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Las Vegas Wash Vegetation Monitoring Report, 2014

September 2015

SOUTHERN NEVADA WATER AUTHORITY

Las Vegas Wash Coordination Committee

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Vegetation Monitoring Report, 2014

SOUTHERN NEVADA WATER AUTHORITY
Las Vegas Wash Project Coordination Team

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Las Vegas Wash Coordination Committee

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September 2015

ABSTRACT

Revegetation projects have been conducted along the Las Vegas Wash for over 14 years to meet the goals of the Las Vegas Wash Coordination Committee. In the fall of 2014, when monitoring for this report took place, approximately 384 acres of revegetation at 248 monitoring areas along the Las Vegas Wash were established. Over 94 of these acres are wetland, with the remaining 290 being described as non-wetland. Sites ranging in age from 1 to 14 growing seasons had total cover, noxious species cover, species richness, and the wetland prevalence index documented. Survivorship was calculated for the four most recently established sites with an average of 83.1% of the planted plants surviving until monitoring. Overall, most revegetation sites either increased in cover or remained constant since 2013; only 10.4% of the sites decreased in cover. Most mature sites have stabilized and cover does not change much between growing seasons.

ACKNOWLEDGEMENTS

Many people have helped to make monitoring of the Las Vegas Wash Revegetation Program a success and even more have contributed to the success of the Revegetation and Restoration Program in general. Specifically, I would like to thank the following people for their assistance in monitoring and management of revegetation sites along the Las Vegas Wash: Carol Lane, Nick Rice, Tim Ricks, and Debbie Van Dooremolen. In addition, I would like to specifically thank Giles Anthony and Soil-Tech for planting and maintaining these Las Vegas Wash revegetation sites. Keiba Crear has been a central figure in advocating for rigorous monitoring and proper maintenance, and I thank you. Thank you to the many people who reviewed this document and provided invaluable comments. Finally, I would like to thank the 29 members of the Las Vegas Wash Coordination Committee and the members of the 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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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 are planted to help further protect the Wash from erosion, as well as to improve the functional attributes of the ecosystem.

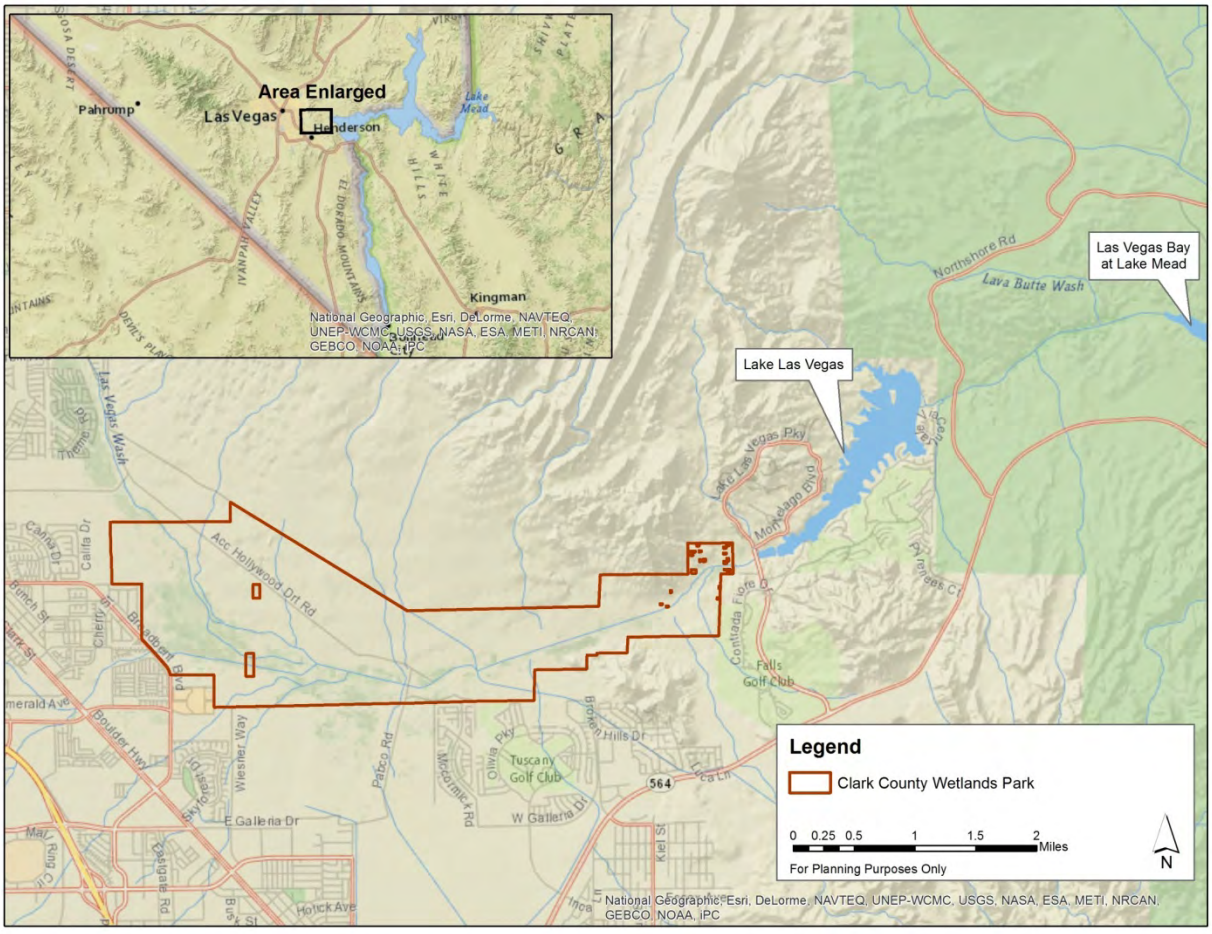

Figure 1. Las Vegas Wash location and general study area map.

The revegetation program is a critical component of the overall plan to stabilize and enhance the Wash. Plants help prevent erosion because their roots bind loose soil particles on the surface and in deep subsurface horizons, thereby acting as soil anchors during scouring events (i.e., floods). In addition, revegetation benefits a variety of wildlife species that occur along the Wash and potentially provide habitat for species formerly found to reestablish there. Because the Wash was not historically a riverine system, it does not have an abundance of source plants native to these conditions. Moreover, during its transitional period, 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 the surrounding 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 2014 data as part of a comprehensive vegetation monitoring program. Vegetation monitoring results from 2002 through 2013 have been previously documented (SNWA 2005, Eckberg and Shanahan 2008, Eckberg 2014a, and Eckberg 2014b); therefore, they are not described in detail in this report. A variety of other monitoring programs have been conducted to help describe the benefit of the ecological changes along the Wash for wildlife (Shanahan 2005a, Shanahan 2005b, Van Dooremolen 2010, O'Farrell and Shanahan 2006, Rice 2007); subsequently, these data are also not included in this report. Since 2003, monitoring activities have been conducted on progressively larger land areas. Approximately 38-acres were monitored in 2003 and approximately 384-acres monitored in 2014. 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). The only exception is the Clark County Water Reclamation District (CCWRD) revegetation sites, which are located just north of the CCWP (Figure 2).

1.3 Need for Revegetation and Vegetation Monitoring

Revegetation projects along the Wash are conducted for a few important reasons. Revegetation is a compensatory mitigation requirement for the 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. Section 404 of the CWA established a program to regulate the discharge of dredged or fill material into waters of the U.S., which include 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, not that they met specific numerical criteria.

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 projects. NDEP issues stormwater general permits for construction activities such as building erosion control facilities, 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 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)"…Vegetation monitoring is an important tool for documenting vegetation cover and achievement of permit conditions.

In addition to permit-required revegetation, projects are also required by federal and state grants received by SNWA 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 Wash Capital Improvements Plan (Wash CIP). The Wash CIP exclusively funds revegetation activities stipulated in federal or state permits (e.g., wetland permits) obtained by SNWA as part of weir construction. In contrast, funding from various grants have been used to supplement the majority of revegetation projects implemented along the Wash. 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 Lands Management Act (SNPLMA IV, SNPLMA V, and SNPLMA VI); however, the majority of these grants have only provided funds for the implementation of specific revegetation projects. Once these areas have been established, the only source of funding for ensuring successful plant establishment have been grants provided by the BOR.

1.5 Typical Maintenance Activities

Maintenance activities help to ensure the long-term success of revegetation sites and positively impact annual monitoring results.

1.5.1 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. Other invasive species that are found on sites and require constant monitoring are tall whitetop, silver-leaf nightshade, red brome, and Johnsongrass. 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 and quailbush can grow so vigorously that they outcompete native species that are trying to establish. 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 species-rich environment.

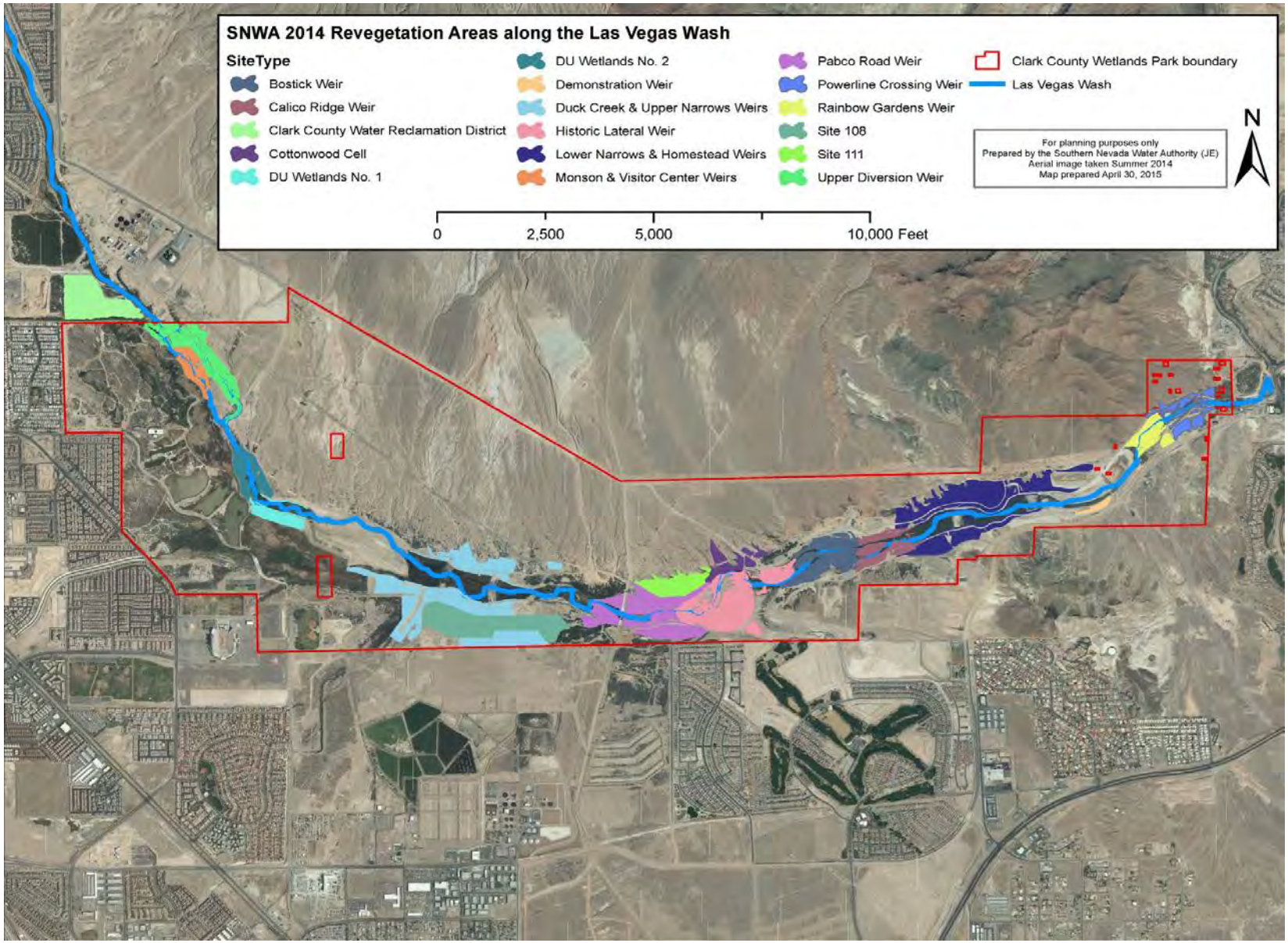

Figure 2. Location of the 2014 Las Vegas Wash revegetation sites and the Clark County Wetlands Park boundary.

