

las vegas wash coordination committee

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Las Vegas Wash Vegetation Monitoring Report, 2016



March 2018



SOUTHERN NEVADA
WATER AUTHORITY

Las Vegas Wash
Coordination
Committee



**Las Vegas Wash
Vegetation Monitoring Report, 2016**

**SOUTHERN NEVADA WATER AUTHORITY
Las Vegas Wash Project Coordination Team**

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Las Vegas Wash Coordination Committee

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ABSTRACT

Revegetation projects have been conducted along the Las Vegas Wash for over 16 years to meet the goals of the Las Vegas Wash Coordination Committee. In the fall of 2016, when monitoring for this report took place, approximately 490 acres of revegetation across 126 sites were established. These sites were broken up into 269 monitoring areas for this report. Sites ranging in age from 1 to 16 growing seasons had total cover, noxious species cover, species richness, and the wetland prevalence index documented. Fifteen new sites were established in 2016. Many of them are at the new Archery and Silver Bowl Weirs site and the Three Kids Weir site. Survivorship was calculated for the two most recently established sites with an average of 62% of the planted plants surviving until monitoring. Overall, most revegetation sites either increased in cover or remained constant since 2015; less than 10% of the sites decreased in cover. Most mature sites have stabilized and cover does not change much between growing seasons.

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1.0 INTRODUCTION

1.1 Background

In 1997, the Southern Nevada Water Authority (SNWA) assembled a citizen’s advisory committee to evaluate water quality issues in the Las Vegas Wash (Wash), Las Vegas Bay, and Lake Mead. These efforts resulted in the establishment of the Las Vegas Wash Coordination Committee (LVWCC), now a 29-member multi-stakeholder group consisting of federal, state, and local agencies, the university, private businesses, an environmental group, and citizens. In 2000, the LVWCC drafted a long-term management plan, the Las Vegas Wash Comprehensive Adaptive Management Plan (CAMP), to facilitate stabilization and enhancement activities along the Wash (LVWCC 2000; Figure 1). On-the-ground activities have been carried out since then to implement the goals of the CAMP, including constructing erosion control structures (weirs) in the stream channel and armoring the banks with rock. After erosion control facilities are built, wetland, riparian, and upland vegetation is planted to help further protect the Wash from erosion, as well as to improve the functional attributes of the ecosystem.

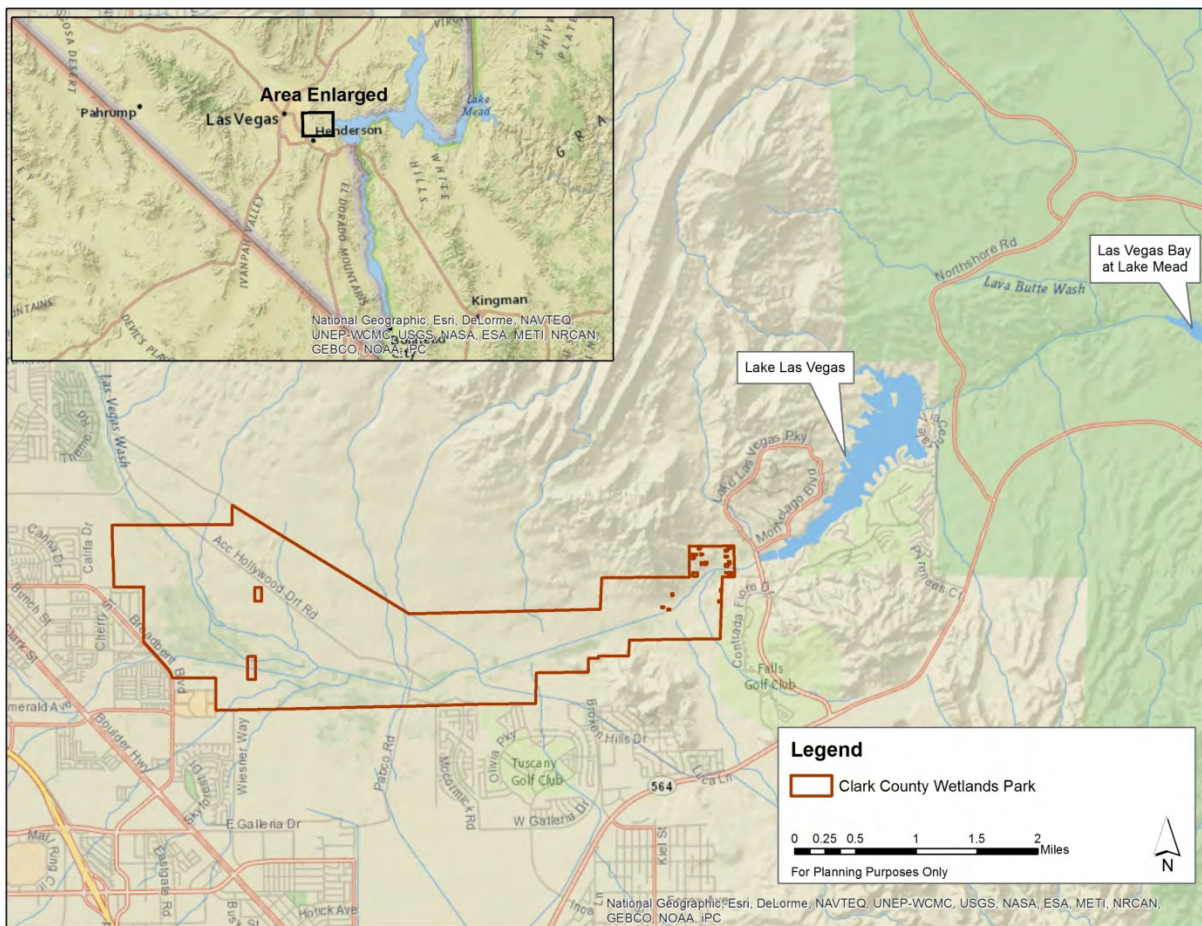


Figure 1. Las Vegas Wash location and general study area map.

A critical component of the overall plan to stabilize and enhance the Wash is the revegetation program. Erosion control is enhanced by plants by their roots binding to loose soil particles on the surface, subsurface and in deep subsurface horizons, thereby acting as soil anchors during scouring events (i.e., floods). In addition, a variety of wildlife species benefit from revegetation efforts. These areas planted with native species also potentially provide habitat for species formerly found to reestablish there. At the time when the erosion control project began along the Wash, there were very few native plants found along its banks, especially wetland and riparian species. Moreover, from the time flows increased and began to incise the channel, exotic species such as salt cedar (*Tamarix ramosissima*) successfully established in the area and became the dominant species. As a result, 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

The primary purpose of this report is to document the status of SNWA's revegetation efforts along the Wash by reporting 2016 data as part of a comprehensive vegetation monitoring program. Vegetation monitoring results from 2002 through 2015 have been previously documented (SNWA 2005, Eckberg and Shanahan 2008, Eckberg 2016); 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 approximately 490 acres were monitored in 2016. The majority of these activities have been conducted on revegetation project sites located within the boundaries of the Clark County Wetlands Park (CCWP; Figure 2). An additional revegetation area is located at the Clark County Water Reclamation District (CCWRD), which is located just north of the CCWP (Figure 2).

1.3 Need for Revegetation and Vegetation Monitoring

Revegetation projects along the Wash are conducted for multiple reasons. 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 United States require 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 United States. Here, this includes wetlands associated with Wash erosion control projects. Section 404 permits require 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 duties through 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 erosion control projects. NDEP issues general stormwater permits for Wash construction activities and permits require that final site stabilization is achieved. Vegetation 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

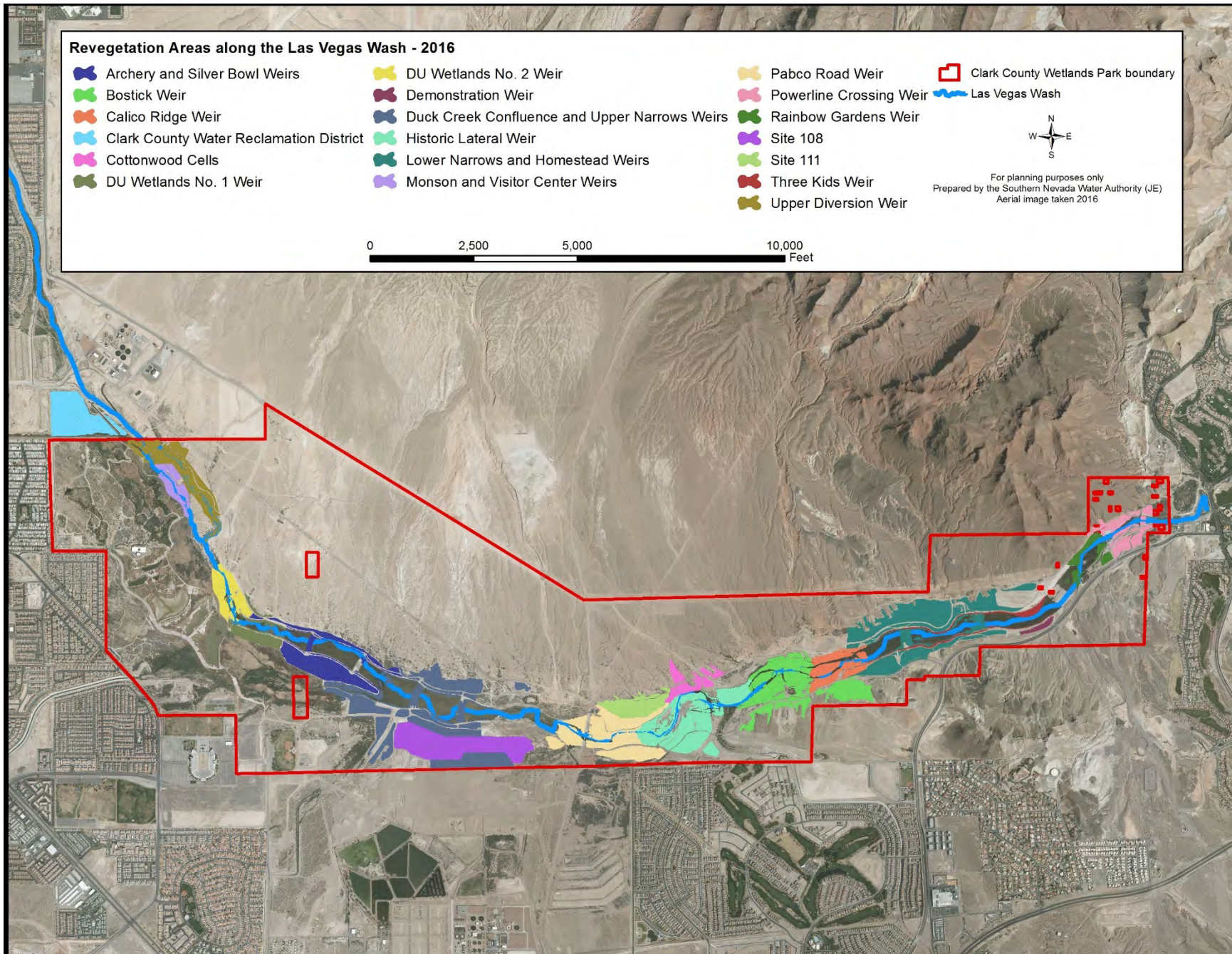


Figure 2. Location of the 2016 Las Vegas Wash revegetation sites.

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 enhancement 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. For program consistency, all revegetation sites are monitored annually and with the same general methodology.

1.4 Program Funding

The two major sources of funding for revegetation projects along the Wash are funding derived from grants and the Las Vegas Wash Capital Improvements Plan (Wash CIP). The Wash CIP funds revegetation activities stipulated in federal or state permits (e.g., wetland permits) obtained by SNWA as part of weir construction. Grant funds have been used to supplement the majority of revegetation projects implemented along the Wash, typically those areas adjacent to but not directly influenced by construction projects. Grants have been obtained from a variety of sources including the Clark County Multiple Species Habitat Conservation Plan, NDEP, Nevada Division of State Parks (NDSP), and three rounds of the Southern Nevada Public Land Management Act (SNPLMA IV, SNPLMA V, and SNPLMA VI); however, the majority of these grants have only provided funds for the initial components of implementation for specific revegetation projects. Once these areas have been established, the only source of funding for ensuring the successful establishment of these sites has been grants provided by the BOR.

1.5 Typical Revegetation Establishment Activities

1.5.1 Planning

The majority of revegetation sites along the Wash are in association with the construction of erosion control structures. This results in most site revegetation efforts being planned in conjunction with those construction activities. Once designs are complete on the structures including temporary and permanent footprints, design of revegetation areas begins. This includes plant selection and irrigation design. Once substantial completion has been reached on the structures, on-site soil testing may alter final plant selection and layout. Included in the design of these structures are species and procedures for hydroseeding. Hydroseeding doubles as the final step in the construction process and the initial step in revegetation.

1.5.2 Plant Procurement

After plant selection has been completed, procurement activities must 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). Plants grown by the Wash team involve collecting seed or cuttings, establishing the seedlings, transplanting into larger containers, irrigating, and delivery back to the Wash for final planting. With revegetation activities taking place along the Wash since

2000, there are now sufficient native species established to procure seeds and cuttings without looking to surrogate areas. Plant propagation for the Wash Team takes place at the SNWA operated Warm Springs Natural Area propagation facility in Moapa, NV.

1.5.3 Invasive and Other Undesirable Species Removal

The majority of the sites described in this report were previously covered in part or entirely by salt cedar, an invasive species that is prolific and spreads easily and can encroach on revegetation sites if removal does not take place. Some of the other invasive species that are found on sites and require constant monitoring are tall whitetop (*Lepidium latifolium*), silver-leaf nightshade (*Solanum elaeagnifolium*), giant reed (*Arundo donax*), Maltese star-thistle (*Centaurea melitensis*) and Johnsongrass (*Sorghum halepense*). Without removal, the native species would not be able to grow, germinate, and become self-sustaining. Considerable effort, therefore, is given to continually survey sites for encroachment, identify the invasive species, and plan for their removal as soon as possible.

In addition to invasive species, there are other undesirable species that are closely monitored for their presence. Common reed (*Phragmites australis*) and quailbush (*Atriplex lentiformis*) can grow so vigorously that they outcompete native species that are trying to establish. The Wash has native and non-native common reed as well as hybrids of the two (Saltonstall et al. 2016). The goal with these is not to completely remove them but to selectively thin them so that other vegetation can have time to establish and create a species-rich environment.

1.5.4 Irrigation

Revegetation sites along the Wash require irrigation for the first 1-3 growing seasons in order 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 bio-diesel powered pumps to a single mainline and then to multiple lateral lines that are fitted with sprinkler heads and/or drip irrigation tubing

The sizes of the sites that are irrigated have ranged from under 10 acres to almost 60 acres. Maintenance on irrigation system components is critical to ensure that plant material is given the proper amount of water. This is particularly true in Southern Nevada where less than five inches of rainfall occurs annually. Irrigation maintenance includes fixing leaks, tightening connections, and fixing or replacing broken pipes or heads.

1.5.5 Trash Removal

Furniture, landscape waste, and many other types of trash have been found on revegetation sites. On these newly created sites, successful establishment can be hindered by trash and other debris collecting on the site. The revegetation program is reducing the amount of illegal dumping that is observed by making the Wash a more scenic location, involving the public in its revegetation activities, and continually removing trash. Without large amounts of visible trash, people are not encouraged to dump there; however, some trash does get into the Wash from wind or water runoff.

1.5.6 Herbivore Control

On revegetation sites, fences are installed to reduce the damage caused by rabbits to newly planted material. Some sites have had a single fence placed around the entire site while others have had smaller fences around the plants themselves. Both must be continually inspected for damage, have repairs made, and adjustments made to the spacing of the fences to reduce plant damage.

2.0 MATERIALS AND METHODS

Monitoring was conducted between August and October 2016, and the methods followed the same guidelines as previous years (Eckberg and Shanahan 2009). As of August 2016, there were 65 wetland and 61 non-wetland revegetation sites. Many of the non-wetland sites were broken up into multiple monitoring areas (Table 1). This marks the first year where wetlands sites outnumber non-wetland sites. The primary reason was the increase in passive wetland sites that have developed on weirs.

ArcGIS was used to monitor 47 of the 126 total revegetation sites in 2016 for total cover; these sites did not have data collected regarding species richness, individual species cover, or Wetland Prevalence Index (WPI). Sites are only monitored using ArcGIS if they meet specific criteria as laid out in the 2008 Las Vegas Wash Vegetation Monitoring Report (Eckberg and Shanahan 2009).

3.0 RESULTS AND DISCUSSION

The following subsections describe monitoring results for each site and for groupings of sites. From 2015 to 2016, the number of areas monitored decreased by 1, while the acreage increased by 79.9 (Table 1). The total areas and acreage include sites monitored in the field as well as with ArcGIS. The increase in acres is primarily due to two factors. First, there were new restoration sites associated with the Duck Creek Confluence and Upper Narrows Weirs. These areas were planted as volunteer events in the fall of 2014 and spring of 2015. Second, there were existing passively created areas along the Wash that had not previously been captured in monitoring.

Cumulatively, there have been 85.01 acres of wetlands created above those required by mitigation permits (Table 2); including, 3.71 acres associated with the Cottonwood Cells, which were fully funded by grants from the BOR and the Clark County Water Reclamation District (CCWRD) which had its permit held by the property owners. Federally funded projects such as these are not eligible for use as mitigation of wetlands impacted in accordance with permits issued by the Corps.

