocol, which had been in place since 2003, and determine if updates were necessary. To better align the protocol with long-term management while also simplifying the survey process, it was imperative that changes be made. Reducing the number of revegetation sites by modifying site boundaries was the first step in this process. Having fewer, larger sites has helped reduce the time spent in the field. Next, using the TMS method has allowed for a more streamlined way to survey these larger sites. Lastly, utilizing aerial imagery and LiDAR data to obtain vegetative cover for sites not monitored in the field, including all weirs and drop structures, has helped reduce time spent on ArcGIS and has eliminated the possibility of human error.

The new field and remote survey methods should continue to be used with the possibility of further modifications if deemed appropriate. Once each site has been surveyed more than one time following the TMS method, direct comparisons of the data can be made between each field survey season. Under the new protocol, sites are field surveyed every third year; this schedule can be altered if there are significant changes between field survey years (Table 22).

	Year 1 (Beginning in 2024)	Year 2	Year 3	Annually
Meander Survey of Upland and Riparian Sites on the North Side	X			
Meander Survey of Upland and Riparian Sites on the South Side		X		
Meander Survey of all Bank and Wetland Sites			X	
Visual Survey of Weirs and Drop Structures			X	
Total Vegetative Cover of Weirs				X

Table 22. Survey schedule of sites along the Las Vegas Wash. This schedule repeats after the third year.

5.0 RECOMMENDATIONS

Annual monitoring of revegetation sites along the Wash should continue, as it provides important information. This monitoring should use the new site boundaries and field and remote methods described in Section 2.0. Although the new site boundaries make comparing past data with current data difficult, this is only temporary, until the second field-monitoring season for each site. The median cover class range for the sites monitored in the field in 2024 was 25–50%. Although this seems low, almost all sites monitored in the field were upland, non-wetland sites. Having less vegetative cover in these areas is common since the plants' access to water is scarce.

Most Green-Up sites had relatively low vegetative cover. If this pattern continues and total cover does not increase for these sites, further investigation into which species are not surviving should be conducted. During the 2024 field surveys, it was noted that alkali sacaton was not doing well in upland areas, and at most sites where this species was planted, only a few green leaves remained on each plant.

What is now known as LNSGU was selected as the location for the 2024 spring Green-Up because it lacked diversity and was dominated by just two species. The planting event installed additional vegetation to improve overall cover and provide better habitat for wildlife per the RMP. Fall of 2024 was the first time this site was monitored following the planting. Results show that the site now has 25 species and a cover class range of 25–50%, showing the value of such efforts. The range should increase over the next several years as the new plants become established and grow larger. Field monitoring for this grant-funded site will occur annually until 2029.

The RMP was created in 2019 to identify activities that would improve revegetation sites along the Wash. Implementation of the RMP began in the fall of 2022, and in the fall of 2024, the updated vegetation monitoring protocol, which better aligns with the RMP, was put into place.

5.1 Data Retention

Grants have played a significant role in the Wash revegetation program, funding many of the sites in this report. SNWA is required to track grant-funded sites along with permitted areas in

perpetuity. There is a legacy revegetation database that is associated with grants and permitted areas from 2003 through 2023. A new database was created and will be updated annually that includes all grants and permitted areas beginning in 2024. This database lays out all information for each grant-funded site, permitted area and associated polygon(s) in ArcGIS. The legacy database will no longer be modified but can still be found in the Wash Team's revegetation monitoring SharePoint folder for reference. Maintaining the new database will help ensure that grant and permit requirements are met.

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