1.5.2 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.

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.

1.5.3 Other Maintenance Activities

There are a variety of other maintenance activities that are conducted along the Wash that are not described in Sections 1.5.1 and 1.5.2. One of these is trash removal. Furniture, landscape waste, and many other types of trash have been found. 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. Other maintenance activities that are addressed include damage caused by off-road vehicles, graffiti, and other acts of vandalism.

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 maintained to continually inspect for damage, make repairs, and adjust the spacing of the fences (so that plant growth is not reduced).

2.0 MATERIALS AND METHODS

Monitoring was conducted between August and October 2014, and the methods followed the same guidelines. As of August 2014, there were 49 wetland and 51 non-wetland revegetation sites. Many of the non-wetland sites were broken up into multiple monitoring areas (Table 1).

ArcGIS was used to monitor 38 of the 100 total revegetation sites in 2014 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). All species documented during vegetation monitoring were crosschecked using the Integrated Taxonomic Information System (ITIS; www.itis.gov) to ensure that the scientific name is currently valid. Each plant species is assigned a Wetland Indicator Status by the National Wetland Plant List (Lichvar 2013) which is also updated annually.

3.0 RESULTS AND DISCUSSION

The following subsections describe monitoring results for each site and for groupings of sites. From 2013 to 2014, the number of areas monitored decreased by 11, while the acreage increased by 10.4 (Table 1). The total areas and acreage include sites monitored in the field as well as with ArcGIS. The decrease can largely be attributed to the removal of areas at the southern end of Site 108. These poor performing areas were cleared and new soil from nearby construction projects were deposited there.

Cumulatively, there have been 44.34 acres of wetlands created above those required by mitigation permits (Table 2); including, 3.64 acres associated with the Cottonwood Cells, which were fully funded by grants from the BOR. Federally funded projects such as these are not eligible for use as mitigation of wetlands impacted in accordance with permits issued by the Corps.

Major Site	Acreage		No. of Monitoring Areas	
	2013	2014	2013	2014
Bostick Weir	24.3	26.0	13	14
Calico Ridge Weir	14.0	15.1	10	10
CCWRD	28.9	28.9	29	29
Cottonwood Cells	10.1	10.3	10	10
Demonstration Weir	2.6	2.2	2	2
Duck Creek Confluence and Upper Narrows Weirs	0.9	27.4	2	6
DU Wetlands No. 1 Weir	8.1	8.7	3	3
DU Wetlands No. 2 Weir	10.3	12.7	4	4
Historic Lateral Weir	44.1	42.1	13	13
Lower Narrows and Homestead Weirs	67.9	58.0	6	6
Monson and Visitor Center Weirs	9.0	8.9	4	4
Pabco Road Weir	38.7	39.5	18	18
Powerline Crossing Weir	14.7	13.6	17	16
Rainbow Gardens Weir	11.3	10.4	6	6
Site-108	50.7	40.6	72	59
Site-111	14.5	14.9	26	24
Upper Diversion Weir	23.3	24.5	24	24
TOTAL	373.4	383.8	259	248

Table 1. Change in cumulative acreage monitored and number of monitoring areas from 2013 to 2014.

Mitigation Project	Mitigation Permit Number	Mitigation Required (acres)	Wetland Area Created (acres)
Bostick Weir	200125114	7.88	18.52
Calico Ridge Weir	200450004	3.8	7.57
Clark County Water Reclamation District	SPK-2009-00227-SG	6.79	6.79°
Cottonwood Cells	N/A	-	3.64*
Demonstration Weir	199825148	0.9	0.67
Duck Creek Confluence and Upper Narrows Weirs	SPK-2009-00042	1.33	2.31
DU Wetlands No. 1 Weir	SPK-2010-00285-SG	1.22	1.24
DU Wetlands No. 2 Weir	2007-1961-SG	0.05	2.87
Historic Lateral Weir	199825148	4.9	16.63
Lower Narrows and Homestead Weirs	SPK-2008-01417-SG	6.25	3.52
Monson and Visitor Center Weirs	200250111	4.81	1.92
Pabco Road Weir	199725375	2.2	12.77
Powerline Crossing Weir	200450454	4.87	2.82
Rainbow Gardens Weir	200250054	1	7.09
Upper Diversion Weir	200550514	0.01	9.05
Bank Protection Projects	-	7.06	-
TOTAL		53.07	97.41

° Permit held by Clark County Water Reclamation District and not eligible for Wash wetland mitigation
* Federally funded revegetation not eligible for wetland mitigation

Table 2. Mitigation requirements and wetland areas established as of August 2014.

3.1 Bostick Weir

There are 13 monitoring areas associated with the Bostick Weir (Figure 3; Table 3). In 2014, eight of these sites were monitored for total cover in the field; the remaining five were monitored using ArcGIS. Eleven of the 13 sites at the Bostick Weir had the same total vegetative cover as in 2013, due to a combination of mature sites over ten years old (Figure 4) and that many wetland areas often reach close to 100% cover quickly. When compared to 2013, Bostick North increased in total cover and had four additional species recorded, but in contrast, Downstream Bostick South decreased in total cover. This site was monitored in 2014 using ArcGIS, so 50-75% total cover are field assessments from 2011 and 2012.

Maintenance activities at Bostick Weir are minimal due to their maturity. However, in 2014, the CCWP completed the installation of a paved bike trail adjacent to sites on the south side of the Wash. This may increase potential vandalism and trash and this would require additional effort. Also, after monitoring concluded and before this report was drafted, construction activities had impacted the Bostick and Upstream Bostick South-wetland sites. There may be maintenance activities required to ensure the health of other sites in 2015 and beyond.

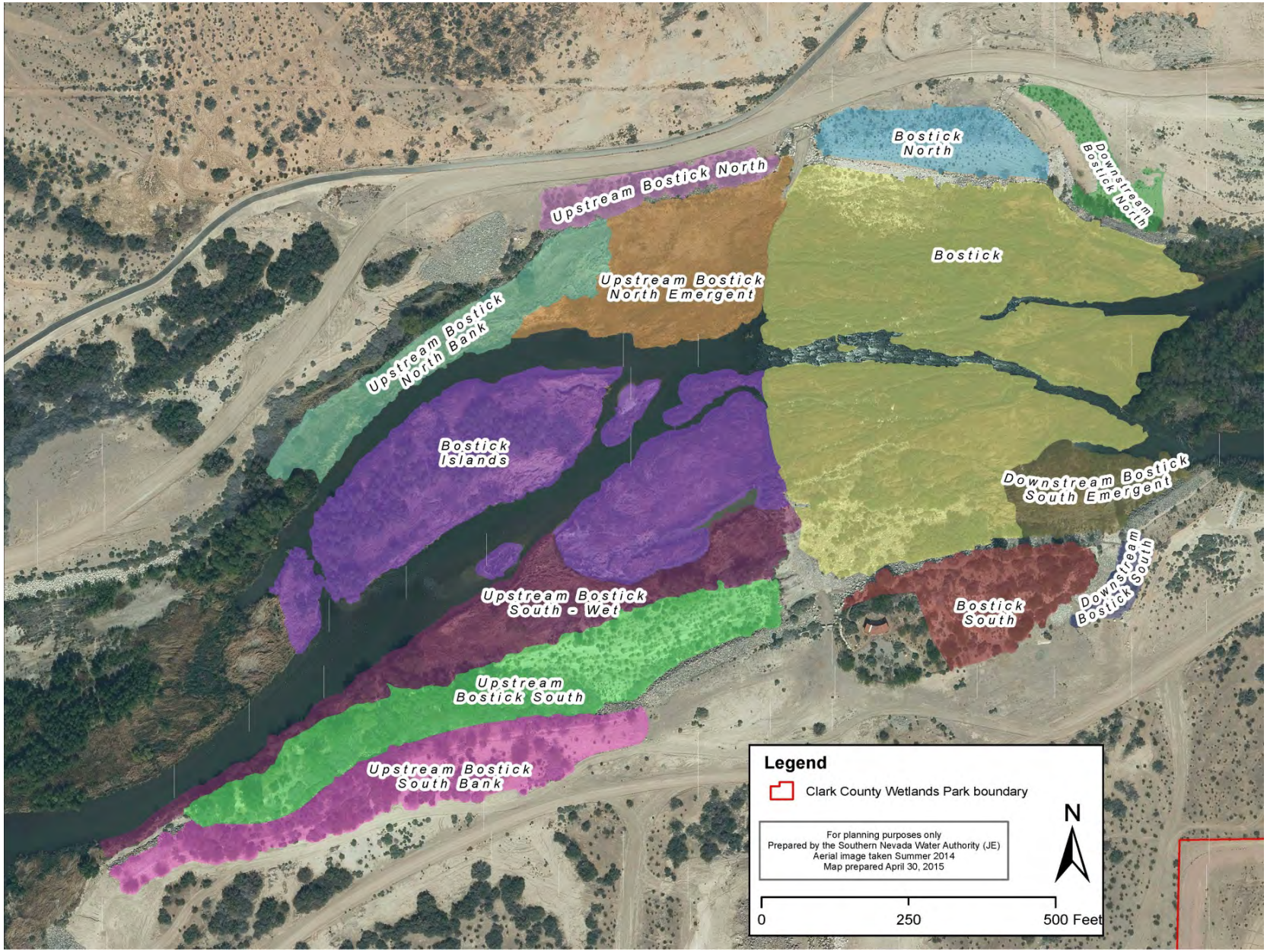

Figure 3. Aerial photograph of 2014 delineated Bostick Weir revegetation sites.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
B	11	8.00	wet	75-100%	3.1%	20	2.35
BI	11	4.64	wet	75-100%	nm	nm	nm
BN	11	0.84	non-wet	50-75%	0.0%	9	4.63
BS	10	1.12	non-wet	75-100%	nm	nm	nm
DBN	11	0.44	non-wet	25-50%	nm	nm	nm
DBS	10	0.21	non-wet	50-75%	nm	nm	nm
DBSE	10	0.80	wet	75-100%	0.5%	10	2.19
UBN	11	0.55	non-wet	75-100%	2.5%	11	4.04
UBNB	10	1.26	wet	75-100%	2.5%	5	2.03
UBNE	10	1.79	wet	75-100%	nm	nm	nm
UBS	11	2.49	non-wet	75-100%	0.5%	15	3.40
UBS	11	2.03	wet	75-100%	2.5%	15	2.17
UBSB	10	1.85	non-wet	75-100%	0.0%	8	4.02

[1]B=Bostick, BI=Bostick Islands, BN=Bostick North, BS=-Bostick South, 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

[2]Wetland 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

[3]Wetland 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 3. Vegetation monitoring results for Bostick Weir revegetation sites in 2014.

Figure 4. Mature upland vegetation at Upstream Bostick South Bank in 2014.

3.2 Calico Ridge Weir

In 2014, at the Calico Ridge Weir, five of the nine revegetation sites had their total cover measured using ArcGIS and four were monitored in the field (Table 4; Figure 5). The only site with a difference in total cover (comparing 2014 to 2013), was Upstream Calico North – non-wetland, which was reduced from 50-75% to 25-50%. This may be a result of the different perspective of monitoring in the field compared to using ArcGIS, which was done for the first time on this site in 2014.