3.1 Archery and Silver Bowl Weirs

Seven revegetation sites were planted in association with the Archery and Silver Bowl Weirs in 2015 and 2016 after these two weirs were simultaneously completed at the beginning of 2015. All of the sites were monitored for the first time in the 2016 vegetation monitoring season (Table 3). Two of the sites, Archery Silver Bowl South 1 (ASBS1) and Archery Silver Bowl South 2 (ASBS2) were both planted as volunteer Green-Ups in October of 2015 and April of 2016 respectively. These events brought over 450 volunteers out to plant the combined 20 acres. The

remaining sites were planted by SNWA’s contractor during the second half of 2015 through the summer of 2016.

Major Site	Acreage		No. of Monitoring Areas	
	2015	2016	2015	2016
Archery & Silver Bowl Weir	—	30.9	—	7
Bostick Weir	26.4	47.3	14	15
Calico Ridge Weir	16.6	16.8	10	10
CCWRD	28.3	27.4	29	29
Cottonwood Cells	10.4	10.4	10	10
Demonstration Weir	2.0	2.0	2	2
Duck Creek Confluence and Upper Narrows Weirs	52.0	61.1	11	13
DU Wetlands No. 1 Weir	10.3	10.3	4	4
DU Wetlands No. 2 Weir	14.0	14.0	5	5
Historic Lateral Weir	44.8	43.8	14	14
Lower Narrows and Homestead Weirs	65.5	65.3	8	7
Monson and Visitor Center Weirs	8.8	8.8	4	4
Pabco Road Weir	41.8	41.8	20	20
Powerline Crossing Weir	14.2	13.8	18	16
Rainbow Gardens Weir	7.3	7.8	7	8
Site-108	40.9	40.9	64	55
Site-111	14.9	14.9	26	24
Three Kids Weir	—	7.4	—	4
Upper Diversion Weir	25.5	25.7	24	21
TOTAL	423.7	490.4	270	269

Table 1. Change in cumulative acreage monitored and number of monitoring areas from 2015 to 2016.

These sites are unique in that much of planting area, specifically all of ASBS2, and parts of Archery Silver Bowl South Bank (ASBSB) and Archery Silver Bowl South Upper Bank (ASBSUB) are on what is now a peninsula with the Wash channel to the north and the Duck Creek Channel to the south (Figure 4). Duck Creek is a tributary to the Wash primarily made up of urban runoff but also carries substantial storm runoff into the Wash.

Because the sites at Archery and Silver Bowl were only established for about one year, they were still actively being irrigated at the time of the 2016 monitoring (Figure 3). Typical non-wetland revegetation sites along the Wash are irrigated through two growing seasons with less frequent application in the second year. Riparian areas may or may not need supplemental water to established depending on groundwater depths. Here, ASBSUB was irrigated along with ASBS1 and ASBS2. ASBSUB had both riparian and upland vegetation planted on it. Similarly, Archery

Silver Bowl North Bank was also planted with some riparian plants and is being irrigated with Archery Silver Bowl North. A couple sites in 2016, including ASBS1, had Rush milkweed (*Asclepias subulata*) documented on them. This is the first year it has been found at the Wash after being planted for the first time in 2015.

Mitigation Project	Mitigation Permit Number	Mitigation Required (acres)	Wetland Area Created (acres)
Archery and Silver Bowl Weirs	SPK-2011-00796-SG	0 ^c	2.11
Bostick Weir	200125114	7.88	18.74
Calico Ridge Weir	200450004	3.80	9.02
Clark County Water Reclamation District	SPK-2009-00227-SG	6.79	5.91 ^a
Cottonwood Cells	N/A	—	3.71 ^b
Demonstration Weir	199825148	0.90	0.49
Duck Creek Confluence and Upper Narrows Weirs	SPK-2009-00042	1.33	16.29
DU Wetlands No. 1 Weir	SPK-2010-00285-SG	1.22	2.50
DU Wetlands No. 2 Weir	2007-1961-SG	0.05	4.07
Historic Lateral Weir	199825148	4.90	18.54
Lower Narrows and Homestead Weirs	SPK-2008-01417-SG	6.25	8.71
Monson and Visitor Center Weirs	200250111	4.81	1.98
Pabco Road Weir	199725375	2.20	14.96
Powerline Crossing Weir	200450454	4.87	2.93
Rainbow Gardens Weir	200250054	1.00	4.79
Three Kids Weir	SPK-2012-01138-SG	0 ^c	7.36
Upper Diversion Weir	200550514	0.01	9.97
Bank Protection Projects	—	7.06	—
TOTAL		53.07	138.08

^a Permit held by Clark County Water Reclamation District and not eligible for Wash wetland mitigation

^b Federally funded revegetation not eligible for wetland mitigation

^c Permits authorized under nationwide Permit Number #27 after 2012 have no mitigation requirement

Table 2. Mitigation requirements and wetland areas established as of October 2016.

Survivorship data was collected on ASBS1 and ASBS2 after their first growing season. ASBS 1 was planted nearly one year prior to monitoring while ASBS2 was planted about 6 months before the 2016 monitoring. Both sites had lower than average plant survival rates for planted plants. Most plants were planted as part of volunteer Green-Up events. ASBS1 had a survivorship of 36.8% and ASBS2 had a survivorship of 67.3%.

The total cover data and visual observation of the site (Figure 3) would suggest a contradiction to this data. However, the majority of the plant cover on both sites is from desert saltbush (*Atriplex polycarpa*) which was hydroseeded on both sites once construction of the two weirs was completed. This species did especially well and may have outcompeted the planted plants for space and resources. It may also be that this species was more adapted to the site conditions than those selected as container plantings.

Site Code ¹	Growing Season	Acreeage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
ASBN	1	6.33	wet	50-75%	0.0%	28	3.64
ASBNB	1	0.20	wet	50-75%	1.0%	18	1.63
ASBNUB	1	1.20	wet	50-75%	0.0%	8	3.45
ASBS1	1	11.36	non-wet	75-100%	0.1%	21	3.90
ASBS2	1	8.64	non-wet	50-75%	0.0%	16	3.74
ASBSB	1	0.30	wet	25-50%	0.0%	18	3.64
ASBSUB	1	1.22	wet	25-50%	0.0%	21	1.52

¹ASBN= Archery Silver Bowl North, ASBNB= Archery Silver Bowl North Bank, ASBNUB= Archery Silver Bowl North Upper Bank, ASBS-1= Archery Silver Bowl South 1, ASBS-2= Archery Silver Bowl South 2, ASBSB= Archery Silver Bowl South Bank, ASBSUB= Archery Silver Bowl South Upper Bank

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 3. Vegetation monitoring results for Archery and Silver Bowl Weirs revegetation sites in 2016.



Figure 3. Desert saltbush is the dominant plant at the Archery Silver Bowl South 1 revegetation site in 2016.

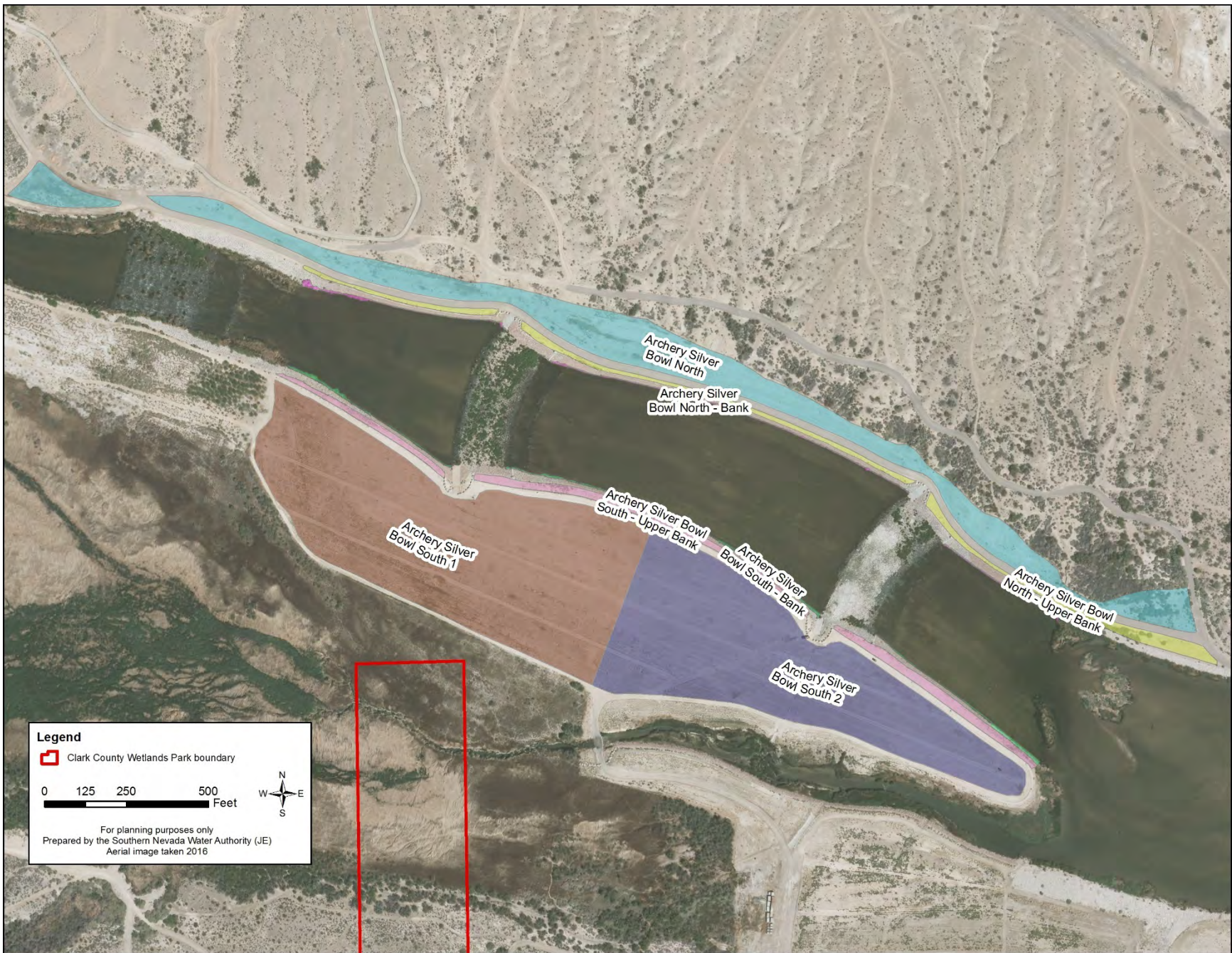


Figure 4. Aerial photograph of 2016 delineated Archery and Silver Bowl Weirs revegetation sites.

3.2 Bostick Weir

There were 14 revegetation sites at the Bostick Weir in 2016 (Table 4). This is one more than there has been for many years. The new site, Bostick South Tamarisk (BST) is also now the largest site near the Bostick Weir (Figures 5 and 6). As the name suggests, this site was primarily tamarisk which was cleared in 2014 and 2015. Planting began in spring 2015 and continued through early 2016. Because this site surrounds the Bostick Kiosk and the CCWP’s trail system, a higher diversity of plants was planted there than most other revegetation sites along the Wash to improve aesthetics. In its first year of monitoring, there were 41 species identified. This is partially due to the higher density of plants planted as well as the site being relatively unimpacted for many years other than the tamarisk removal which resulted in a large seed bank being exposed once the tamarisk was removed. As with many sites previously dominated by tamarisk, follow-up treatment was required to ensure eradication of the noxious weed; it covered just 1-5% of the site during monitoring. The total coverage of the site was 25-50%.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
B	13	8.03	wet	75-100%	0.6%	24	2.03
BI	13	4.76	wet	75-100%	nm	nm	nm
BN	13	0.84	non-wet	25-50%	0.0%	5	4.95
BS	12	1.20	non-wet	75-100%	nm	nm	nm
BST	1	21.03	non-wet	25-50%	3.0%	41	2.50
DBN	13	0.48	non-wet	50-75%	nm	nm	nm
DBS	12	0.22	non-wet	50-75%	nm	nm	nm
DBSE	12	0.80	wet	75-100%	2.5%	9	2.38
UBN	13	0.55	non-wet	75-100%	2.5%	11	4.18
UBNB	12	1.31	wet	75-100%	0.5%	5	1.86
UBNE	12	1.85	wet	75-100%	nm	nm	nm
UBS	13	2.50	non-wet	75-100%	nm	nm	nm
UBS	13	2.00	wet	75-100%	nm	nm	nm
UBSB	12	1.70	non-wet	75-100%	nm	nm	nm

¹B=Bostick, BI=Bostick Islands, BN=Bostick North, BS=Bostick South, BST=Bostick South Tamarisk, DBN=Downstream Bostick North, DBS=Downstream Bostick South, DBSE=Downstream Bostick South Emergent, UBN=Upstream Bostick North, UBNB=Upstream Bostick North Bank, UBNE=Upstream Bostick North Emergent, UBS=Upstream Bostick South, UBSB=Upstream Bostick South Bank

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps’ 1987 Wetland Delineation Manual. “wet” = wetland and “non-wet” = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 4. Vegetation monitoring results for Bostick Weir revegetation sites in 2016.

For the remaining 13 sites at the Bostick Weir, five were monitored in the field and eight were monitored for total cover using ArcGIS per the recommended schedules laid out in Eckberg and Shanahan (2009). There were no substantial differences in 2016 compared to previous monitoring years for total cover or species richness on any site. This is to be expected as all sites besides BST (Figure 5) are either in their 12th or 13th growing season. There will be minor fluctuations in smaller species and their cover on the site but for the most part, these sites have reached an equilibrium barring any unforeseen impact such as fire, flood, or if activities related to erosion control require impacts to these sites.



Figure 5. Native and planted Creosote bush at the Bostick South Tamarisk revegetation site in 2016.

3.3 Calico Ridge Weir

All but one of the nine revegetation sites at the Calico Ridge Weir were monitored in the field in 2016 (Table 5; Figure 7). Downstream Calico North (DCN) was the only site monitored for total cover using ArcGIS. DCN has had the same total cover (25-50%) for the past five monitoring years with two of the years being measured using ArcGIS. Only two of the nine revegetation sites had any change in total cover from 2015 to 2016; Upstream Calico North - non-wetland (UCN-N) and Upstream Calico South – non-wetland (UCS-N). Both of these sites saw their total cover reduce since the previous monitoring year. UCN-N decreased from 50-75% total cover to 25-50% and UCS-N decreased from 75-100% to 50-75%. Both sites total cover went up in 2015 and are now the same total cover recorded in 2014. Many upland sites such as these which are dominated by saltbush have density and healthiness of plants dependent on climatic conditions, especially

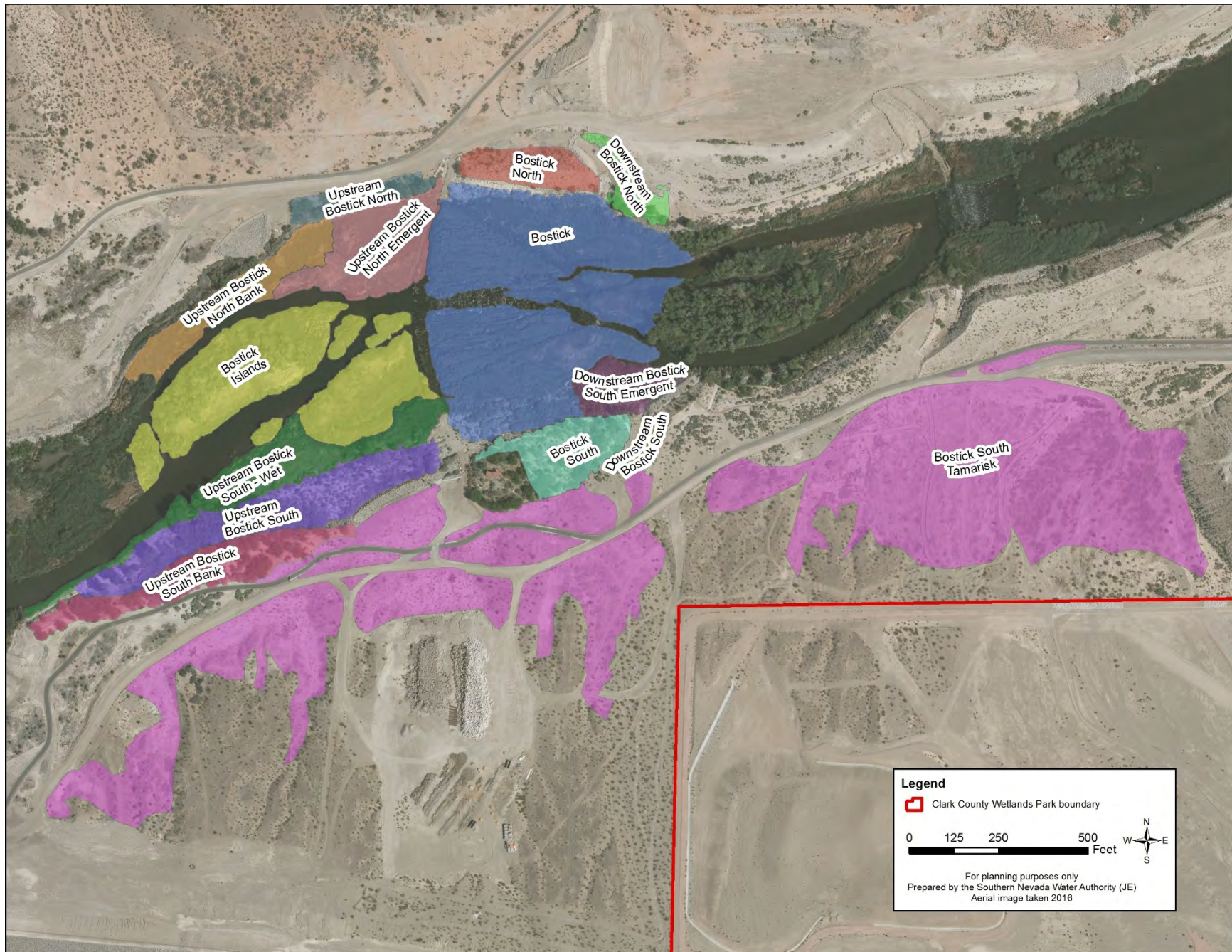


Figure 6. Aerial photograph of 2016 delineated Bostick Weir revegetation sites.

rainfall. This explains minor fluctuations from year to year in total cover; the average is likely near the border of the two total cover categories.

Wetland sites have a variety of dominant plants depending on where they are formed. Upstream Calico Emergent is dominated by Goodding’s willow (*Salix gooddingii*) because it is an island with a large soil substrate (Figure 8). The wetlands that have formed on the Calico Ridge Weir itself have remained at the maximum cover value of 75-100% since monitoring began in its second year, 2006. However, the make-up of the plants on the site has been regularly changing. In 2006, there were 28 species on the site, and it was dominated by common reed which had a cover of 50.6%. Only two other species had cover over 10%; Bermuda grass (*Cynodon dactylon*) at 21.1% and Goodding’s willow at 37.5%. In 2014, there were just eight species on the site. Common reed became even more dominant, covering 87.5% of the site. Bermuda grass and Goodding’s willow both decreased in cover to 1.3% and 1.5% respectively. In the latest monitoring in 2016, common reed is still the dominant species but decreased in total cover to just 49.5%. The second most dominant species is now sandbar willow (*Salix exigua*) at 26.7%, up from just 2.5% in 2014. Bermuda grass was not found on the site and Goodding’s willow increased to 7.8% total cover.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
C	12	2.06	wet	75-100%	0.3%	4	2.00
DCN	12	0.65	non-wet	25-50%	nm	nm	nm
DCS	12	2.25	non-wet	50-75%	0.0%	6	4.97
DCS	12	1.38	wet	75-100%	0.5%	5	1.51
UCE	12	3.62	wet	75-100%	0.27%	6	1.65
UCN	12	1.99	non-wet	25-50%	2.5%	13	4.61
UCN	12	1.01	wet	75-100%	0.5%	5	1.98
UCS	12	2.86	non-wet	50-75%	0.0%	13	4.35
UCS	12	0.88	wet	75-100%	2.5	8	2.27

¹C=Calico, DCN=Downstream Calico North, DCS=Downstream Calico South, UCE=Upstream Calico Emergent, UCN=Upstream Calico North, UCS=Upstream Calico South

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps’ 1987 Wetland Delineation Manual. “wet” = wetland and “non-wet” = non-wetland

³Wetland Prevalence Index (WPI) value. WPI≤2.0 = wetland, 2.0<WPI<2.5 = likely wetland, 2.5≤WPI<3.5 = may be wetland, 3.5≤WPI<4.0 = not likely a wetland, and WPI≥4.0 = upland

nm = this attribute was not monitored

Table 5. Vegetation monitoring results for Calico Ridge Weir revegetation sites in 2016.

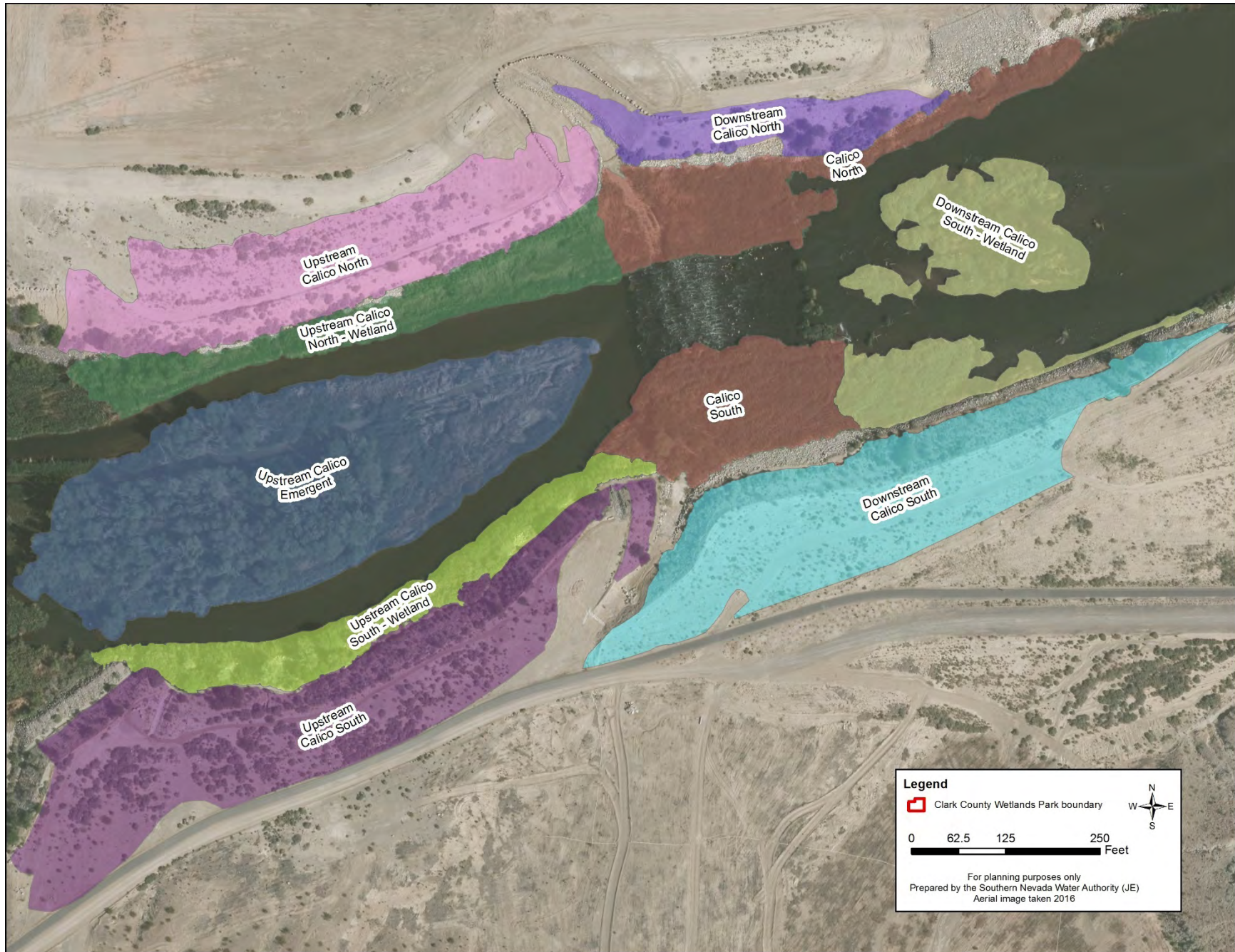


Figure 7. Aerial photograph of 2016 delineated Calico Ridge Weir revegetation sites.



Figure 8. Goodding's willow tower over the Wash at the Upstream Calico Emergent revegetation site.

3.4 Clark County Water Reclamation District

The site located at the CCWRD was monitored in 2016, its seventh year, exclusively using ArcGIS (Figure 9; Table 6). It was originally made up of 29 semi-equivalent monitoring areas in terms of size categorized into wetland and non-wetland. In 2014, construction began adjacent to the site by Clark County to line the Wash channel through their property with concrete thus changing the capacity of water through the area as well as the speed at which water passes from upstream. Portions of the CCWRD revegetation site were impacted directly by plants needing to be removed in order to complete the construction. It was because of this construction that physical access to the site was made difficult and therefore only total cover was measured using ArcGIS (Table 6). It is anticipated that the channelization project will also impact groundwater penetration from the east under the site which may have some impact on the larger trees accessing water. However, most trees are quite large and mature; if the changes are minor, there should be little impact observed.



Figure 9. Aerial photograph of 2016 delineated Clark County Water Reclamation District revegetation sites.

Site Code	Growing Season	Acreage	Wetland Status ¹	Total Cover	Noxious Species Cover	Number of Species	WPI ²
CCWRD	7	21.44	non-wet	83.8%	nm	nm	nm
CCWRD	7	5.92	wet	87.8%	nm	nm	nm
TOTAL	7	27.33	both	84.6%	nm	nm	nm

¹Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

²Wetland Prevalence Index (WPI) value. WPI≤2.0 = wetland, 2.0<WPI<2.5 = likely wetland, 2.5≤WPI<3.5 = may be wetland, 3.5≤WPI<4.0 = not likely a wetland, and WPI≥4.0 = upland

nm = this attribute was not monitored

Table 6. Monitoring results for the Clark County Water Reclamation District revegetation site in 2016.

3.5 Cottonwood Cells

Five of the seven revegetation sites at the Cottonwood Cells (Table 7) were established in 2012; Cottonwood Cell 3 (CC3), Cottonwood Cell 3-2, Cottonwood Cell Bank, Cottonwood Cell North (Figure 10), and Cottonwood Cell North Stockpiles. The remaining sites; Cottonwood Cell 1 (CC1) and Cottonwood Cell 2 were planted in 2002 and 2005 respectively (Table 7; Figure 11). CC1 has had the maximum cover value of 75-100% for the past two growing seasons. Unfortunately, there has been a decline in the cover of cottonwood trees (*Populus fremontii*) since 2010 and an increase in cover of johnsongrass, a state listed noxious weed, since first being documented on the site in 2014. Cottonwoods covered 75-100% of the site in 2010, 50-75% in 2012, and 25-50% in the past three growing seasons. Simultaneously, johnsongrass had 5-25% cover in 2014, 25-50% in 2015, and 50-75% in 2016. In 2016, the National Park Service Invasive Plant Management Team began regular treatment of noxious weeds throughout the Wash including johnsongrass. 2017 monitoring data will show how effective these treatments are after the first year.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
CC1	15	0.97	wet	75-100%	63.0%	12	2.77
CC2	12	0.53	wet	75-100%	0.0%	6	3.00
CC3	5	1.62	wet	75-100%	38.6%	40	2.73
CC3-2	4	0.39	wet	75-100%	0.5%	13	4.46
CCB	4	0.19	wet	75-100%	5.0%	19	2.13
CCN	5	4.83	non-wet	68.6%	0.1%	32	3.90
CCNS	5	1.83	non-wet	24.3%	0.3%	11	4.06

¹CC1=Cottonwood Cell 1, CC2=Cottonwood Cell 2, CC3=Cottonwood Cell 3, CC3-2=Cottonwood Cell 3-2, CCB=Cottonwood Cell Bank, CCN=Cottonwood Cell North, CCNS=Cottonwood Cell North Stockpiles

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. WPI≤2.0 = wetland, 2.0<WPI<2.5 = likely wetland, 2.5≤WPI<3.5 = may be wetland, 3.5≤WPI<4.0 = not likely a wetland, and WPI≥4.0 = upland

Table 7. Vegetation monitoring results for Cottonwood Cell revegetation sites in 2016.

The most species rich site for the past couple growing seasons has been Cottonwood Cell 3 (CC3) with 40 species in 2016. This site wraps around the original two Cottonwood Cell sites. Although the name implies its similarity to the other sites, it was designed quite differently. CC1 and CC2 were planted exclusively with pole cuttings for cottonwood trees. As a result, the sites became heavily dominated by cottonwoods. CC3 had many cottonwoods planted on it but there were also a wide variety of other species. In addition, CC1 and CC2 relied on groundwater to provide the water necessary for the establishment of the cottonwood trees. CC3 had temporary irrigation installed to established the planted plants. Irrigation systems also have the effect of establishing seed that is dispersed naturally onto the site; both desirable and non-desirable species.



Figure 10. The Cottonwood Cell North site had a wide variety of species present in 2016.

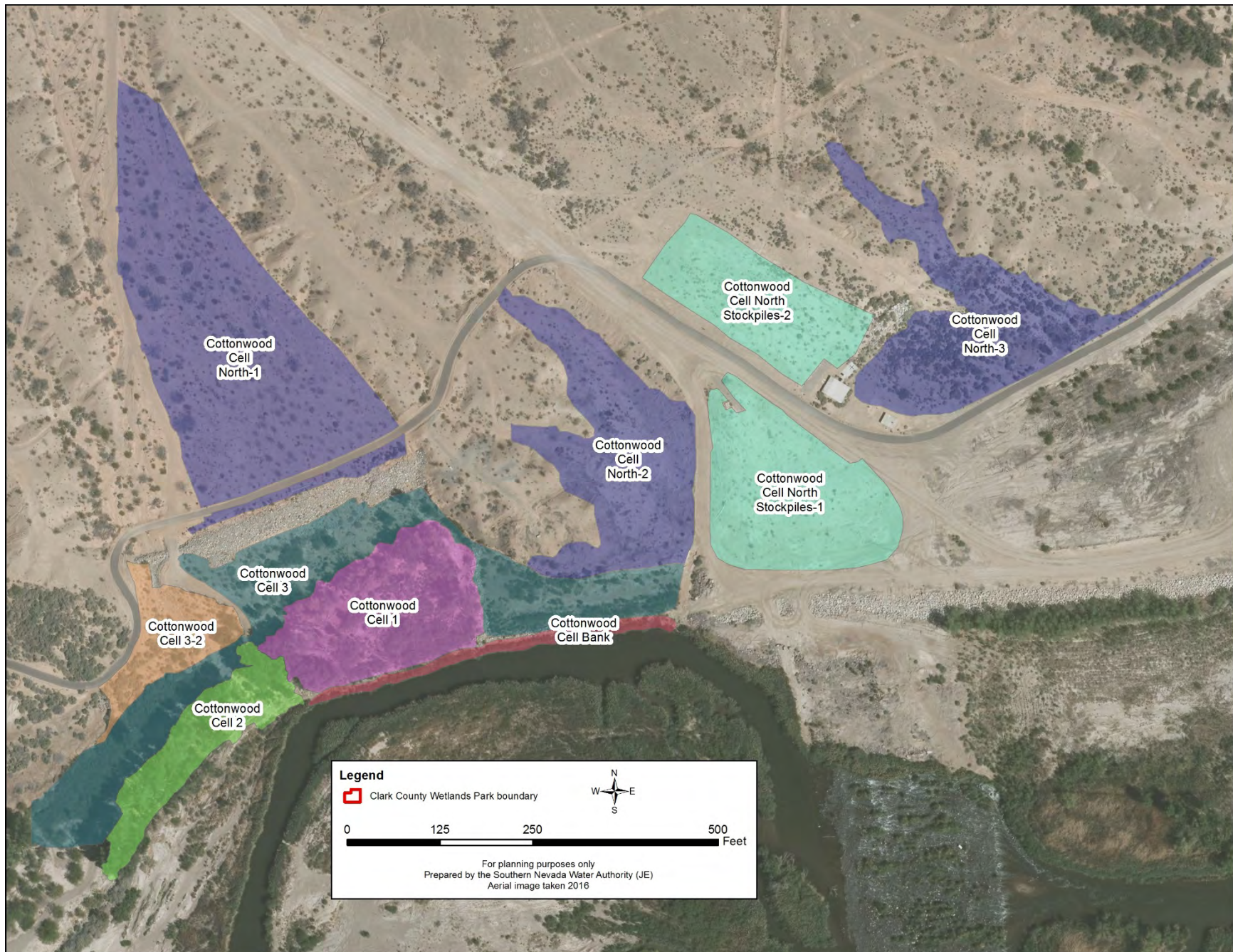


Figure 11. Aerial photograph of 2016 delineated Cottonwood Cell revegetation sites.

3.6 Demonstration Weir

The two sites at the Demonstration Weir have not changed much in terms of species richness and total cover over the past year (Figures 12 and 13; Table 8). An understandable observation given the sites are 14 years old. Given the monitoring protocol described in Eckberg and Shanahan 2009, the sites would normally not be monitored in the field. However, the nearby construction of the Three Kids Weir, which replaced the Demonstration Weir, was expected to have impacts on these sites. The wetland site especially is likely to see changes in plant health and perhaps plant composition due to changes in groundwater level and proximity to the Wash itself. An access road was installed adjacent to the Upstream Demonstration South – Wetlands (UDS-W) revegetation site which removed and will eliminate the establishment of emergent species typically found on the banks of wetland sites. The non-wetland site, dominated by creosote bush, has not had much change in plant composition in many years (Figure 12).



Figure 12. Creosote bush dominated the Upstream Demonstration South–Non-wetland site in 2016.

On UDS-W, the only two species with a WPI less than 3, which is used to indicate if a species is a wetland species or likely a wetland species, are Goodding’s willow and sandbar willow which have cover of 5-25% and 1-5% respectively. These numbers are consistent or similar to results found in the past few years. While the Three Kids Weir construction altered the topography of the Wash channel near these sites, conditions were already altered to limit wetland habitat.