Like Bostick Weir, very little maintenance is done on sites at the Calico Ridge Weir. Also, like Bostick Weir, there are now bike trails and increased visitation to these sites which may require additional maintenance (i.e., increased public use may result in litter or other trash that needs cleaning or intentional/unintentional plant damage). Downstream of the Calico Ridge Weir (Figure 6), are the Lower Narrows and Homestead Weirs and because these areas are newer, they have been recently irrigated; nearby irrigation often increases the spread of weeds. While there has not been any substantial increase in weeds at this time, the sites will be monitored to ensure they do not become a problem.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
C	10	1.80	wet	75-100%	2.5%	8	2.01
DCN	10	0.65	non-wet	25-50%	nm	nm	nm
DCS	10	2.03	non-wet	25-50%	nm	nm	nm
DCS	10	0.68	wet	75-100%	0.1%	4	2.00
UCE	10	3.28	wet	75-100%	nm	nm	nm
UCN	10	1.98	non-wet	25-50%	nm	nm	nm
UCN	10	0.93	wet	75-100%	0.5%	5	1.98
UCS	10	2.87	non-wet	50-75%	nm	nm	nm
UCS	10	0.88	wet	75-100%	0.5%	11	2.20

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

[2]Wetland 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

[3]Wetland 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 4. Vegetation monitoring results for Calico Ridge Weir revegetation sites in 2014.

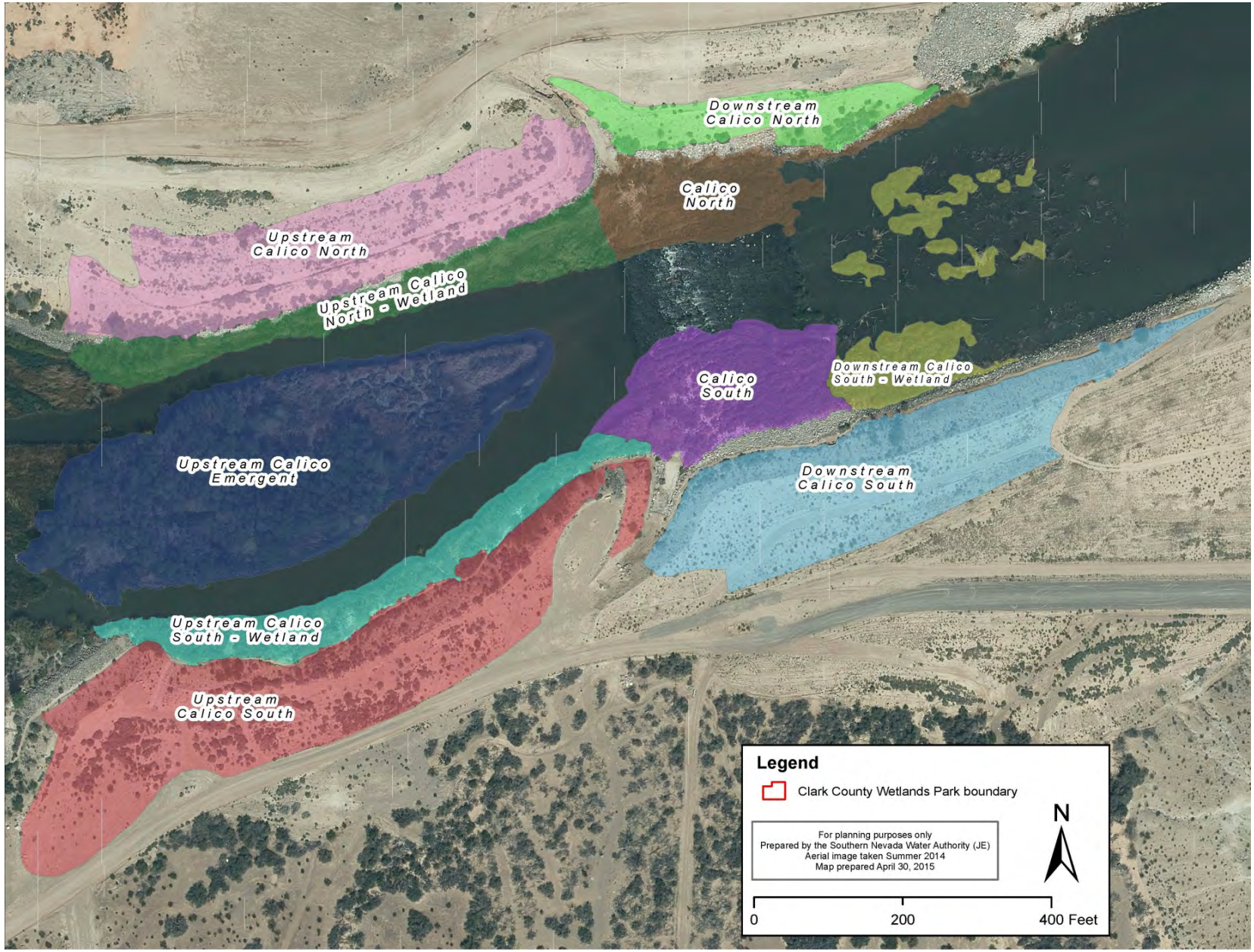

Figure 5. Aerial photograph of 2014 delineated Calico Ridge Weir revegetation sites.

Figure 6. Common Reed is the dominant vegetation on the Calico Ridge Weir.

3.3 Clark County Water Reclamation District

The site located at the CCWRD was monitored in 2014, its fifth year, exclusively using ArcGIS (Figure 7; Table 5). It was planted at the fall 2010 Green-Up location, divided into 29 monitoring areas based on size, and then categorized into wetland and non-wetland - per the jurisdictional determination conducted (prior to clearing the salt cedar that previously dominated the site). Since wetlands follow non-linear patterns (Figure 7), the monitoring area was determined to be wetland if the majority of the site fell into the delineated area. Non-wetland areas were not separated during monitoring and areas funded by NDEP and SNPLMA Round VI funds are shown in Figure 7.

Using ArcGIS, total cover of the site was slightly higher in 2014: 76.8% compared to 72.9% in 2013 (Figure 8). Maintenance activities on this site regularly take place after any substantial rainfall in the Las Vegas Valley because it receives flooding and substantial trash deposition. In 2105, major construction running adjacent to this site will likely impact it and maintenance could result from the disturbance.

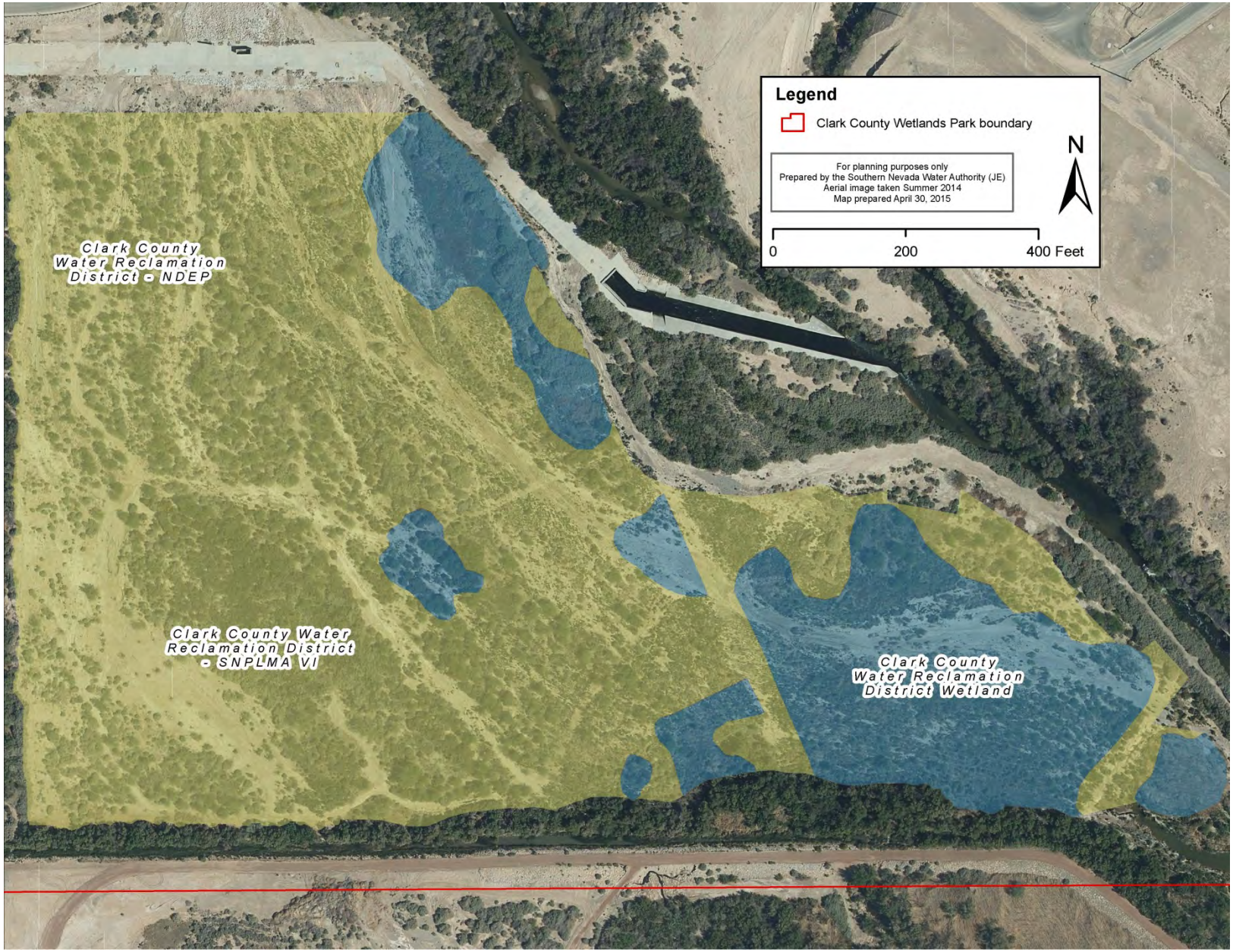

Figure 7. Aerial photograph of the 2014 delineated Clark County Water Reclamation District revegetation sites.

Site Code	Growing Season	Acreage	Wetland Status[1]	Total Cover	Noxious Species Cover	Number of Species	WPI[2]
CCWRD	5	22.13	non-wet	76.8%	nm	nm	nm
CCWRD	5	6.79	wet	77.0%	nm	nm	nm
TOTAL	5	28.93	both	76.8%	nm	nm	nm

[1]Wetland 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

[2]Wetland 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 the Clark County Water Reclamation District revegetation site in 2014.

Figure 8. Vegetation at the Clark County Water Reclamation District sites continues to have high total cover in 2014.

3.4 Cottonwood Cells

There are seven revegetation sites associated with the Cottonwood Cells (Table 6; Figure 9). All seven sites were monitored in the field. The two original cottonwood cells (Cottonwood Cell 1 and Cottonwood Cell 2) were planted in 2002 and 2005, respectively, and are relatively mature, whereas the remaining five sites planted in 2012 are still relatively young. Contrary to their name, the five newer sites are not dominated by cottonwood trees; they were named due to their proximity to the original two cells. Despite being much younger, these new sites have very high total cover (Table 6). Cottonwood Cell 1 has diminished in total cover over the past few growing seasons due to mortality of cottonwood trees from various diseases (Figure 10).

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
CC1	13	0.97	wet	50-75%	2.5%	14	2.12
CC2	10	0.53	wet	75-100%	2.5%	8	2.94
CC3	3	1.56	wet	50-75%	17.5%	46	2.92
CC3-2	2	0.40	wet	75-100%	1.0%	26	3.90
CCB	2	0.18	wet	75-100%	0.5%	36	1.82
CCN	3	4.83	non-wet	75-100%	1.0%	51	3.55
CCNS	3	1.83	non-wet	77.2%	0.5%	26	4.11

[1]CC1=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

[2]Wetland 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

[3]Wetland 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. Vegetation monitoring results for Cottonwood Cell revegetation sites in 2014.

Cottonwood Cell North and Cottonwood Cell North Stockpiles are located along drainages that extend northward to Sunrise and Frenchman Mountains. This explains why they have such high abundance in species. Many are native to the area and are not found on any other site. This location also resulted in increased weed infestations that require regular maintenance. Many of these sites will be impacted by the construction of the Historic Lateral Weir Expansion Project that began in 2015 with some vegetation clearing. Some parts of these sites will be removed, while others may benefit from a large increase in the backwater (that should be able to move into these sites) behind the Historic Lateral Weir.