Figure 13. Aerial photograph of 2016 delineated Demonstration Weir revegetation sites.

The Demonstration Weir had failed multiple times which resulted in the Wash channel cutting through the center of the weir. This reduced the amount of water along the banks and therefore for the plants further up the banks as well. The total cover of the non-wetland site in 2016 was the same as 2015 but down from the three monitoring years prior. The only species with a decline in cover was quailbush. It is assumed that this was more a result of natural life cycles of quailbush rather than a result of changing water levels.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
UDS	14	1.55	non-wet	25-50%	0.0%	8	4.76
UDS	14	0.49	wet	50-75%	2.5%	8	2.85

¹UDS=Upstream Demonstration South

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland
nm = this attribute was not monitored

Table 8. Vegetation monitoring results for Demonstration Weir revegetation sites in 2016.

3.7 Duck Creek Confluence and Upper Narrows Weirs

The Duck Creek Confluence and Upper Narrows Weirs were completed in early 2013. Despite being very young vegetation areas, the majority of the sites have the highest total cover measurement possible, 75-100%. Nine of the 12 sites had this maximum total cover value. As expected, this includes all five of the wetland sites (Figure 14) as well as four of the seven non-wetland sites (Table 9). There were two additional sites monitored in 2016 compared to the ten monitored in 2015 (Figure 15). These sites are the Duck Creek Upper Narrows South Riparian (DCUNSR) and Duck Creek Channel South. Both of these sites were in their second growing season this monitoring year but were not monitored in 2015. DCUNSR was planted simultaneously with Duck Creek Upper Narrows South-2 (DCUNS-2) as part of the spring 2015 Green-Up. It was separated for monitoring purposes due to being closer to the Wash and at a slightly lower elevation and therefore is expected to have slightly different plant composition. This held true in this first monitoring year. DCUNSR had 75-100% cover while DCUNS-2 had just 25-50% cover for the second year in a row.

All of the previously monitored non-wetland sites at the Duck Creek Confluence and Upper Narrows Weirs either increased in total cover or stayed the same from 2015 to 2016. The site with the lowest total cover, Duck Creek Upper Narrows North Stockpile (DCUNNS), was planted in the fall of 2013. As the name implies, it is on the site of a former rock stockpile. Being a rock stockpile for many years, the soil is very compacted. In addition, the site is much higher in elevation than most Wash sites including all of the other sites associated with the Duck Creek Confluence and Upper Narrows Weirs. That being said, the plants planted on the site have survived for the nearly three years since planting and have been relatively consistent with a slight increase in 2016 to reach the current total cover of 5-25%.

Site Code ¹	Growing Season	Acreeage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
DCUNE	4	3.68	wet	75-100%	0.3%	24	1.49
DCUNN	3	13.70	non-wet	50-75%	0.1%	30	0.36
DCUNNR	3	1.39	non-wet	75-100%	0.1%	12	0.02
DCUNNS	3	1.31	non-wet	5-25%	0.5%	8	0.42
DCUNS-1	3	7.86	non-wet	75-100%	15.0%	23	0.59
DCUNS-2	2	10.48	non-wet	25-50%	0.0%	14	2.49
DCUNS-3	2	9.59	non-wet	75-100%	0.0%	10	3.59
DCUNSR	2	2.91	non-wet	75-100%	0.5%	13	3.55
DCCS	2	1.03	wet	75-100%	0.5%	10	1.99
DCCW	3	2.71	wet	75-100%	nm	nm	nm
UDCCI	3	0.68	wet	75-100%	nm	nm	nm
UNW	3	2.32	wet	75-100%	nm	nm	nm

¹ DCUNE=Duck Creek Upper Narrows Emergent, DCUNN=Duck Creek Upper Narrows North, DCUNNR=Duck Creek Upper Narrows North Riparian, DCUNNS=Duck Creek Upper Narrows North Stockpile, DCUNS-1=Duck Creek Upper Narrows South 1, DCUNS-2=Duck Creek Upper Narrows South 2, DCUNS-3=Duck Creek Upper Narrows South 3, DCUNSR= Duck Creek Upper Narrows South Riparian, DCCS= Duck Creek Channel South, DCCW=Duck Creek Confluence Weir, UDCCI=Upstream Duck Creek Confluence Channel, UNW=Upper Narrows Weir

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 9. Vegetation monitoring results for Duck Creek Confluence and Upper Narrows Weirs revegetation sites in 2016.



Figure 14. Wetland vegetation on the banks and weirs at Duck Creek Confluence and Upper Narrows Weirs.

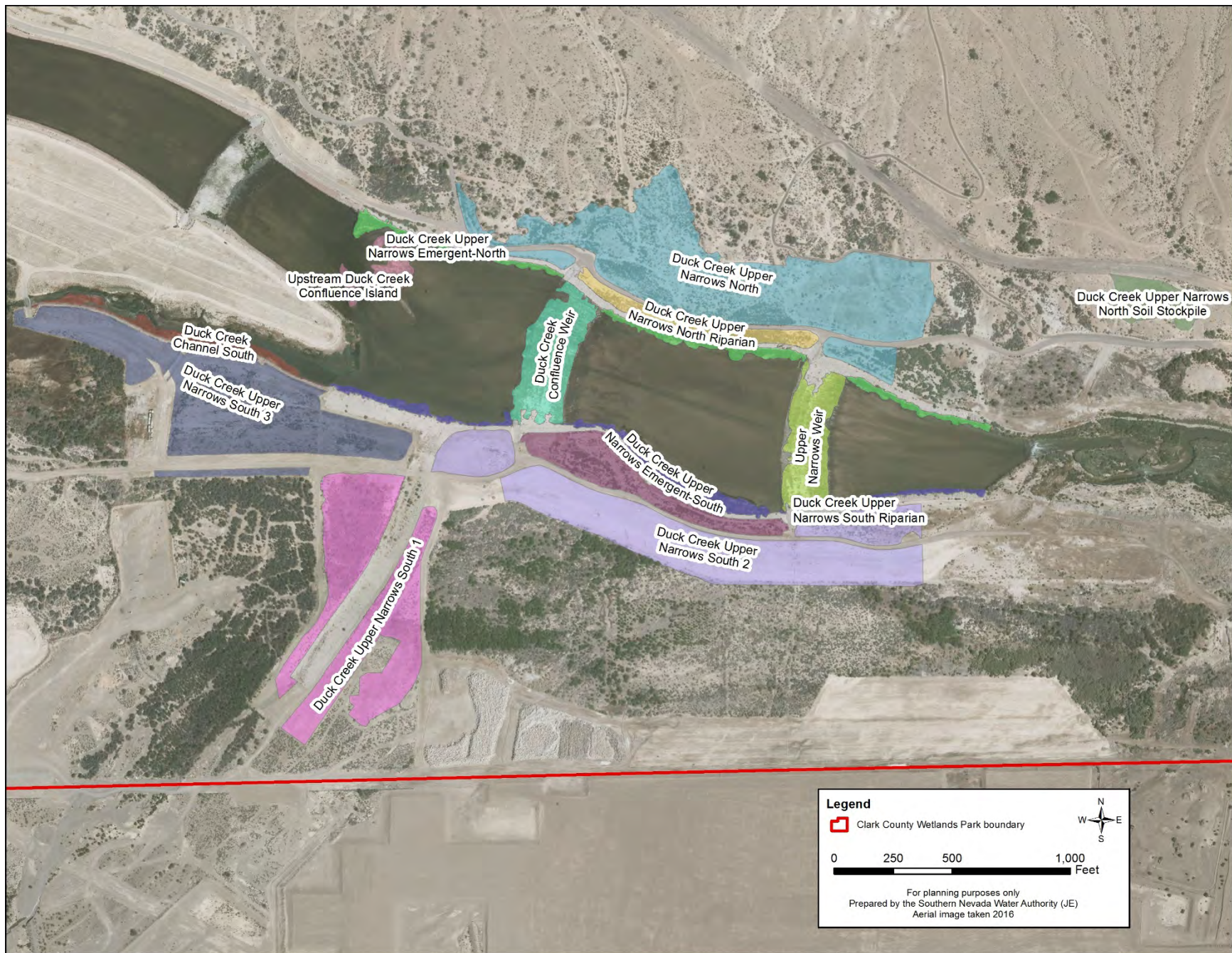


Figure 15. Aerial photograph of 2016 delineated Duck Creek Confluence and Upper Narrows Weirs revegetation sites.

3.8 DU Wetlands No. 1 Weir

The DU Wetlands No. 1 Weir has three revegetation sites associated with it (Table 10; Figure 16). Two of the sites were actively planted; DU Wetlands No. 1 Emergent (DU1E) and DU Wetlands No. 1 South (DU1S). The third revegetation site is a passively created wetland on the weir itself, DU Wetlands No. 1 Weir (DU1W). Both wetland sites, DU1E and DU1W, have the maximum total cover value of 75-100%. DU1S, the lone non-wetland site, had 50-75% total cover in 2016 (Figure 17). DU1S had the same cover in 2015 when it was measured using ArcGIS, although this is down from 2014 when it had 75-100% cover. This slight decline is common across non-wetland sites in their third and fourth growing season as they are typically not irrigated past the second growing season. As a result, many of the smaller forbs, grasses, and shrubs and many non-native plants are not able to stay alive with lower water available. This was the case for DU1S as well. The main species that declined in cover for the site was alkali sacaton (*Sporobolus airoides*) which had 25-50% cover in 2014 and just 1-5% cover in 2016. This grass was one of the species hydroseeded on the site as the final step in weir construction. The seed established quickly where irrigation was applied and even along irrigation lines themselves where condensation was enough water to germinate the seeds. Once irrigation ceased in 2014, most of the grasses either diminished in size or died.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
DU1E	4	2.00	wet	75-100%	1.5%	39	1.88
DU1S	4	7.84	non-wet	50-75%	5.1%	20	3.36
DU1W	4	0.50	wet	75-100%	nm	nm	nm

¹ DU1S=DU Wetlands No. 1 South, DU1E=DU Wetlands No. 1 Emergent, DU1W=DU Wetlands No. 1 Weir

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 10. Vegetation monitoring results for DU Wetlands No. 1 Weir revegetation sites in 2016.

3.9 DU Wetlands No. 2 Weir

There are three active revegetation sites at the DU Wetlands No. 2 Weir and one passively created wetland site (Table 11). The passively created site is on the weir itself and is not monitored in the field due to dangerous conditions doing monitoring on the weirs themselves (Figure 18). Instead, this and all other weirs are monitored using ArcGIS. The other wetland site at DU Wetlands No. 2 Weir is DU Wetlands No. 2 Emergent (DU2E). DU2E is made up of two monitoring areas, labeled as the north and south side (which are actually east and west) and then combined using a weighted average for individual species cover as well as the total site cover. Three of the four sites had the maximum total cover of 75-100% and one site, DU Wetlands No. 2 South, had 50-75% cover (Figure 19). This is down from past monitoring, including the first growing season where most sites have a lower total cover. The site was monitored using ArcGIS last year.

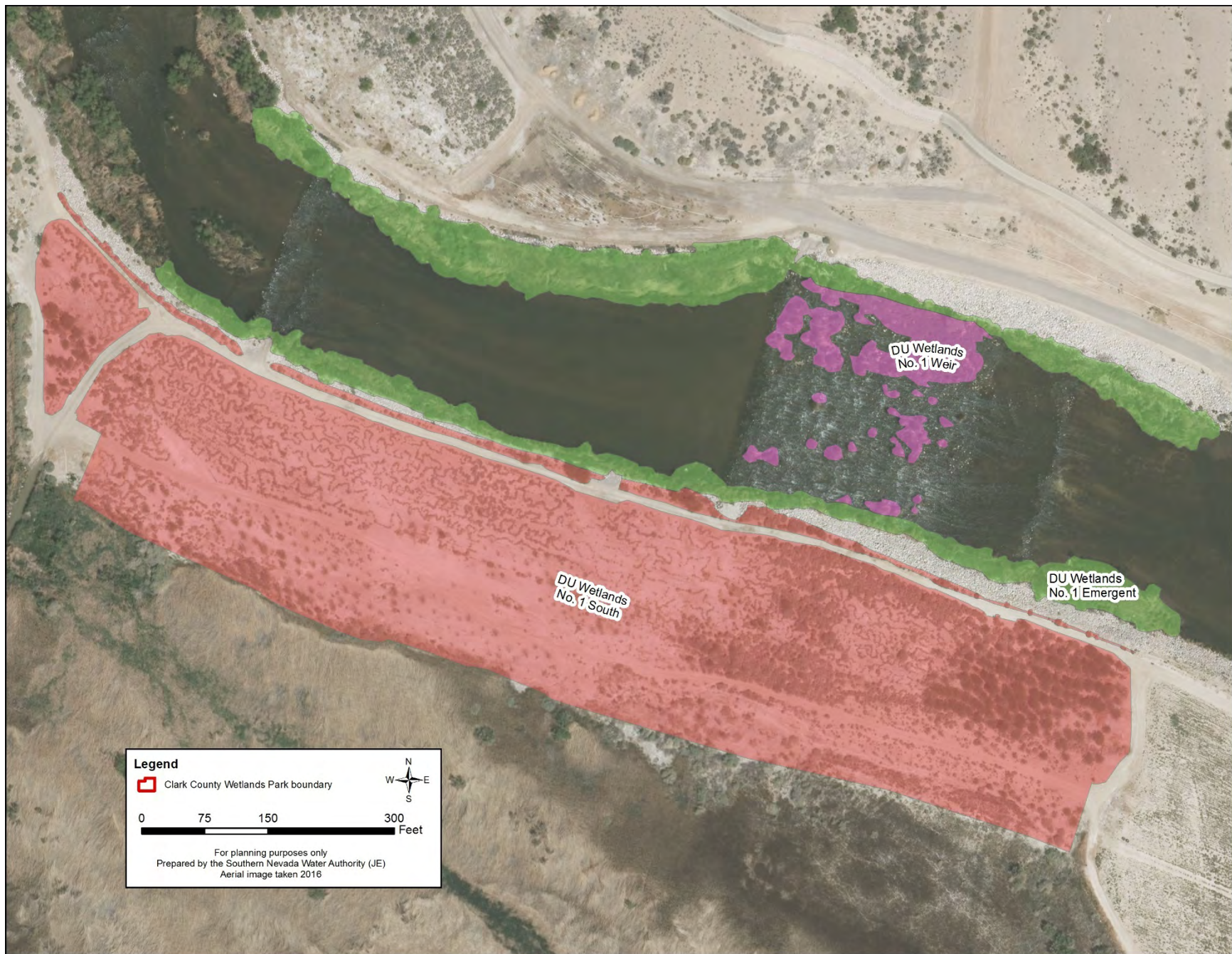


Figure 16. Aerial photograph of 2016 delineated DU Wetlands No. 1 Weir revegetation sites.



Figure 17. Riparian vegetation along the Wash banks at the DU Wetlands No. 1 South revegetation site in 2016.

The biggest species cover decline was from alkali sacaton which had 25-50% cover in 2014 and was just 1-5% cover in 2016. This species is considered a facultative species in its WPI which means it may be a wetland plant. This means it requires a substantial amount of water. The specific reason is unknown, but there may be a decline in available water on the site.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
DU2E	7	3.38	wet	75-100%	2.5%	15	1.87
DU2N	7	5.03	non-wet	75-100%	0.5%	24	3.77
DU2S	7	4.91	non-wet	50-75%	5.6%	18	3.72
DU2W	7	0.69	wet	75-100%	nm	nm	nm

¹DU2N=DU Wetlands No. 2 North, DU2S=DU Wetlands No. 2 South, DU2E=DU Wetlands No. 2 Emergent, DU2W=DU Wetlands No. 2 Weir

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. WPI≤2.0 = wetland, 2.0<WPI<2.5 = likely wetland, 2.5≤WPI<3.5 = may be wetland, 3.5≤WPI<4.0 = not likely a wetland, and WPI≥4.0 = upland
nm = this attribute was not monitored

Table 11. Vegetation monitoring results for DU Wetlands No. 2 Weir revegetation sites in 2016.