The natural die off of cottonwood trees in Cottonwood Cell 1 and 2 gives an opportunity to replant the site under the remaining cottonwood trees with a more diverse understory. This will improve the wildlife suitability and the increased spacing between trees should result in better health for those that remain. Cottonwood Cell 2 has not yet experienced the level of die off as Cottonwood Cell 1. It is recommended that the site have some cottonwoods thinned in order to prevent disease transmission. In conjunction, shrubs and other shorter trees should be installed to create various height structures and diversity.

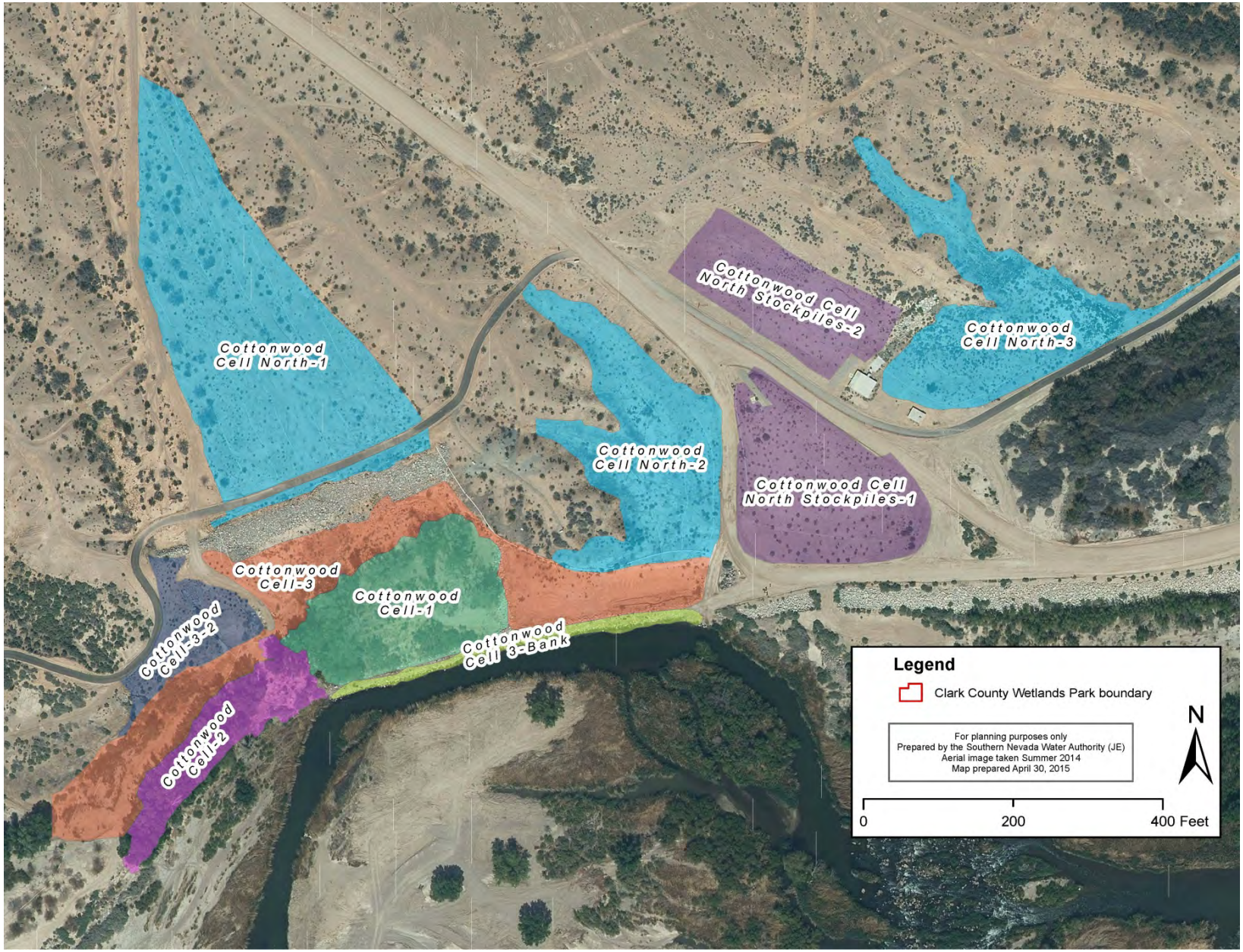

Figure 9. Aerial photograph of 2014 delineated Cottonwood Cell revegetation sites.

Figure 10. Some mortality at Cottonwood Cell 1 has reduced the total cover in recent years.

3.5 Demonstration Weir

The two revegetation sites at the Demonstration Weir had the same total cover and many of the same attributes in 2014 as in 2013 (Table 7: Figure 11). Being very mature sites at 12 growing seasons typically there aren't many changes on an annual basis. This will likely change somewhat, in 2015, especially for the wetland site. The Three Kids Weir was constructed downstream of the Demonstration Weir and inundated it, as well as created a much larger backwater area behind the new weir. This will alter the banks and increase the amount of water available to those plants near the current water level. It's possible that some of the plants on the non-wetland site may also benefit from a higher water table (Figure 12).

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
UDS	12	1.54	non-wet	50-75%	0.0%	11	4.76
UDS	12	0.67	wet	75-100%	2.5%	10	3.19

[1]UDS=Upstream Demonstration South

[2]Wetland 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

[3]Wetland 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 7. Vegetation monitoring results for the Demonstration Weir revegetation sites in 2014.

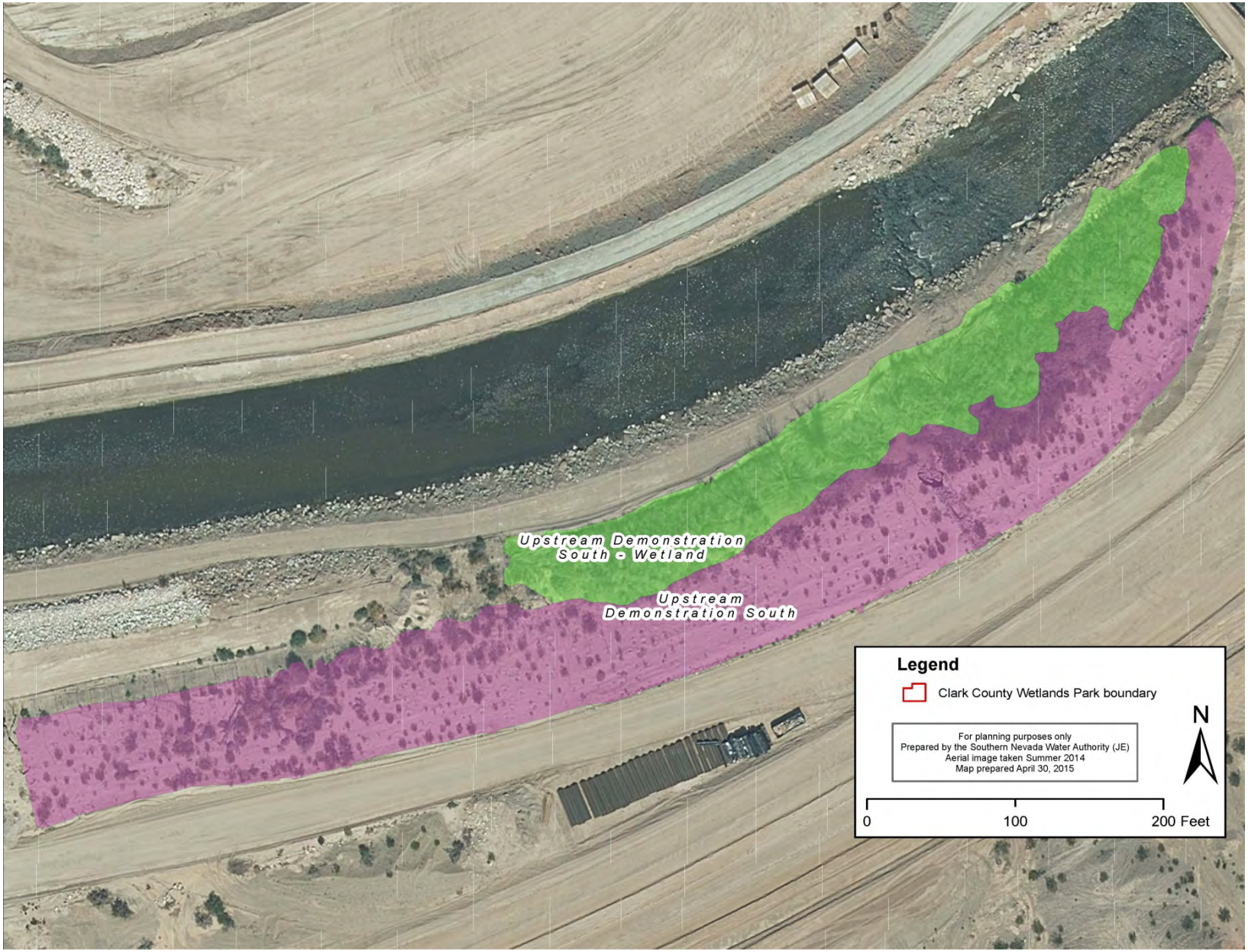

Figure 11. Aerial photograph of 2014 delineated Demonstration Weir revegetation sites.

Like most mature sites, maintenance activities on the Demonstration Weir have been limited for many years. However, the construction of the adjacent Three Kids Weir and CCWP bike trail (installed adjacent to the non-wetland site) have impacted the site's hydrology and topography. It is expected that additional maintenance activities will be needed in the upcoming years with most being accomplished in conjunction with revegetation of the Three Kids Weir itself.

Figure 12. Creosote bush dominates the Upstream Demonstration South-non-wetland site in 2014.

3.6 Duck Creek Confluence and Upper Narrows Weirs

The Duck Creek Confluence and Upper Narrows Weirs were completed in early 2013. The most recently planted revegetation sites along the Wash are located in this area. As of 2014 monitoring, there were five revegetation sites associated with the Duck Creek and Upper Narrows Weirs (Figure 13; Table 8). Duck Creek Upper Narrow Emergent was the only site monitored in 2013. The remaining four sites had their first monitoring conducted in 2014 (Figure 14). Newly planted sites such as these require intense maintenance activities to ensure success in the long term. These sites were still actively irrigated throughout the spring, summer, and fall seasons in 2013 and 2014, including during. This regular irrigation results in large amounts of weeds and other non-desirable species that must be removed.