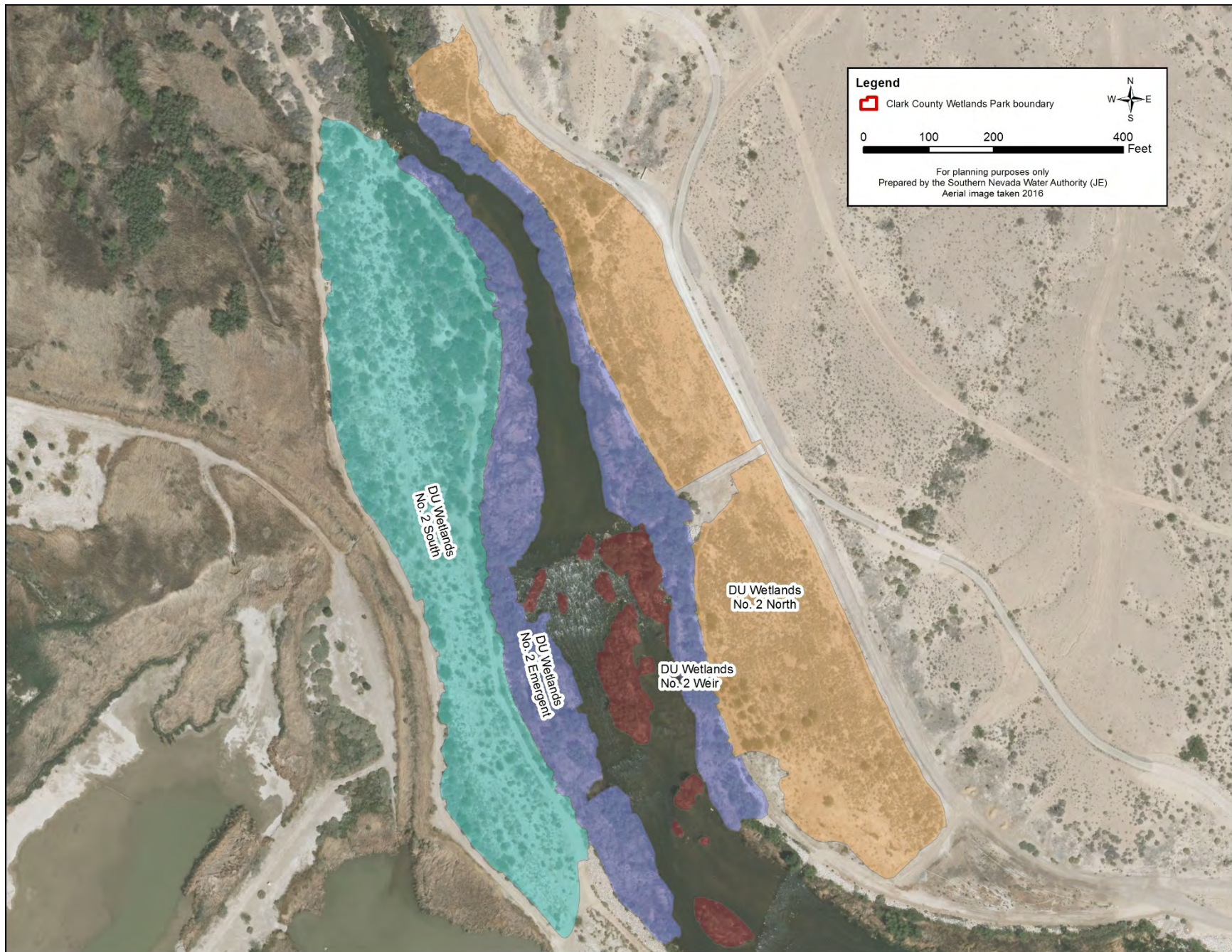


Figure 18. Aerial photograph of 2016 delineated DU Wetlands No. 2 Weir revegetation sites.



Figure 19. DU Wetlands No. 2 South had a diverse mix of vegetation types in 2016.

3.10 Historic Lateral Weir

Seven of the 12 Historic Lateral Weir revegetation sites were monitored in the field in 2016 (Figures 20-22; Table 12) compared to just three in 2015. Nine of the sites are 15 growing seasons old or older and the remaining three are 6-9 years old. This maturity results in not many changes to the sites in terms of vegetative cover. However, construction on the Historic Lateral Weir Expansion, which began in 2017 which will have significant impacts to many of the revegetation sites. First, many sites had some vegetation removed to allow for construction. Second, the water availability is likely to change for other sites with a much larger backwater area being part of the design as well as changes to the weir itself altering the lateral infiltration of water. So, most of the sites that would normally alternate to being monitored using ArcGIS in 2017 were monitored in the field to document the changes resulting from the weir construction more accurately.

Many large changes have already taken place. Upstream Historic Lateral South Soil Stockpile (Figure 20) was cleared after monitoring for a water quality project. Upstream Historic Lateral South Bank-Wetland (UHLSB-W), Upstream Historic Lateral South Bank-Non-wetland

(UHLSB-N; Figure 21), and Upstream Historic Lateral South Upper Plateau 2 (UHLSUP2) all had portions of the site removed in early 2015 to prepare for construction of the Historic Lateral Weir Expansion. Due to delays in the start of construction, much of the formerly vegetated area has come back. UHLSB-W had their monitored areas decreased to reflect the removed vegetation. The other two sites did not. UHLSB-N did not have much of its larger plant material in the area removed so the impact on total vegetative cover was not affected much. By reducing the monitoring area, UHLSB-W maintained the same high total cover, 75-100%. The largest impact was to UHLSUP2 which had 50.7% total cover in 2016 compared to 62.5% in 2015. This site was not altered for monitoring since much of the site will remain once construction is completed but vehicles may use the area which is why the vegetation was cleared.



Figure 20. Upstream Historic Lateral South Soil Stockpile during 2016 monitoring.



Figure 21. Upstream Historic Lateral South Bank non-wetland during monitoring in 2016.

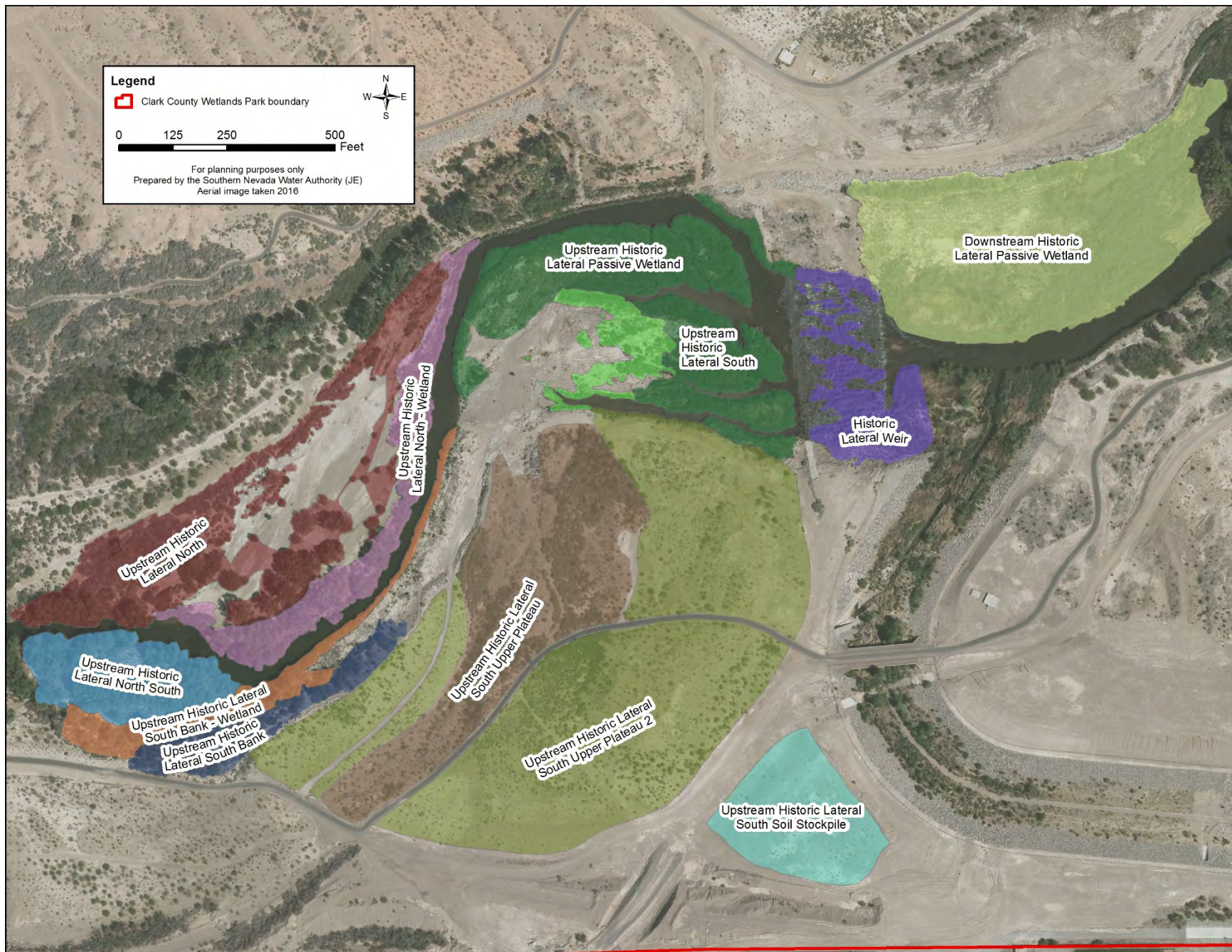


Figure 22. Aerial photograph of 2016 delineated Historic Lateral Weir revegetation sites.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
DHLPW	16	6.70	wet	75-100%	nm	nm	nm
HLW	16	1.55	wet	75-100%	nm	nm	nm
UHLN	16	4.54	non-wet	75-100%	nm	nm	nm
UHLN	16	1.99	wet	75-100%	nm	nm	nm
UHLNS	16	1.76	wet	75-100%	3.5%	9	2.04
UHLPW	15	4.51	wet	75-100%	nm	nm	nm
UHLS	16	0.85	wet	50-75%	2.5%	30	2.24
UHLSB	16	1.12	non-wet	75-100%	0.5%	17	4.46
UHLSB	16	1.17	wet	75-100%	0.1%	23	2.61
UHLSS	6	2.06	non-wet	25-50%	nm	nm	nm
UHLSUP	9	5.17	non-wet	75-100%	2.5%	17	4.42
UHLSUP2	6	12.41	non-wet	50.7%	1.0%	21	4.82

¹DHLPW=Downstream Historic Lateral Passive Wetlands, HLW=Historic Lateral Weir, UHLN=Upstream Historic Lateral North, UHLNS=Upstream Historic Lateral North South, UHLPW=Upstream Historic Lateral Passive Wetlands, UHLS=Upstream Historic Lateral South, UHLSB=Upstream Historic Lateral South Bank, UHLSS=Upstream Historic Lateral South Stockpile, UHLSUP=Upstream Historic Lateral South Upper Plateau, UHLSUP2=Upstream Historic Lateral South Upper Plateau 2

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. WPI≤2.0 =wetland, 2.0<WPI<2.5 = likely wetland, 2.5≤WPI<3.5 = may be wetland, 3.5≤WPI<4.0 = not likely a wetland, and WPI≥4.0 = upland

nm = this attribute was not monitored

Table 12. Vegetation monitoring results for Historic Lateral Weir revegetation sites in 2016.

3.11 Lower Narrows and Homestead Weirs

Three of the six revegetation sites at the Lower Narrows and Homestead Weirs were monitored in the field in 2016 while the remaining three sites were monitored for total cover using ArcGIS (Figure 23; Table 13). All but one of the sites had the same total cover in 2016 as they did in 2015, that is Lower Narrows Homestead North (LNHN). This is one of the largest revegetation sites along the Wash at 40.52 acres. It had 75-100% total cover in 2015 and dropped to 25-50% in 2016. One potential reason was that LNHN was monitored in the field in 2015 and using ArcGIS in 2016. Along with this change in monitoring, being a very large site and not being broken up into smaller monitoring areas like other large sites (Site 108, Site 111), it is difficult to get an accurate estimate of total site cover in the field. Conversely, LNHN is dominated by desert saltbush (75-100% in 2015) which is difficult to observe using ArcGIS. Monitoring data from 2017 will help determine if this sharp change in cover was a result of monitoring methods or an actual change in plant cover. Two of the three wetland sites are passively created on the two weirs themselves (Figure 23). The third, Lower Narrows Homestead Emergent (LNHE), was actively planted with California bulrush (*Schoenoplectus californicus*) and sandbar willow (Figure 24) and has been expanding in size since being planted in the winter of 2012-2013.

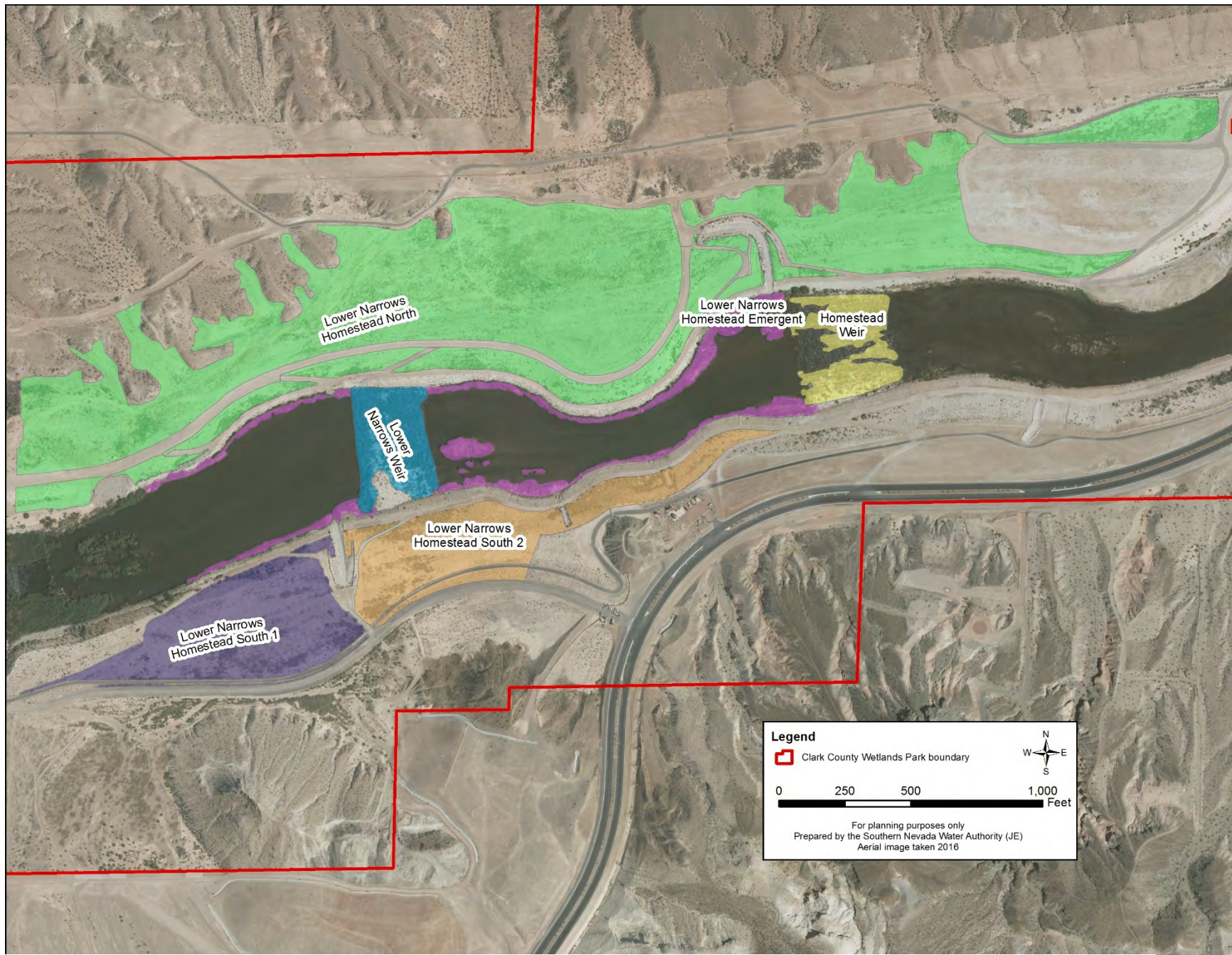


Figure 23. Aerial photograph of 2016 delineated Lower Narrows and Homestead Weirs revegetation sites.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
HW	5	2.47	wet	75-100%	nm	nm	nm
LNW	5	2.60	wet	75-100%	nm	nm	nm
LNHE	5	2.75	wet	75-100%	1.9%	33	1.74
LNHN	5	40.52	non-wet	25-50%	nm	nm	nm
LNHS1	5	7.31	non-wet	50-75%	0.0%	8	4.83
LNHS2	4	6.58	non-wet	50-75%	0.0%	10	4.72

¹HW=Homestead Weir, LNW=Lower Narrows Weir, LNHB-S=Lower Narrows Homestead Bank South, LNHB-N=Lower Homestead Bank North, LNHE=Lower Narrows Homestead Emergent, LNHN=Lower Narrows Homestead North, LNHS1=Lower Narrows Homestead South 1, LNHS2=Lower Narrows Homestead South 2

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 13. Vegetation monitoring results for Lower Narrows and Homestead Weirs revegetation sites in 2016.



Figure 24. California bulrush and sandbar willow at the Lower Narrows Homestead Emergent site.

3.12 Monson and Visitor Center Weirs

Two of the Monson and Visitor Center Weirs' revegetation sites were monitored in the field in 2016 despite none of the four sites being monitored in the field in 2015 (Figure 25 and 26; Table 14). This is due to flood debris, including trash, building up on the Upper Diversion Bridge to

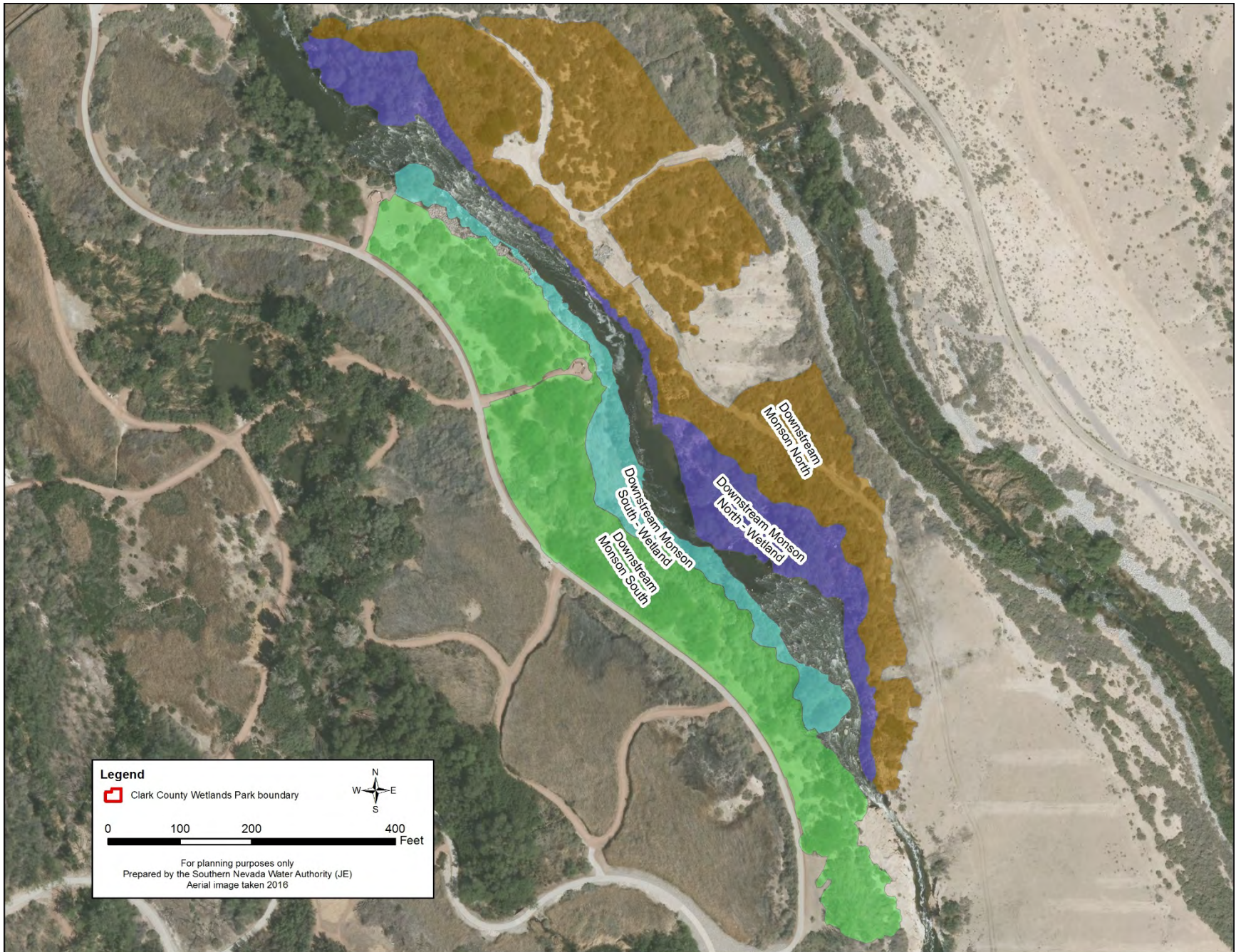


Figure 25. Aerial photograph of 2016 delineated Monson and Visitor Center Weirs revegetation sites.

the point that it is impassable or dangerous to reach the Downstream Monson North-Non-wetland (DMN-N) and Downstream Monson North-Wetland (DMN-W). Because these sites are very mature in their 14th growing season, there is not much change in total cover from year to year. This is supported by all four sites having 75-100% total cover in the last four growing seasons regardless of monitoring method. Crews from the BOR cleared the dense vegetation upstream of the Upper Diversion Bridge along with the trash built up on the weir, allowing access to all of the sites in 2017.



Figure 26. Looking upstream from the Monson Weir in 2016.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
DMN	14	3.85	non-wet	75-100%	nm	nm	nm
DMN	14	1.24	wet	75-100%	nm	nm	nm
DMS	14	2.99	non-wet	75-100%	0.5%	9	4.30
DMS	14	0.74	wet	75-100%	2.5%	14	2.19

¹DMN=Downstream Monson North, DMS=Downstream Monson South

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 14. Vegetation monitoring results for Monson and Visitor Center Weirs revegetation sites in 2016.

3.13 Pabco Road Weir

Four of the 14 revegetation sites associated with the Pabco Road Weir were monitored in the field in 2016. Field monitored sites in 2016 included two of the oldest sites on the Wash; Pabco North-Wetland (PN-W; Figure 27) and Pabco North–Non-wetland (PN-N), both 16 growing seasons old as well as two of the younger sites; Downstream Pabco South Upper Plateau (DPSUP) and Downstream Pabco South Upper Bank (DPSUB), both six growing seasons old (Table 15; Figure 28). All four of these sites were originally planted as volunteer Green-Up events. The remaining ten sites were monitored for total cover using ArcGIS. Pabco Road Weir is the oldest permanent weir along the Wash and as such has some of the oldest revegetation sites. Many of the sites have not had much change in vegetative cover or species composition for many years.

The two older sites monitored in the field in 2016 both had the maximum total cover value at 75-100% cover. PN-W has had this total cover since the current method of monitoring began in 2006. PN-N's total cover has bounced up and down over the years. It had 75-100% total cover six of the last eight years and 50-75% in 2015 and 2012. There haven't been any significant changes that would result in this, just normal changes in plant growth, natural die-off, and damage to plants from wind, weather and herbivory.



Figure 27. Mature riparian trees and shrubs line the bank at the Pabco North-Wetland revegetation site in 2016.

The two younger Pabco Road sites monitored in 2016 both had 50-75% total cover in 2016. DPSUP has been at this cover level for most of its six growing seasons with a slight increase in 2014 and 2012. However, 2016 marked the lowest species richness in the six years of monitoring at 23. This is 17 less species than the highest recorded in 2013 and two less species than the previous year. For a non-wetland site, this isn't unusual since many annuals and biannuals will die off. The hope is that seeding will take place and the species will continue to exist although perhaps in smaller numbers. There were only 13 species planted on the site in 2011, so the additional 10 species are all self-established. Two of the original 13 species are no longer found on the site; desert holly (*Atriplex hymenelytra*) and desert marigold (*Baileya multiradiata*). Desert holly was planted in very small numbers and may have been crowded out by more aggressive species on the site. It was only observed in the first year of monitoring in 2011 with just 0.06% cover. Desert marigold is a biannual and unfortunately was last observed in 2015. This small native forb had 1-5% cover in 2011 but less than 1% each year from 2012-2015.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
DPI	16	1.09	wet	75-100%	nm	nm	nm
DPN	8	9.41	non-wet	75-100%	nm	nm	nm
DPNB	5	0.80	wet	75-100%	nm	nm	nm
DPS	16	4.31	wet	75-100%	nm	nm	nm
DPSUB	6	0.89	non-wet	50-75%	0.1%	20	3.09
DPSUP	6	9.86	non-wet	50-75%	0.3%	23	4.55
PN	16	3.34	non-wet	75-100%	2.5%	16	3.36
PN	16	0.84	wet	75-100%	2.5%	14	2.16
PS	16	1.19	non-wet	75-100%	nm	nm	nm
PS	16	0.39	wet	75-100%	nm	nm	nm
UPI	16	0.29	wet	75-100%	nm	nm	nm
UPN	11	2.71	wet	75-100%	nm	nm	nm
UPS*	15	4.52	wet	75-100%	nm	nm	nm
UPSUP	15	2.19	non-wet	75-100%	nm	nm	nm

¹DPI=Downstream Pabco Island, DPN=Downstream Pabco North, DPNB=Downstream Pabco North Bank, DPS=Downstream Pabco South, DPSUB=Downstream Pabco South Upper Bank, DPSUP=Downstream Pabco South Upper Plateau, PN=Pabco North, PS=Pabco South, UPI=Upstream Pabco Island, UPN=Upstream Pabco North, UPS=Upstream Pabco South, UPSUP=Upstream Pabco South Upper Plateau

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

* UPS includes Upstream Pabco South Lower Plateau

nm = this attribute was not monitored

Table 15. Vegetation monitoring results for Pabco Road Weir revegetation sites in 2016.

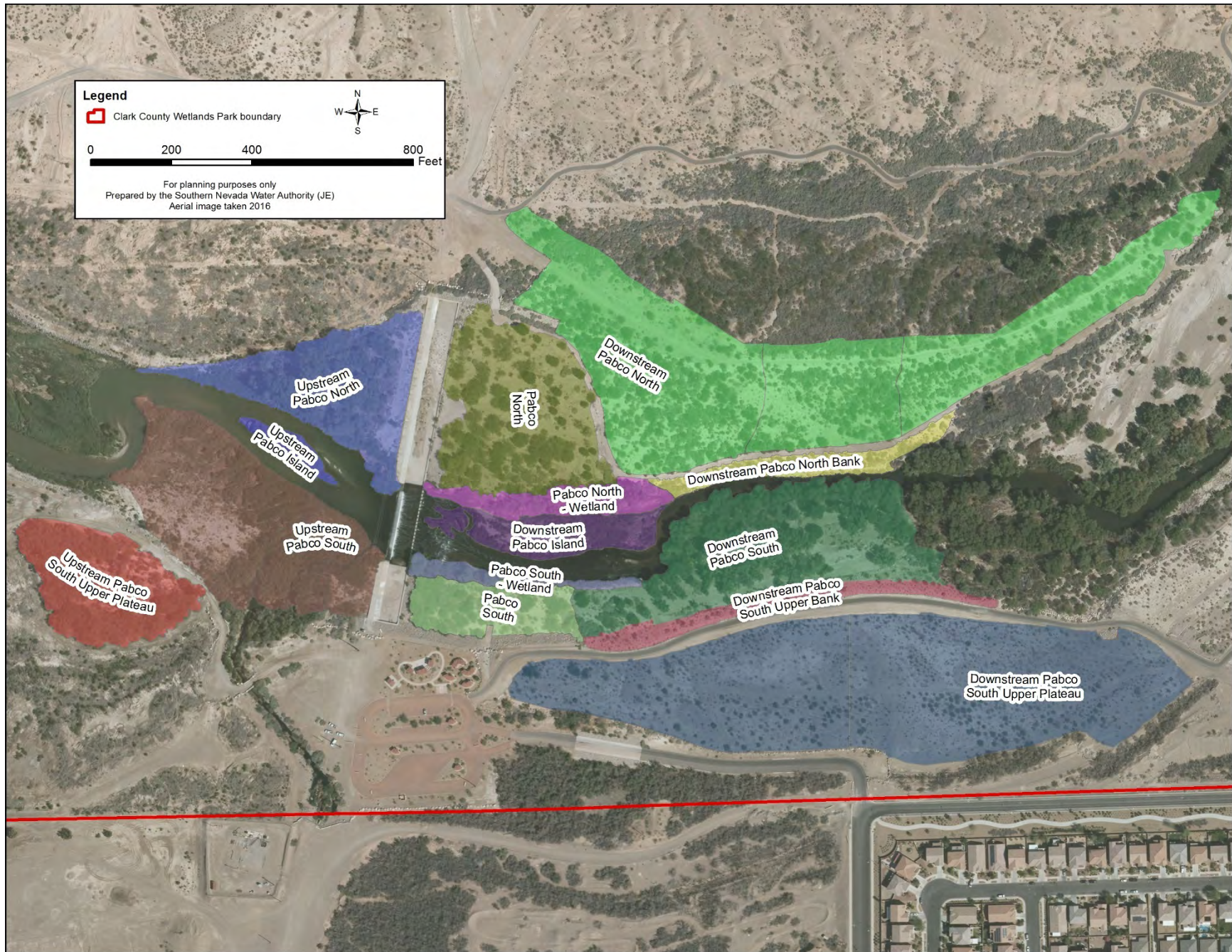


Figure 28. Aerial photograph of 2016 delineated Pabco Road Weir revegetation sites.

3.14 Powerline Crossing Weir

All but one of the Powerline Crossing Weir revegetation sites were monitored in the field in 2015 (Table 16; Figure 29). As a result, since these sites are now in their tenth growing season, they were not monitored in the field in 2016. The tenth revegetation site was the passive wetlands that established on the Powerline Crossing Weir itself. This site was removed in 2016 to improve weir function and at the time of the 2016 monitoring, no new vegetation had established on the weir.

Using ArcGIS to measure the total vegetative cover on the remaining nine sites, only two had a different total cover in 2016 compared to the field measured results in 2015. These sites are Upstream Powerline South Plateau (UPLSP) and Upstream Powerline North Bank (UPLNB). UPLSP decreased from 71.8% to 60.9%. This site is made up of four monitoring areas and the total cover is the weighted average of those four areas that range from 0.65 to 4.03 acres. UPLNB increased from 5-25% to 25-50%. This site had been 5-25% cover for the previous five monitoring years. 2017 monitoring data will show if this was a result of the changing method of measurement or if the site indeed has changed in terms of plant growth.

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
DPLNB	10	0.25	wet	75-100%	nm	nm	nm
DPLSB	10	0.31	wet	75-100%	nm	nm	nm
PLSB	10	0.56	non-wet	75-100%	nm	nm	nm
UPLNB	10	0.64	non-wet	25-50%	nm	nm	nm
UPLNE	10	1.10	wet	75-100%	nm	nm	nm
UPLNP	10	4.09	non-wet	54.0%	nm	nm	nm
UPLNW	10	0.35	wet	75-100%	nm	nm	nm
UPLSB	10	0.92	wet	75-100%	nm	nm	nm
UPLSP	10	5.61	non-wet	60.9%	nm	nm	nm

¹DPLNB=Downstream Powerline North Bank, DPLSB=Downstream Powerline South Bank, PCW=Powerline Crossing Weir, PLSB=Powerline South Bank, UPLNB=Upstream Powerline North Bank, UPLNE=Upstream Powerline North Emergent, UPLNP=Upstream Powerline North Plateau, UPLNW=Upstream Powerline North Wetland, UPLSB=Upstream Powerline South Bank, UPLSP=Upstream Powerline South Plateau

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 16. Vegetation monitoring results for Powerline Crossing Weir revegetation sites in 2016.

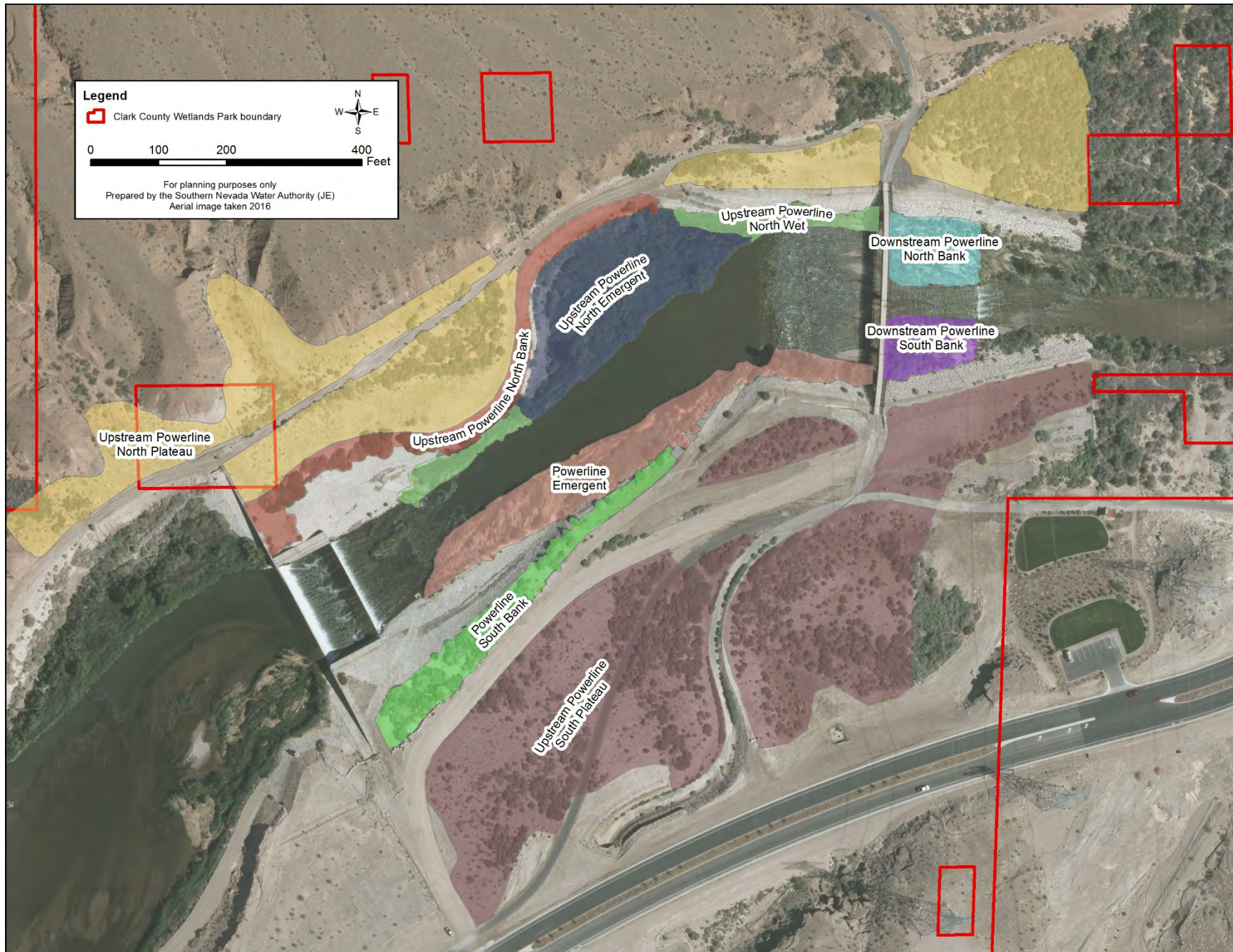


Figure 29. Aerial photograph of 2016 delineated Powerline Crossing Weir revegetation sites.