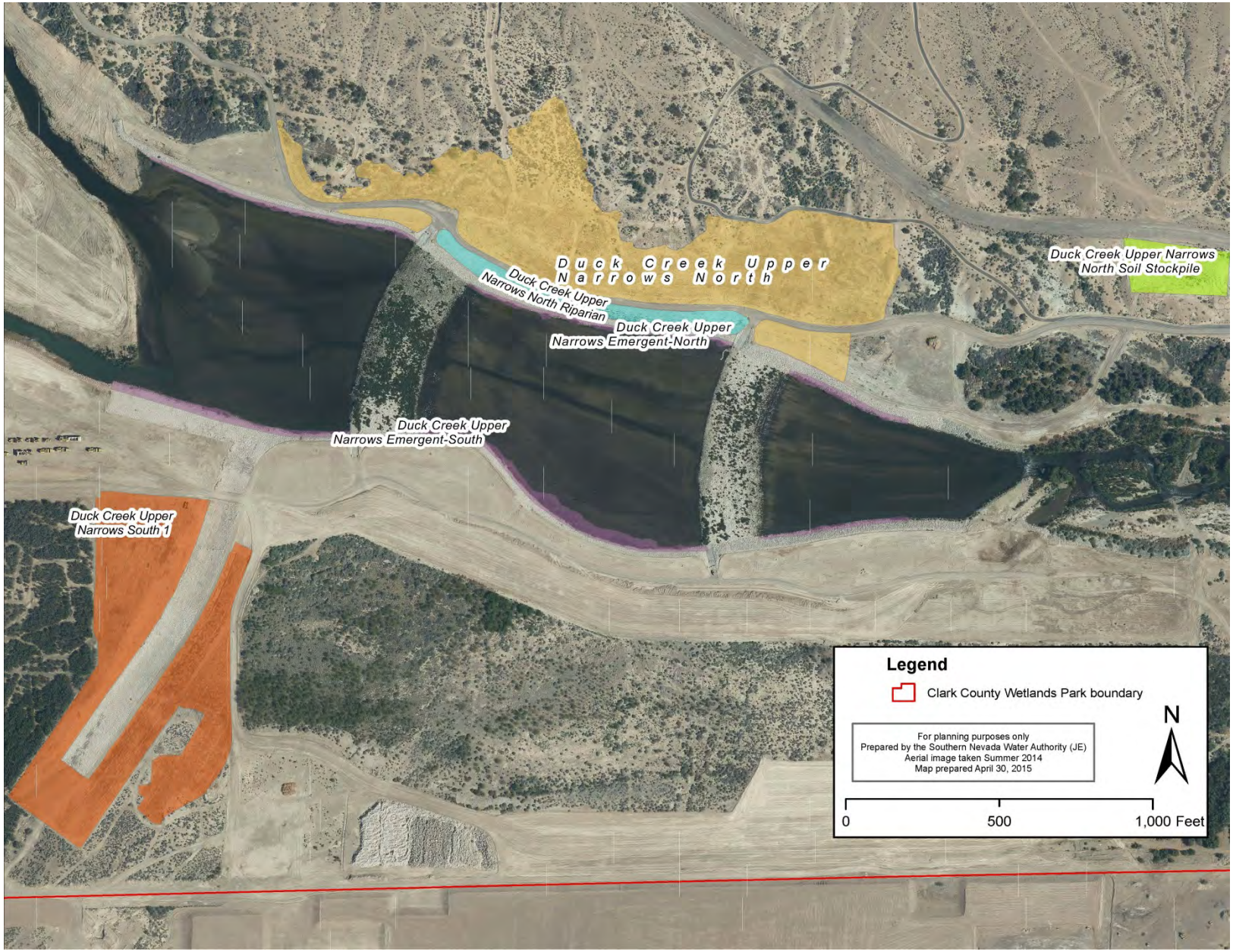

Figure 13. Aerial photograph of 2014 delineated Duck Creek Confluence and Upper Narrows Weirs revegetation sites.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
DCUNE	2	2.31	wet	75-100%		34	
DCUNN	1	13.32	non-wet	25-50%		32	
DCUNNR	1	1.34	non-wet	75-100%		20	
DCUNNS	1	1.22	non-wet	5-25%		11	
DCUNS-1	1	9.20	non-wet	75-100%		23	

[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

[2]Wetland 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

[3]Wetland 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 8. Vegetation monitoring results for Duck Creek Confluence and Upper Narrows Weirs revegetation sites in 2014.

Figure 14. Diverse vegetation covers the Duck Creek Upper Narrows North revegetation site in 2014.

3.7 DU Wetlands No. 1 Weir

The DU Wetlands No. 1 Weir was completed in early 2013, and two sites were planted soon after (Figure 15; Table 9). The wetland areas along the north and south banks of the Wash, DU Wetlands No. 1 Emergent, were planted throughout the early months of 2013. DU Wetlands No. 1 South is an upland non-wetland site that was planted as part of the spring 2013 Green-Up.

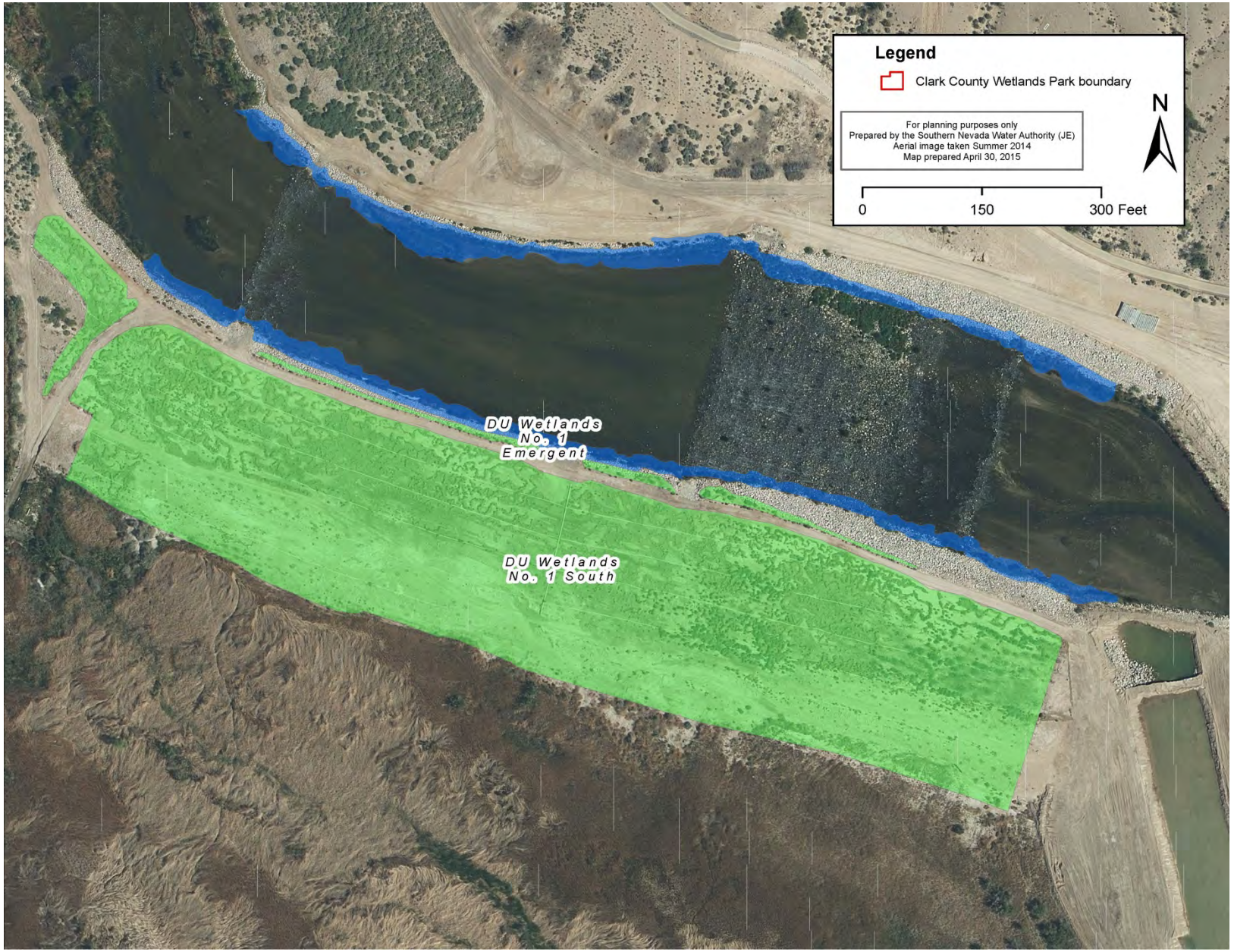

Figure 15. Aerial photograph of 2014 delineated DU Wetlands No. 1 Weir revegetation sites.

(Figure 16). The upland area north of the DU Wetlands No. 1 Weir was not planted due to its proximity to the construction area near the Archery and Silver Bowl Weirs. These weirs were completed at the end of 2014, and the area will be planted in 2016.

Like the sites associated with the Duck Creek Confluence and Upper Narrows Weirs, the non-wetland site at the DU Wetlands No. 1 Weir is young, and in 2014, it was only in its second growing season. Due to the rapid establishment of the planted plants, it is no longer being irrigated. However, like most immature sites, it still has a lot of open space that allows for weeds to encroach and compete with native/planted plants. In addition, directly downstream is the recently completed Archery and Silver Bowl Weirs that is still being irrigated and may encourage the establishment of weeds, which increases the level of maintenance.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
DU1E	2	1.24	wet	75-100%	1.1%	36	1.81
DU1S	2	7.44	non-wet	75-100%	3.2%	22	3.48

[1] DU1S=DU Wetlands No. 1 South, DU1E=DU Wetlands No. 1 Emergent

[2]Wetland 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

[3]Wetland 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 9. Vegetation monitoring results for DU Wetlands No. 1 Weir revegetation sites in 2014.

Figure 16. Screwbean mesquites at DU Wetlands No. 1 South have matured substantially in their first two growing seasons.

3.8 DU Wetlands No. 2 Weir

The three sites at the DU Wetlands No. 2 Weir were all in their fifth growing season at the time of monitoring (Figures 17 and 18; Table 10). Since the sites were established, all three have had the maximum cover range (75-100%) each year for five monitoring years. The sole wetland site, DU Wetlands No. 2 Emergent, includes areas on the north and south banks of the Wash.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
DU2E	5	2.87	wet	75-100%	0.5%	24	1.82
DU2N	5	5.13	non-wet	75-100%	0.5%	18	3.99
DU2S	5	4.69	non-wet	75-100%	7.5%	22	3.81

[1]DU2N=DU Wetlands No. 2 North, DU2S=DU Wetlands No. 2 South, DU2E=DU Wetlands No. 2 Emergent

[2]Wetland 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

[3]Wetland 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 10. Vegetation monitoring results for the DU Wetlands No. 2 Weir revegetation sites in 2014.

Once sites reach the fourth or fifth growing season as these have, there is minimal regular maintenance involved. These sites also have very little traffic from park visitors, limiting disturbance. The only exception in upcoming years is the removal of a small patch of Russian knapweed that was discovered in 2013 and has grown to 2.5% of the site's cover in 2014.

Figure 17. Desert saltbush and honey mesquite dominated the DU Wetlands No. 2 North revegetation site in 2014.

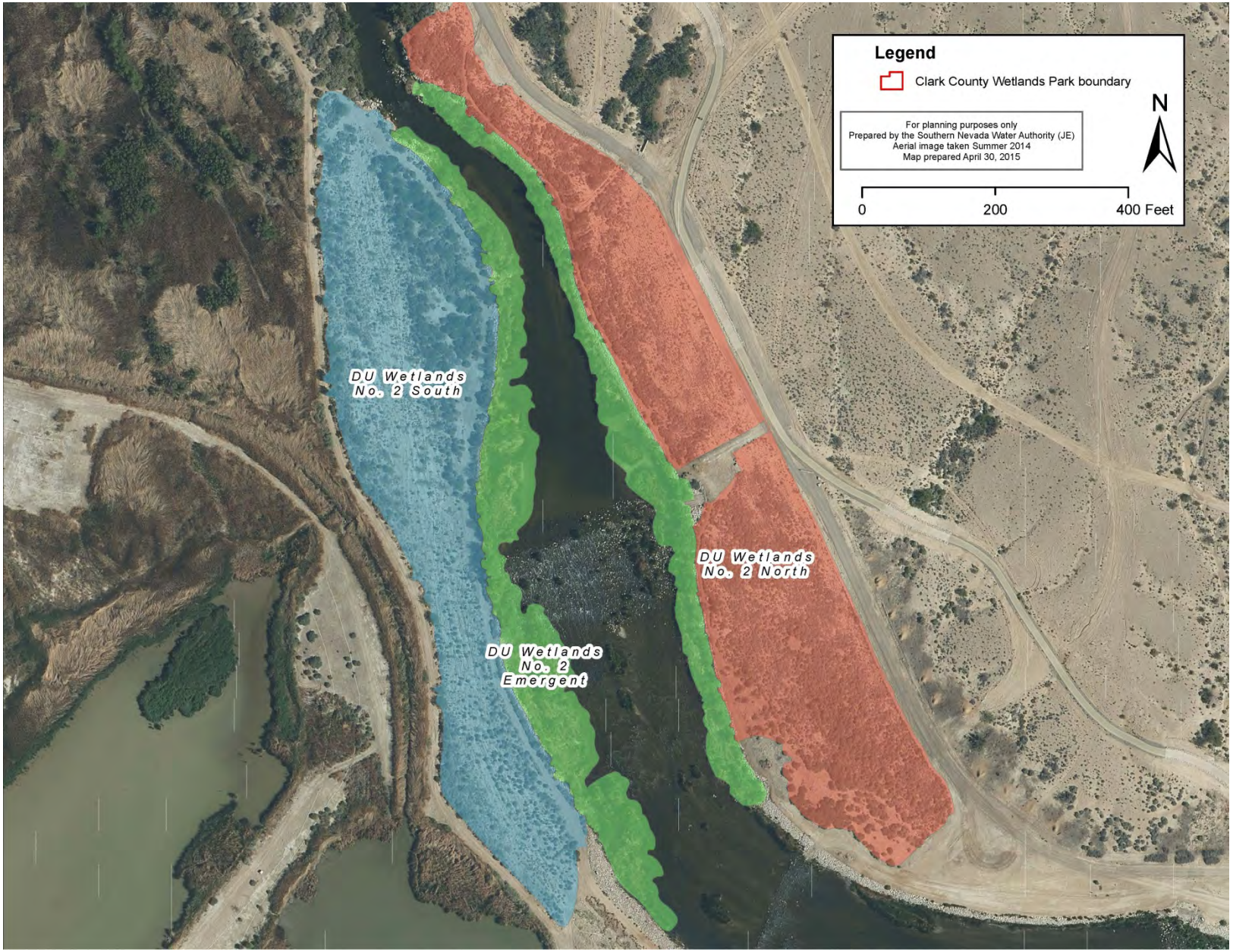

Figure 18. Aerial photograph of 2014 delineated DU Wetlands No. 2 Weir revegetation sites.

3.9 Historic Lateral Weir

Seven of the 11 revegetation sites at the Historic Lateral Weir were monitored in the field in 2014. The remaining four had their total cover measured using ArcGIS (Table 11; Figure 19), including two wetland sites that were created passively. They have never been monitored in the field because it is physically difficult to reach the sites safely. Their size and cover are annually monitored in order to keep track of wetlands that establish on their own.

The majority of sites at this weir were in their fourteenth growing season during 2014 monitoring and are some of the most mature vegetation along the Wash. Three additional non-wetland areas were created and planted near the weir in later years. After the 2014 monitoring concluded, there was considerable clearing in this area to prepare for the expansion of the weir. This significantly impacted many revegetation sites and the disturbed soil, along with changes in hydrology (including consequences from flood events) will greatly effect these sites in the future (Figure 20).

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
DHLPW	14	6.56	wet	75-100%	nm	nm	nm
UHLN	14	4.34	non-wet	75-100%	nm	nm	nm
UHLN	14	1.85	wet	75-100%	5.3%	28	2.29
UHLNS	14	1.71	wet	75-100%	7.5%	11	2.04
UHLPW	14	3.72	wet	75-100%	nm	nm	nm
UHLS	14	0.87	wet	75-100%	0.5%	29	2.36
UHLSB	14	1.21	non-wet	75-100%	nm	nm	nm
UHLSB	14	1.92	wet	75-100%	0.0%	9	2.55
UHLSS	4	2.06	non-wet	5-25%	0.1%	11	4.61
UHLSUP	7	5.42	non-wet	75-100%	2.5%	17	4.34
UHLSUP2	4	12.42	non-wet	50-75%	0.6%	22	4.81

[1]DHLPW=Downstream Historic Lateral Passive Wetlands, UHLN=Upstream Historic Lateral North, UHLNS=Upstream Historic Lateral North South, UHLS=Upstream Historic Lateral South, UHLPW=Upstream Historic Lateral Passive Wetlands, 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

[2]Wetland 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

[3]Wetland 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 the Historic Lateral Weir revegetation sites in 2014.

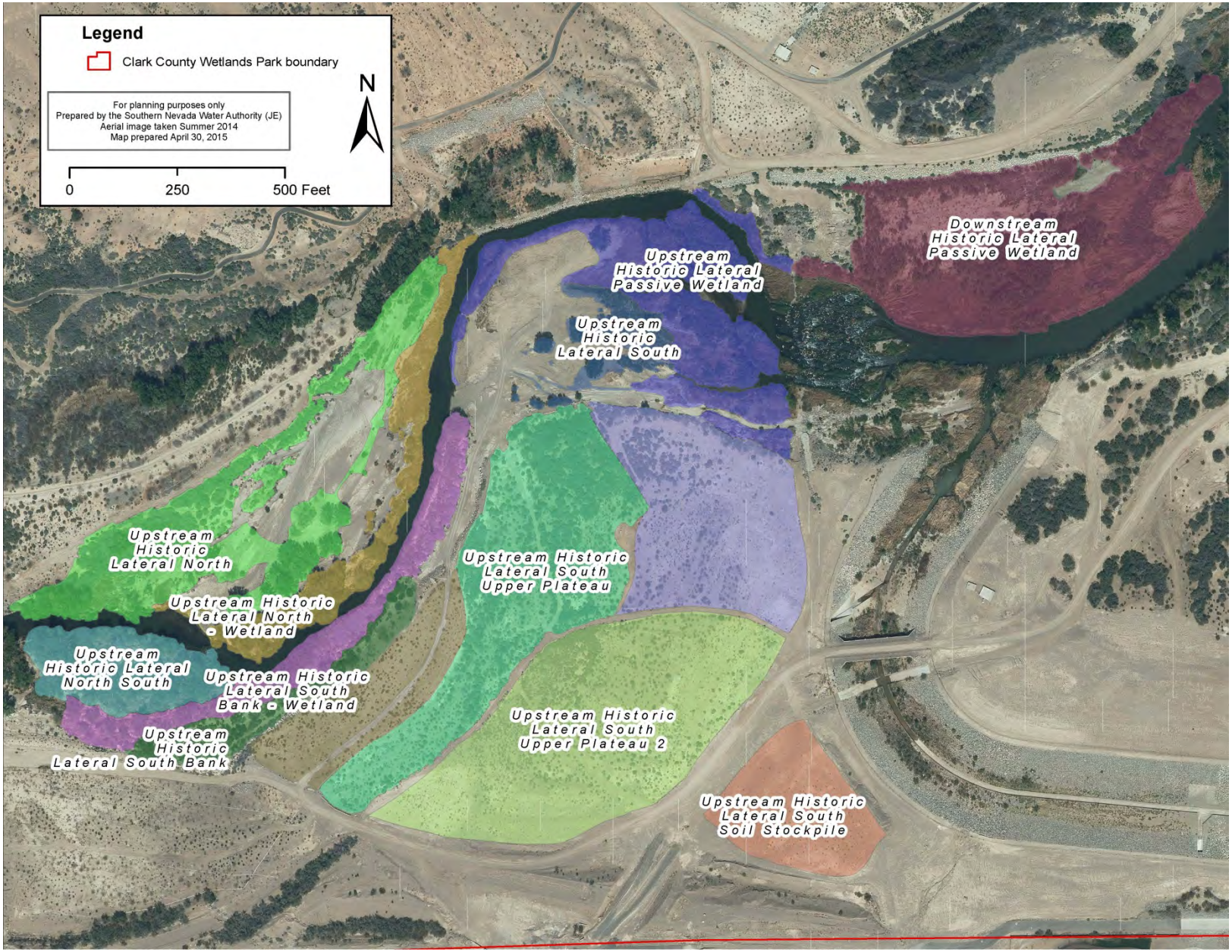

Figure 19. Aerial photograph of 2014 delineated Historic Lateral Weir revegetation sites.

Figure 20. Upstream Historic Lateral North South has naturally formed channels as a result of flooding events.

3.10 Lower Narrows and Homestead Weirs

The four revegetation sites at the Lower Narrows and Homestead Weirs are relatively young compared to others along the Wash. Like most of the newer sites, these were all monitored in the field in 2014. They were planted in 2011 and 2012 and include three non-wetland sites and one wetland site (Table 12; Figures 21 and 22). The last few years have included a lot of maintenance including irrigating the sites to ensure successful establishment of the planted plants and hydroseed. In addition, weeding is an ongoing maintenance activity here. Now past their third growing season, it is expected that the effort required to reduce weeds and ensure successful restoration of the sites will be markedly reduced.

One major change from the 2013 monitoring year were impacts to the Lower Narrows Homestead North, the only non-wetland site on the north side of the Wash that was effected by construction activities at the Three Kids Weir. This was anticipated; the area that had vegetation removed had only been hydroseeded along with the rest of the non-wetland areas and was not actively managed. Additionally, the bank protection on both sides of the Wash had soil deposited from the Three Kids Weir Project. This may have had a minor influence on the adjacent revegetation site but will ultimately increase the area available to plant riparian vegetation.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
LNHE	3	3.52	wet	75-100%	0.6%	39	1.53
LNHN	3	40.48	non-wet	50-75%	0.0%	13	3.90
LNHS1	3	7.37	non-wet	75-100%	0.0%	13	4.89
LNHS2	2	6.58	non-wet	75-100%	0.0%	15	4.79

[1]LNHE=Lower Narrows Homestead Emergent, LNHN=Lower Narrows Homestead North, LNHS1=Lower Narrows Homestead South 1, LNHS2=Lower Narrows Homestead South 2

[2]Wetland 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

[3]Wetland 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 Lower Narrows and Homestead Weirs revegetation sites in 2014.

Figure 21. Lower Narrows Homestead Emergent has dense vegetation lining the banks of the Vegas Wash.

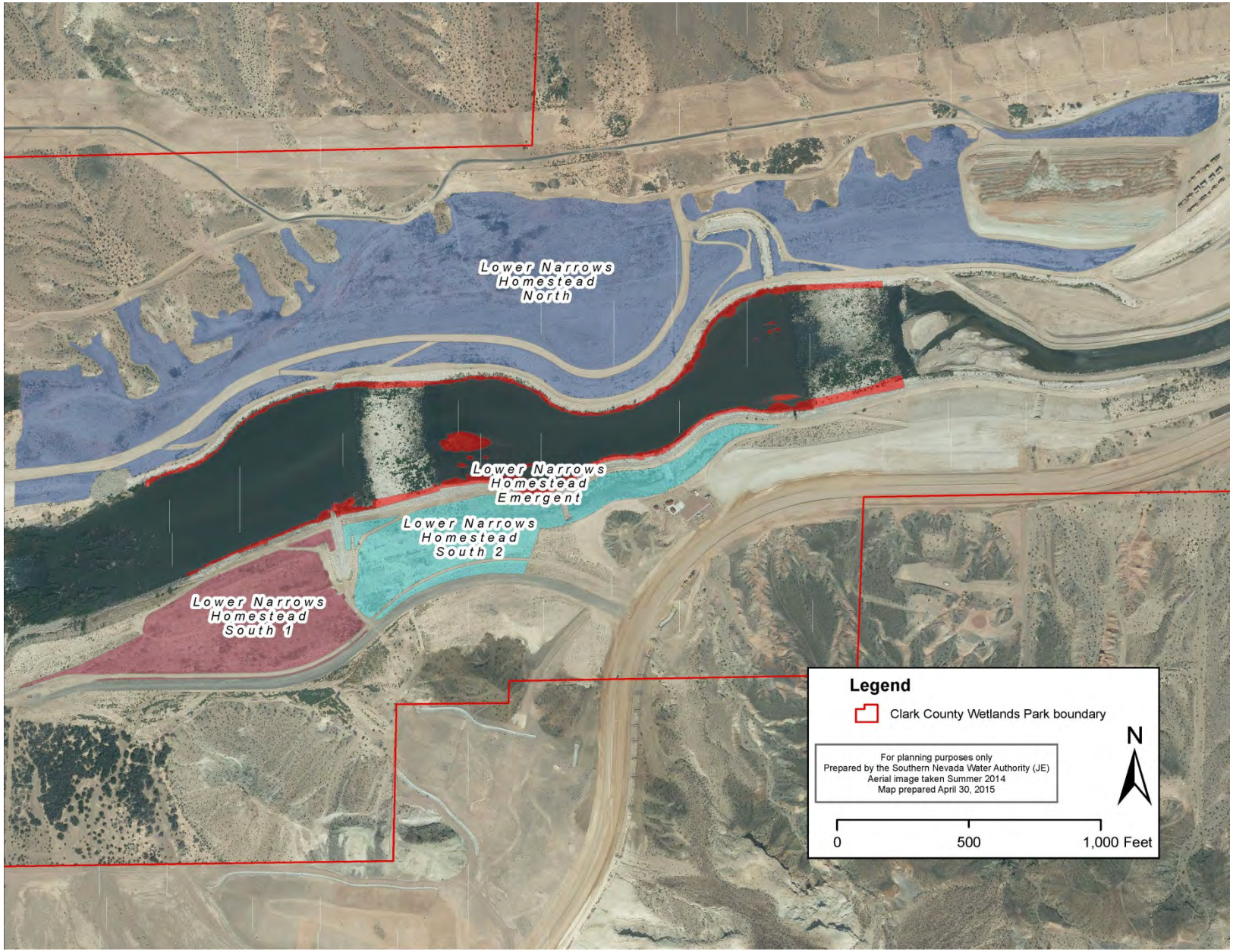

Figure 22. Aerial photograph of 2014 delineated Lower Narrows and Homestead Weirs revegetation sites.