3.15 Rainbow Gardens Weir

Five of the eight revegetation sites at the Rainbow Gardens Weir were monitored in the field in 2016 (Table 17; Figure 30). The remaining three sites had their total cover measured using ArcGIS. Only one of the three sites, Upstream Rainbow North Bank (URNB), was an actively planted site and has field measurements taken in alternating years now that it is a mature site. The other two sites, Upstream Rainbow Island (URI) and Upstream Rainbow North Passive Wetland (URNPW), are both passively created wetlands in the Wash channel itself and will likely not be field monitored as it is difficult and potentially dangerous to access the sites on foot.

One new site was monitored in 2016, Upstream Rainbow South Bank 2 (URSB2). It is a passively created wetland revegetation site. This site had portions present prior but was never monitored. Although there were wetland areas present in previous years, the construction of the Three Kids Weir combined with increased water area from the removal of much of the Rainbow Islands resulted in substantial alteration to the site (Figure 31). It was monitored in the field in 2016 and had 11 species identified and a total cover of 75-100%

Site Code ¹	Growing Season	Acreage	Wetland Status ²	Total Cover	Noxious Species Cover	Number of Species	WPI ³
RI	12	0.52	wet	75-100%	0.0%	5	1.53
URI	12	1.22	wet	75-100%	nm	nm	nm
URNB	7	1.58	non-wet	25-50%	nm	nm	nm
URNPW	12	1.99	wet	75-100%	nm	nm	nm
URSB1	11	0.02	non-wet	50-75%	0.0%	2	2.92
URSB2	1	0.44	non-wet	75-100%	2.5%	11	2.52
URSE	12	0.63	wet	75-100%	37.5%	8	2.70
URSP	11	1.39	non-wet	5-25%	0.0%	6	4.91

¹RI=Rainbow Islands, URI=Upstream Rainbow Island, URNB=Upstream Rainbow North Bank, URNPW=Upstream Rainbow North Passive Wetlands, URSB1=Upstream Rainbow South Bank 1, URSB2=Upstream Rainbow South Bank 2, URSE=Upstream Rainbow South Emergent, URSP=Upstream Rainbow South Plateau

²Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

³Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland
nm = this attribute was not monitored

Table 17. Vegetation monitoring results for Rainbow Gardens Weir revegetation sites in 2016.

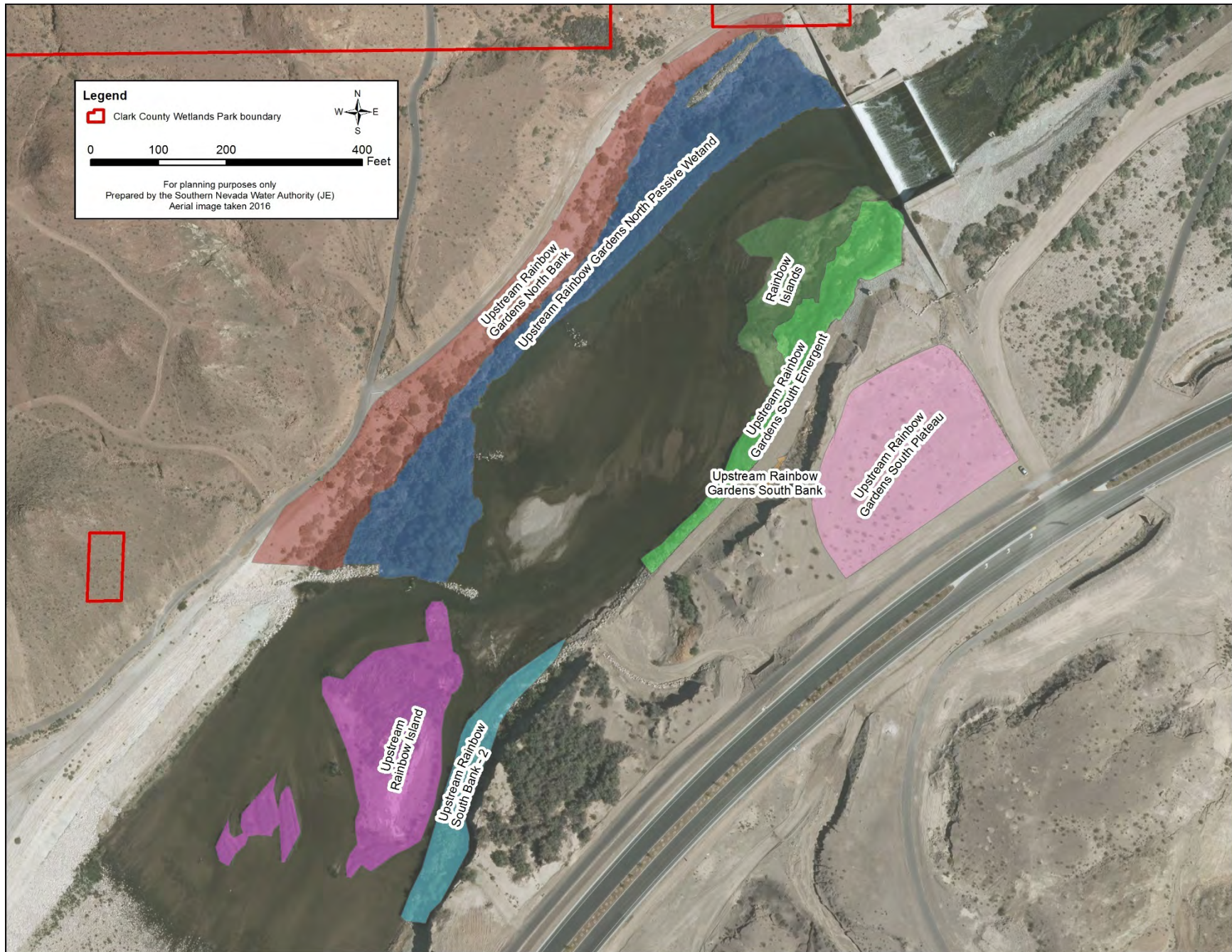


Figure 30. Aerial photograph of 2016 delineated Rainbow Gardens Weir revegetation sites.



Figure 31. Rainbow Islands revegetation site in 2016.

3.16 Site 108

All of Site 108 was monitored for total cover using ArcGIS in 2015, therefore it was measured in the field again in 2016 (Table 18). This is the largest revegetation site along the Wash. Parts were planted in spring of 2006 and the remainder planted in the following fall. In general, Site 108 as a whole was similar in all of the monitoring characteristics in 2016 as compared to the last field monitoring in 2014. There was a decrease in cover of alkali sacaton from 20.9% to 9.7% and a slight increase in cover of quailbush from 11.1% to 15.2%. Many individual monitoring areas were dominated by screwbean mesquite (*Prosopis pubescens*; Figure 32) and honey mesquite (*Prosopis glandulosa* var. *torreyana*). The total vegetative cover of the site also decreased slightly from 64.0% to 58.1%. This minor change in total cover can be a result of multiple factors. This includes decreased vigor of plants due to climatic conditions in 2016 or the weeks and months prior to monitoring. However, the change is not very substantial and therefore is not of concern regarding the health of the site. Subsequent monitoring will reveal if this is a trend or simply a one-year dip in plant cover.

The total project was funded through four different grants (Figure 33) from the NDEP, NDSP, and the fourth and fifth rounds of the SNPLMA administered by the BLM. To monitor this large site, it was broken up into smaller areas and each area has all of the attributes calculated and then a weighted average of all of them is used to determine the total site information. The exception is species richness which is the sum of all the unique species found through all of the monitoring areas. In 2016, there were 55 monitoring areas. This is down from 2015 where there were 64.

Funding Areas	Growing Season ³	Acreage	Wetland Status ¹	Total Cover	Noxious Species Cover	Number of Species	WPI ²
NDEP	10	7.75	non-wet	49.6%	0.9%	11	4.11
NDSP	10	12.57	non-wet	69.5%	1.2%	14	3.68
SNPLMA IV	10	8.61	non-wet	67.0%	4.9%	10	2.57
SNPLMA V	10	11.59	non-wet	45.8%	3.8%	11	3.50
TOTAL	10	40.52	non-wet	58.0%	2.7%	18	3.47

¹Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual.

"wet" = wetland and "non-wet" = non-wetland

²Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

³Portions of funding areas SNPLMA IV and SNPLMA V were planted in the spring of 2006 and others in the fall of 2006

nm = this attribute was not monitored

Table 18. Vegetation monitoring results for Site 108 revegetation site in 2016.



Figure 32. Screwbean mesquites are dense in certain areas of Site 108 in 2016.

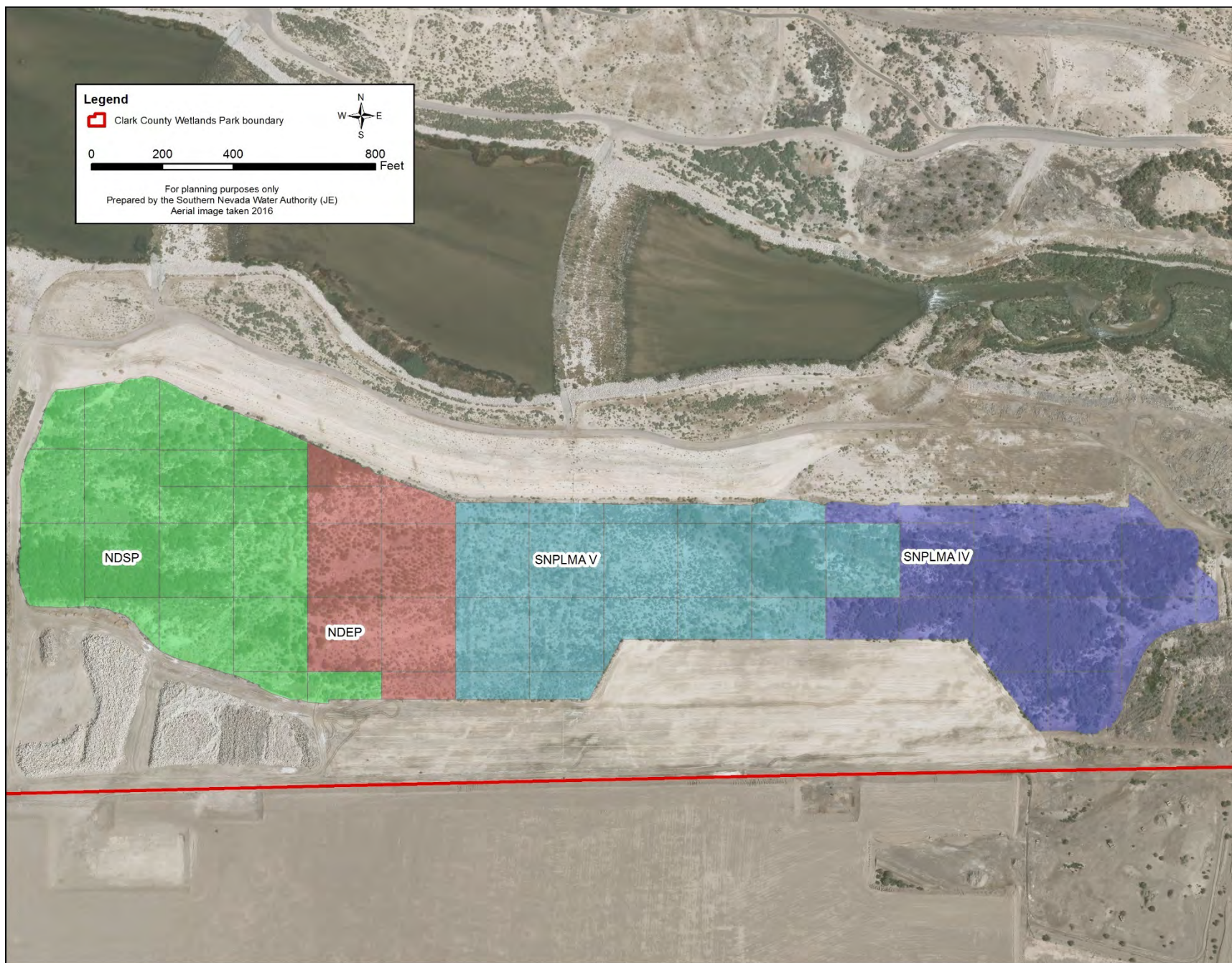


Figure 33. Aerial photograph of Site 108 with 2016 delineations based on funding source.

3.17 Site 111

Another one of the largest revegetation sites along the Wash is Site 111. This site is almost 15 acres in size and was planted in the spring of 2007. The site is primarily an upland saltbush community combined with areas dominated by mesquites (Figure 34) and a small wash located on the eastern end of the site is dominated by large cottonwoods. Similarly to Site 108, this site was broken up into smaller areas to be able to monitor it effectively (Figure 35). Also like Site 108, there has been little change in the past few years regardless of monitoring method.

In 2016, Site 111 had a total cover of 78.9% (Table 19). This is a slight increase over 2015 when it was 75.5% as monitored using ArcGIS. In 2014, the last year it was monitored in the field, the total cover was 75.7%. Most individual species had similar cover values in 2016 as compared to 2014 as well. However, cottonwoods which are only located in the Wash on the eastern side of the site doubled in cover from 4.2% to 8.4%. No new individuals of cottonwood trees were identified; this expansion is a result of the growth of the existing trees. The construction of the Historic Lateral Weir Expansion downstream may have an impact on the groundwater on this site, especially in the lower areas such as where the cottonwoods are located. The new project will create a larger backwater behind the weir which may allow for further groundwater intrusion which may be beneficial for plant growth. This project is scheduled to be completed in 2019.



Figure 34. Honey mesquites fill in a pathway at Site 111 in 2016.

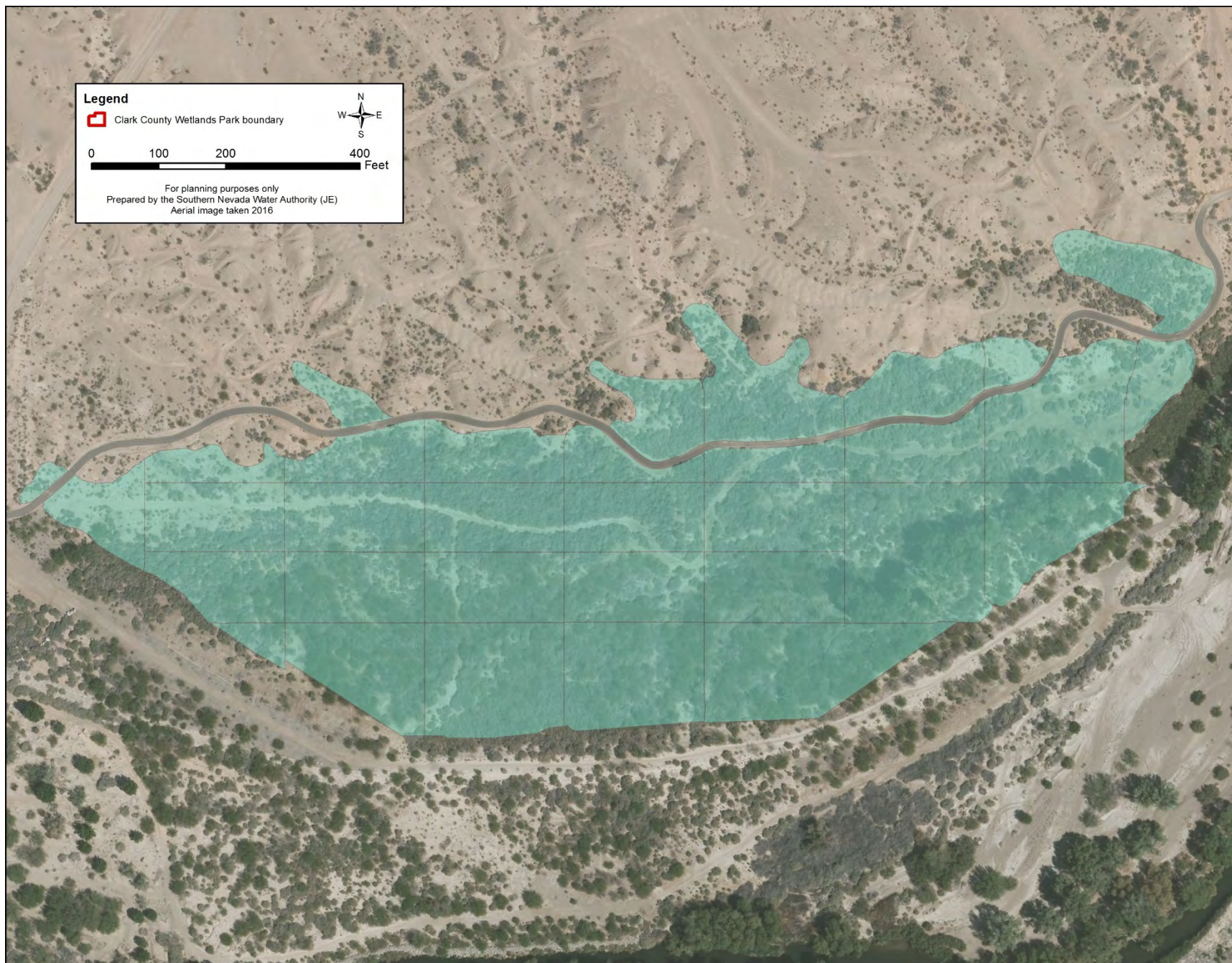


Figure 35. Aerial photograph of the 2016 delineated Site 111 revegetation site.