3.11 Monson and Visitor Center Weirs

All four revegetation sites at the Monson and Visitor Center Weirs were monitored in the field in 2014 (Table 13; Figures 23 and 24). In 2014, these sites were in their twelfth growing season; therefore, not many attributes change on an annual basis. The last major impact in the area was the construction of the Upper Diversion Bridge in 2008, which diverted some of the flows away from the main Wash channel in this area, although increases in overall flows from the wastewater treatment facilities upstream maintained adequate water for established vegetation. Another weir will be constructed downstream of these areas in the next few years which may have some consequences. Future monitoring will be done to quantify any effects.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
DMN	12	4.02	non-wet	75-100%	2.5%	5	3.30
DMN	12	1.17	wet	75-100%	15.0%	8	2.13
DMS	12	2.96	non-wet	75-100%	0.0%	10	3.35
DMS	12	0.75	wet	75-100%	3.0%	21	2.29

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

[2]Wetland 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

[3]Wetland 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 13. Vegetation monitoring results for the Monson and Visitor Center Weirs revegetation sites in 2014.

Figure 23. A large Goodding's willow grows on the bank of the Las Vegas Wash at the Downstream Monson North-wetland revegetation site in 2014.

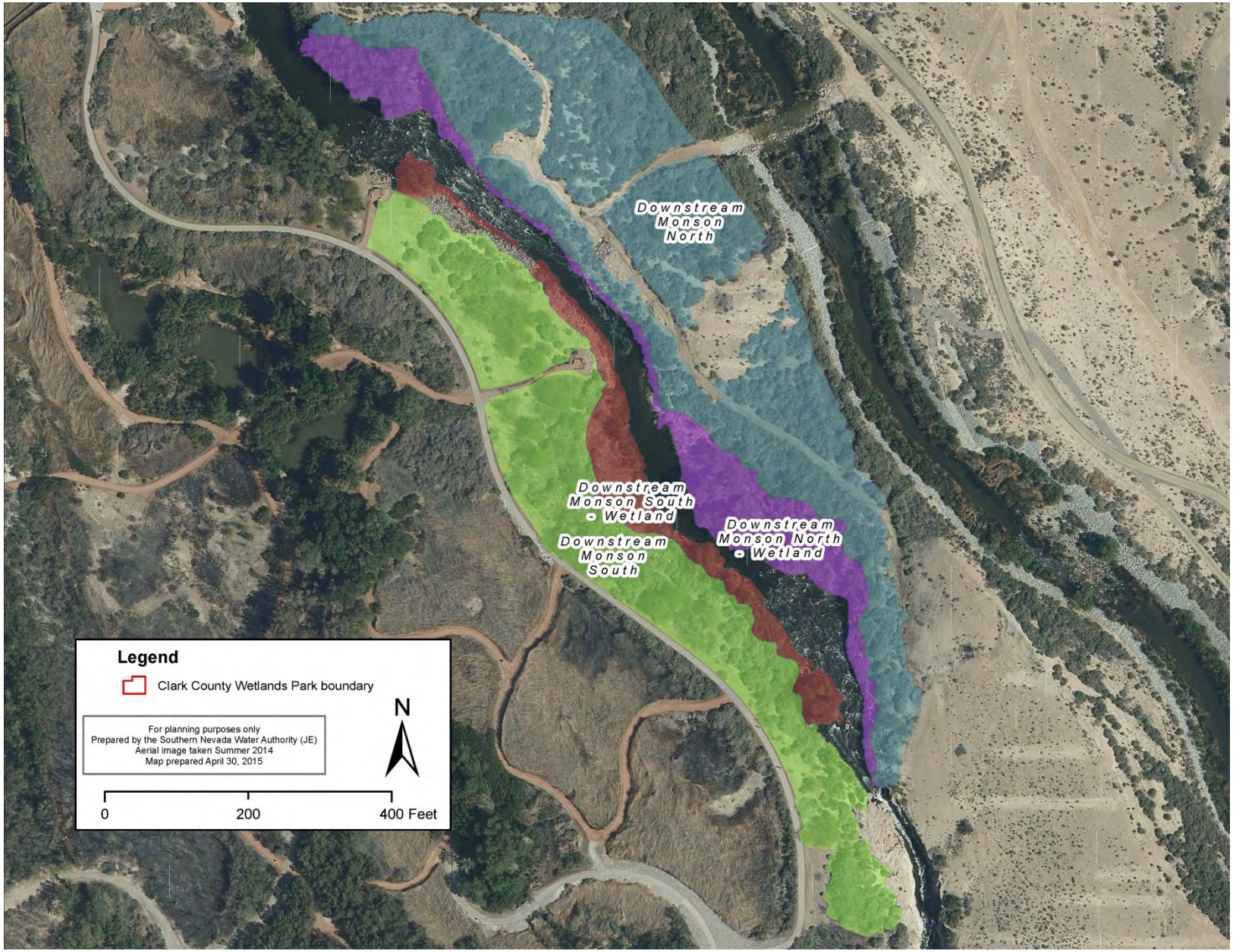

Figure 24. Aerial photograph of 2014 delineated Monson and Visitor Center Weirs revegetation sites.

3.12 Pabco Road Weir

The Pabco Road Weir was the first permanent weir installed. Therefore, many of the revegetation sites associated with it are some of the oldest along the Wash. Ten of the 12 revegetation sites at here were monitored in the field, and Downstream Pabco North and Downstream Pabco South had total cover measured using ArcGIS (Figures 25 and 26; Table 14). In addition to the older sites, other areas have been planted in the vicinity.

Both older and newer sites have required little maintenance in the past few years. Success of the revegetation on newer sites has limited the required irrigation. Weed encroachment is frequently associated with the level of irrigation applied; therefore, irrigation is ceased as soon as possible after native plants have been established. After monitoring concluded in 2014, the CCWP trail was installed adjacent to many of these sites and currently terminates at the Pabco Road Trailhead, which will bring many more visitors to the area. Also, construction activities in preparation for the Sunrise Mountain Weir has removed Upstream Pabco South Lower Plateau (UPSLP), a component of Upstream Pabco South (Figure 25). When construction is complete, the Wash channel will extend southward to the previous southern boundary of the UPSLP and the altered hydrology will definitely effect the surrounding vegetation.

Figure 25. Upstream Pabco South Lower Plateau was removed in 2014 for maintenance and preparation for the upcoming Sunrise Mountain Weir construction.

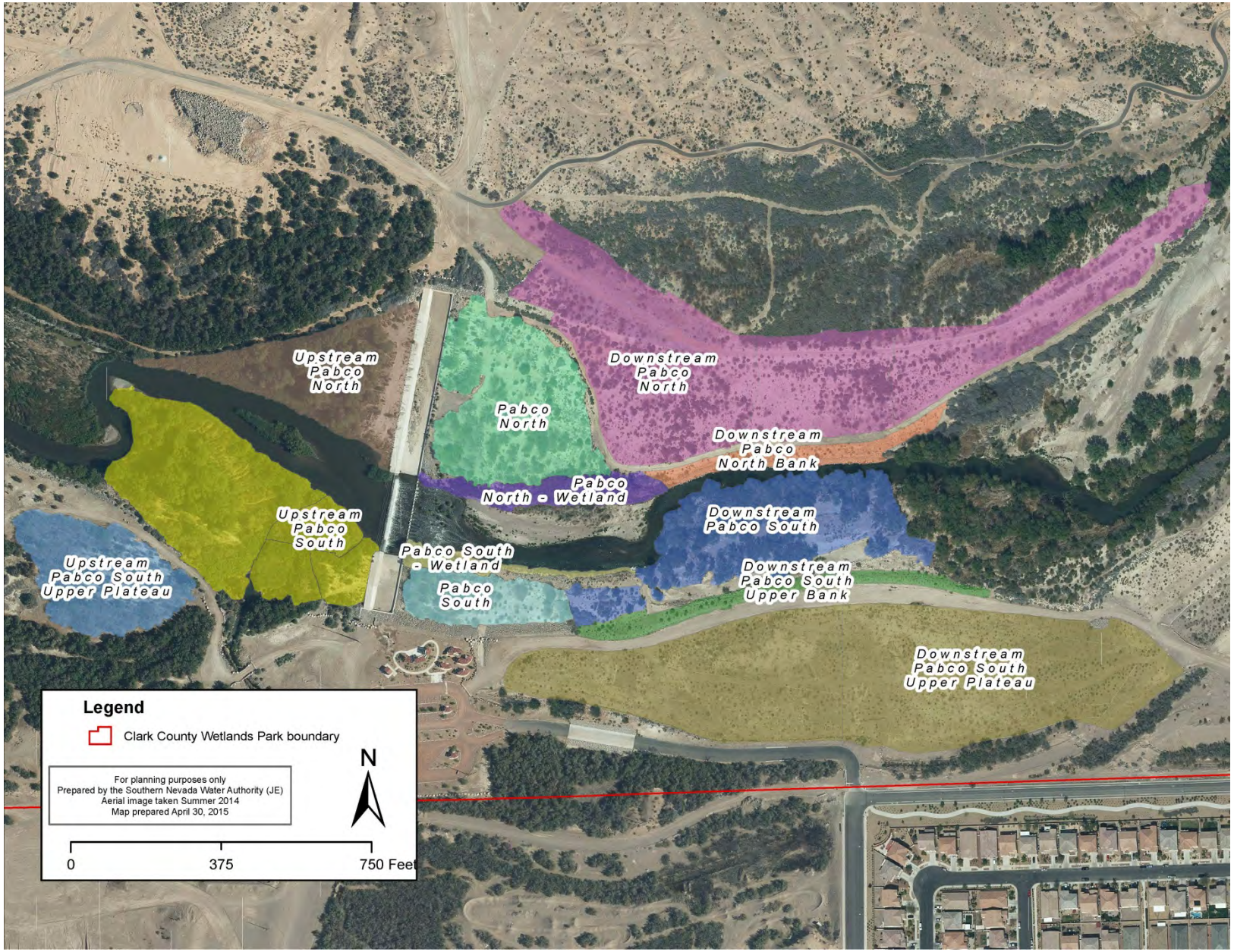

Figure 26. Aerial photograph of 2014 delineated Pabco Road Weir revegetation sites.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
DPN	6	9.41	non-wet	50-75%	nm	nm	nm
DPNB	3	0.76	non-wet	75-100%	2.5%	27	2.68
DPS	14	3.51	wet	75-100%	nm	nm	nm
DPSUB	4	0.89	non-wet	50-75%	3.5%	21	3.05
DPSUP	4	9.93	non-wet	76.6%	1.6%	30	4.26
PN	14	3.24	non-wet	75-100%	2.5%	16	3.53
PN	14	0.83	wet	75-100%	2.5%	20	2.30
PS	14	1.11	non-wet	75-100%	0.0%	9	4.68
PS	14	0.36	wet	75-100%	2.5%	17	1.77
UPN	9	2.57	wet	75-100%	2.7%	23	1.98
UPS*	14	4.74	wet	75-100%	4.6%	24	2.57
UPSUP	13	2.13	non-wet	75-100%	2.5%	10	3.75

[1]PN=Pabco North, PS=Pabco South, UPS=Upstream Pabco South, UPN=Upstream Pabco North, UPSUP=Upstream Pabco South Upper Plateau, DPS=Downstream Pabco South, DPN=Downstream Pabco North, DPSUP=Downstream Pabco South Upper Plateau, DPNB=Downstream Pabco North Bank

[2]Wetland 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

[3]Wetland 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

* UPS includes Upstream Pabco South Lower Plateau

nm = this attribute was not monitored

Table 14. Vegetation monitoring results for Pabco Road Weir revegetation sites in 2014.