Site Code	Growing Season	Acreage	Wetland Status	Total Cover	Noxious Species Cover	Number of Species	WPI ²
S111	10	14.61	non-wet	78.9%	2.4%	11	3.69

¹Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual.

"wet" = wetland and "non-wet" = non-wetland

²Wetland Prevalence Index (WPI) value. WPI \leq 2.0 = wetland, 2.0 < WPI < 2.5 = likely wetland, 2.5 \leq WPI < 3.5 = may be wetland, 3.5 \leq WPI < 4.0 = not likely a wetland, and WPI \geq 4.0 = upland

nm = this attribute was not monitored

Table 19. Vegetation monitoring results for Site 111 revegetation site in 2016.

3.18 Three Kids Weir

The newest weir along the Wash is the Three Kids Weir (Figure 36; Table 20). This weir replaced the Demonstration Weir and is located in the same general area. The Demonstration Weir was a temporary structure without adequate design, as such, it failed on multiple occasions. The Three Kids Weir located downstream of the Demonstration Weir site is much larger and created a much larger backwater, inundating what remained of the Demonstration Weir.

There were four revegetation sites at the Three Kids Weir at the time of monitoring in 2016 (Table 20; Figure 36). All of the sites are wetland sites. Two of the sites are very unique compared to most other Wash revegetation sites. Lower Narrows Homestead Bank–North (LNHB-N) and Lower Narrows Homestead Bank–South (LNHB-S) are the banks that were installed in association with the Lower Narrows and Homestead Weirs located just upstream from the Three Kids Weir. As part of the construction of the Three Kids Weir, excess soil was deposited on top of the rock bank protection on both the north and south side of the Wash (Figure 37). Each site is about 30 feet wide and 2800 feet long. This has provided a substantial amount of area that can be planted with riparian and semi-riparian species that wouldn't be able to be planted otherwise.

All four Three Kids Weir wetland sites had at least some active planting. However, like most wetland areas, there is a substantial amount of plant materials that passively established on the sites. This may be especially so in sites such as these since they are located at the lower end of Wash and seeds and plant material from all the sites upstream can get lodged in the open soil here. In addition, LNHB-N and LNHB-S were created adjacent to the wetland sites on the north and south side of Lower Narrows and Homestead Weirs.

Another unique site at the Three Kids Weir is the Upstream Three Kids North Bank (U3KNB) site. This site is just over three acres in size. The majority is above the water level by a foot or two and needed to be actively planted. It was planted with wetland and riparian plants and should not need much irrigation if any to complete establishment. The banks were passively established. Many plants passively established on the upper portion as well. There were five species that had 5-25% cover. Three of them were passively established: southern cattail (*Typha domingensis*), cocklebur (*Xanthium strumarium*), and common reed. The two species that were planted were sandbar willow and Goodding's willow.

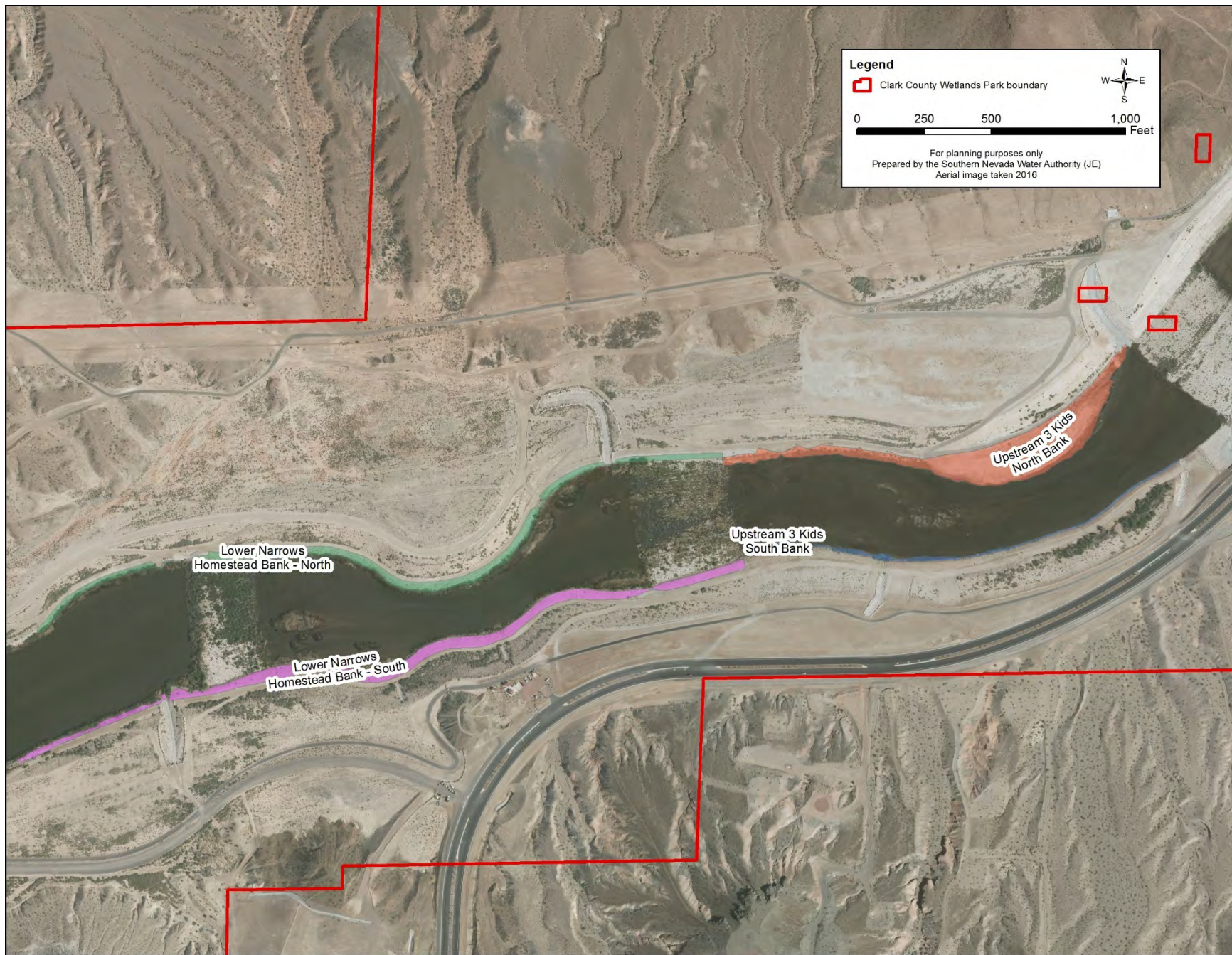


Figure 36. Aerial photograph of 2016 delineated Three Kids Weir revegetation sites.

Site Code	Growing Season	Acreage	Wetland Status	Total Cover	Noxious Species Cover	Number of Species	WPI ²
LNHB-N	1	1.75	wet	50-75%	0.5%	20	1.52
LNHB-S	1	2.04	wet	50-75%	0.5%	20	1.67
U3KNB	1	3.03	wet	25-50%	2.6%	33	2.24
U3KSB	1	0.53	wet	75-100%	2.5%	27	1.79

¹U3KNB= Upstream Three Kids North Bank, U3KSB= Upstream Three Kids South Bank

¹Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

²Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland

nm = this attribute was not monitored

Table 20. Vegetation monitoring results for Three Kids Weir revegetation sites in 2016.



Figure 37. Riparian plants on the Lower Narrows Homestead Bank South revegetation site are planted in fill soil from the Three Kids Weir.

3.19 Upper Diversion Weir

All but one of the revegetation sites at the Upper Diversion Weir were monitored in the field in 2016. The one exception, Upper Diversion Island (UDI), was scheduled to be monitored in the field after using ArcGIS in 2015 but debris built up on the Upper Diversion Weir made it unsafe to access the site. The debris and most of the vegetation upstream of the weir (Figure 38) was cleared in the winter months following monitoring allowing the site to be field monitored in 2017.

All of the revegetation sites at the Upper Diversion Weir have over 70% vegetative cover (Figure 39; Table 21). The site with the lowest cover, Downstream Upper Diversion North (DUDN), had a cover of 71.7% which was a weighted average of the total cover of three monitoring areas that break up the nearly 10-acre site. This is 0.1% lower than 2015 when ArcGIS was used to collect total cover estimates and the exact same as the total cover in 2014 when it was last monitored in the field. All of the other sites had the highest cover range of 75-100%. All of these sites have had the same total cover for at least the past three growing seasons.

While noxious weed cover across all sites was low in 2016, there was one concern. Salt cedar was the only species found on any site with noxious species cover except for Upper Diversion Island Emergent (UDIE). There was an individual green fountaingrass (*Pennisetum setaceum*) found on the site increasing the noxious species cover by 0.1%. This grass was used extensively in landscaping in the Las Vegas Valley for many years before being added to the Nevada State List of Noxious Weeds. It has become a problem in many waterways in the southwestern United States and is just beginning to encroach on the Wash. It is being treated when identified. However, sites such as UDIE are relatively difficult to access and successful herbicide application may be hard to achieve. Further monitoring will determine if larger efforts must be made to control this species along the Wash.



Figure 38. Dense wetland vegetation fills the backwater behind the Upper Diversion Weir in 2016.

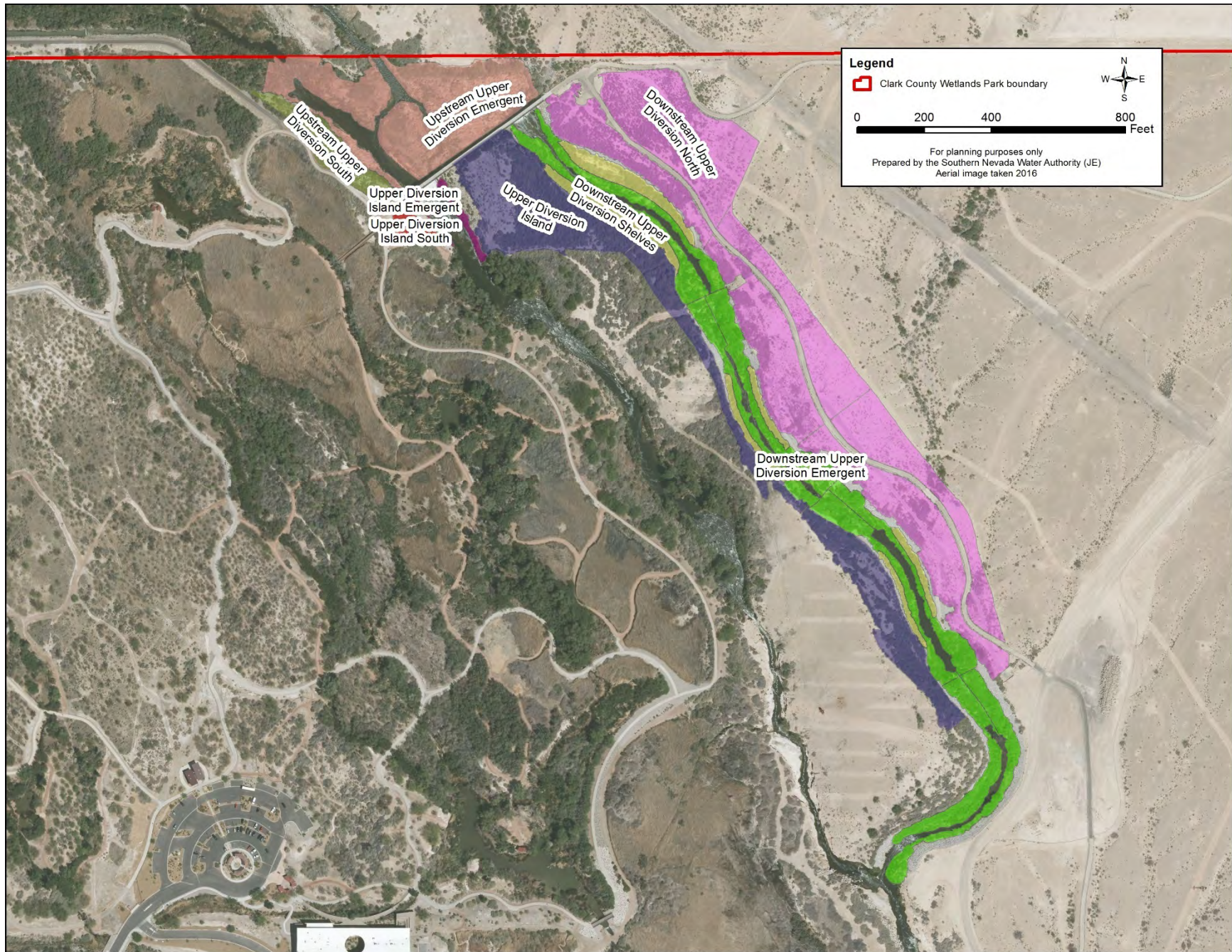


Figure 39. Aerial photograph of 2016 delineated Upper Diversion Weir revegetation sites.

Site Code	Growing Season	Acreage	Wetland Status	Total Cover	Noxious Species Cover	Number of Species	WPI ²
DUDE	8	4.69	wet	75-100%	0.7%	18	1.60
DUDN	8	9.74	non-wet	71.7%	0.0%	5	4.94
DUDS	8	1.44	wet	75-100%	2.5%	8	2.38
UDI	8	5.05	non-wet	75-100%	nm	nm	nm
UDIE	8	0.19	wet	75-100%	2.6%	10	1.83
UUDE	8	3.65	wet	75-100%	0.5%	12	1.49
UUDS	8	0.76	non-wet	75-100%	0.0%	3	2.00
UDIS	8	0.21	non-wet	75-100%	0.0%	5	4.69

¹DUDE=Downstream Upper Diversion Emergent, DUDN=Downstream Upper Diversion North, DUDS=Downstream Upper Diversion Shelves, UDI=Upper Diversion Island, UDIE=Upper Diversion Island Emergent, UUDE=Upstream Upper Diversion Emergent, UUDS=Upstream Upper Diversion South, UDIS=Upstream Upper Diversion Island South

¹Wetland status resulting from a JD (i.e., jurisdictional determination) conducted according to the Corps' 1987 Wetland Delineation Manual. "wet" = wetland and "non-wet" = non-wetland

²Wetland Prevalence Index (WPI) value. $WPI \leq 2.0$ = wetland, $2.0 < WPI < 2.5$ = likely wetland, $2.5 \leq WPI < 3.5$ = may be wetland, $3.5 \leq WPI < 4.0$ = not likely a wetland, and $WPI \geq 4.0$ = upland
nm = this attribute was not monitored

Table 21. Vegetation monitoring results for Upper Diversion Weir revegetation sites in 2016.

4.0 CONCLUSIONS

The status of revegetation sites along the Wash in 2016 demonstrates success in terms of growing plant cover, plant survivorship, reduction of noxious weeds, and overall ecological health. Of the 126 total sites monitored, (S108, S111, and CCWRD are considered one site each), 83 (65.9%) had the same cover as they did in 2015, 16 (12.7%) increased in cover, and 12 (9.5%) decreased in cover. The remaining 15 (11.9%) sites were first monitored in 2016, including 11 from the new Three Kids, Archery, and Silver Bowl Weirs. ArcGIS was used to measure the total cover for 49 (38.9%) of the sites.

All but one of the 12 sites that decreased in total cover from 2015 to 2016 were non-wetland sites. Upstream Demonstration South-Wetland was the only wetland site that decreased in cover. This site was impacted by the construction of the Three Kids Weir and is no longer suitable for wetland vegetation. However, the bank protection upstream of the Three Kids Weir which had soil installed on top of it was planted in 2016 and already had 50-75% cover essentially replacing the wetlands lost here. Two of the sites (Downstream Upper Diversion North and Cottonwood Cell North Stockpile) decreased by less than 1% each. Of the remaining nine non-wetland sites that decreased in cover, none did so by more than one cover range (i.e. 75-100% to 50-75%, 50-75% to 25-50%, etc.). This is not unexpected with non-wetland sites nor is it a cause for concern regarding the overall health of the site. Because sites are irrigated for the first few growing season, there is unnaturally high growth rates among plants and establishment by some plants that would otherwise not be found in such dry areas. Once irrigation ceases, there is often die-back of these plants that self-established on the irrigated site that cannot survive on rainfall alone. In addition, desert areas

are naturally self-limiting due to low water availability and recruitment is slower than riparian and wetland areas.

Although there is not currently concern regarding the occasional decline in vegetative cover on non-wetland sites. All sites are currently being evaluated for potential enhancements beyond the regular removal of non-native vegetation. Sites older than five growing seasons typically do not have substantial germination of new species. These sites are being evaluated to see if the addition of specific types of plants will increase the ecological function of the site. For example, a site dominated by shrubs may benefit by having trees planted while a site dominated by trees may provide more wildlife habitat if it had an understory of shrubs. Data presented in this report will be used to evaluate each site in the coming years.

5.0 LITERATURE CITED

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