3.13 Powerline Crossing Weir

Only two of the nine revegetation sites at the Powerline Crossing Weir were monitored in the field for all plant attributes in 2014: Upstream Powerline North Bank and Upstream Powerline North Emergent (Figure 27; Table 15). They were all in their eighth growing season and have very mature vegetation. The required minor maintenance activities in the past year included clean-up of debris resulting from construction of a nearby park in the City of Henderson (Figure 28). With the CCWP trail system now connected to the bridge associated with the weir, along with the proximity to the City of Henderson's new park, it is expected that this area will see more visitation in upcoming years which may lead to additional maintenance needs.

3.14 Rainbow Gardens Weir

Five of the six sites at the Rainbow Gardens Weir are either nine or ten growing seasons old; the sixth site, Upstream Rainbow North Bank (URNB), was hydroseeded in 2010 and in its fifth growing season when monitored in 2014 (Figures 29 and 30; Table 16). ArcGIS was used for URNB and Upstream Rainbow North Passive Wetlands. Very little maintenance has been done on any of these sites in many years. URNB had some maintenance the year after it was hydroseeded with irrigation and weeding, but even this recent site has had little need for substantial effort. Portions of Rainbow Islands and Upstream Rainbow South Emergent had some vegetation removed in early 2015 for preventive maintenance of the Rainbow Gardens Weir. The extent to which this removal impacted overall vegetation on these sites will be determined in the 2015 monitoring.

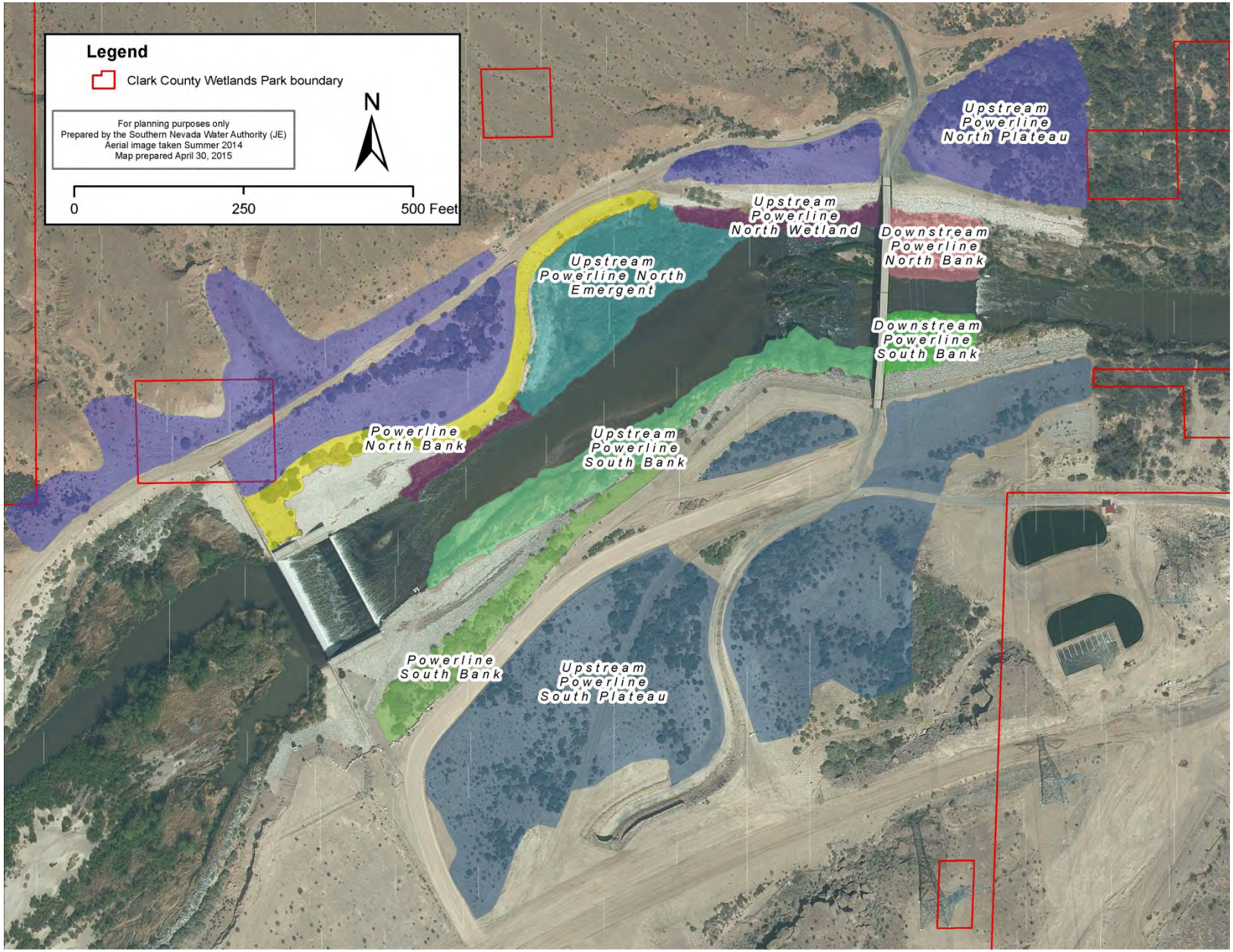

Figure 27. Aerial photograph of 2014 delineated Powerline Crossing Weir revegetation sites.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
DPLNB	8	0.30	wet	75-100%	nm	nm	nm
DPLSB	8	0.25	wet	75-100%	nm	nm	nm
PLSB	8	0.56	non-wet	75-100%	nm	nm	nm
UPLNB	8	0.64	non-wet	5-25%	0.0%	3	3.26
UPLNE	8	1.08	wet	75-100%	0.0%	8	2.15
UPLNP	8	4.08	non-wet	46.9%	nm	nm	nm
UPLNW	8	0.35	wet	75-100%	nm	nm	nm
UPLSB	8	0.84	wet	75-100%	nm	nm	nm
UPLSP	8	5.52	non-wet	45.4%	nm	nm	nm

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

[2]Wetland 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

[3]Wetland 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 15. Vegetation monitoring results for Powerline Crossing Weir revegetation sites in 2014.

Figure 28. The new city of Henderson Park near the Powerline Crossing Weir.

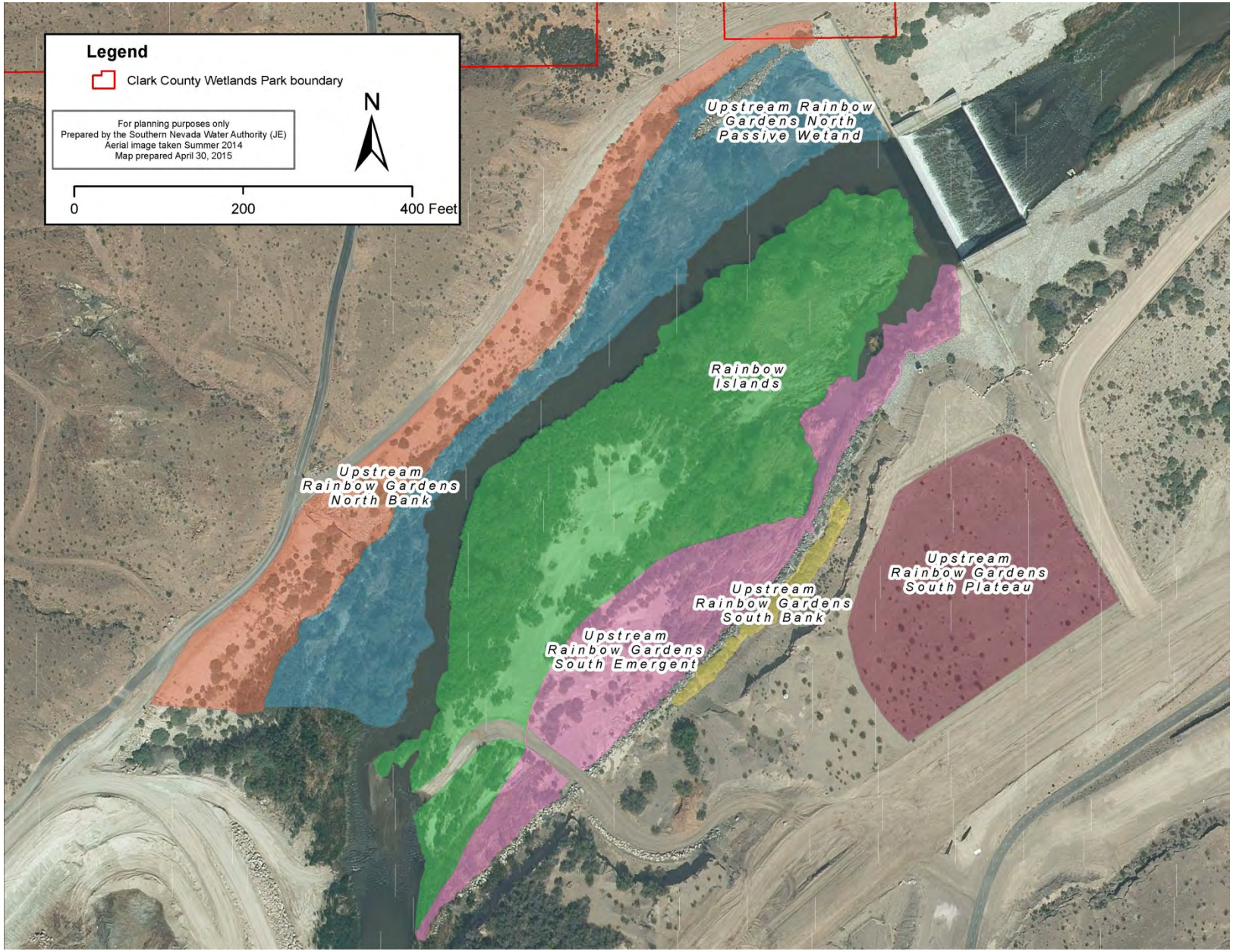

Figure 29. Aerial photograph of 2014 delineated Rainbow Gardens Weir revegetation sites.

Site Code[1]	Growing Season	Acreage	Wetland Status[2]	Total Cover	Noxious Species Cover	Number of Species	WPI[3]
RI	10	3.69	wet	75-100%	2.6%	16	2.22
URNB	5	1.58	non-wet	25-50%	nm	nm	nm
URNPW	10	1.92	wet	75-100%	nm	nm	nm
URSB	9	0.15	non-wet	75-100%	0.5%	3	2.99
URSE	10	1.48	wet	75-100%	2.6%	21	2.28
URSP	9	1.60	non-wet	25-50%	0.0%	10	4.69

[1]URNB=Upstream Rainbow North Bank, URNPW=Upstream Rainbow North Passive Wetlands, URSB=Upstream Rainbow South Bank, URSE=Upstream Rainbow South Emergent, URSP= Upstream Rainbow South Plateau, RI=Rainbow Islands

[2]Wetland 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

[3]Wetland 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 16. Vegetation monitoring results for Rainbow Gardens Weir revegetation sites in 2014.

Figure 30. Large Goodding's willow trees filled the Rainbow Islands revegetation site in 2014.

3.15 Site 108

All of Site 108 was monitored in the field in 2014 (Figure 31). There were 59 monitoring areas throughout the 40-acre and each had all vegetation attributes collected. The site is further broken down into sections based on their original funding source (Table 17; Figure 32). Little maintenance has been required since the planted plants have been established. The one activity that has transpired is invasive tamarisk removal. Prior to 2013, this site was surrounded on all sides by large stands of tamarisk. A large stand to the west was removed as part of the construction

of the Duck Creek Confluence and Upper Narrows Weirs, and a second large stand to the east was removed after monitoring concluded as part of the preparation for the construction of the Sunrise Mountain Weir.

Figure 31. Alkali sacaton had filled in as a dense groundcover over much of Site 108 in 2014.

Originally, this site measured close to 60 acres. Construction of the Duck Creek Confluence and Upper Narrows Weirs removed portions along the northern edge of the site. Areas in the southern part of the site had never established well, so excess soil from the construction of the Archery and Silver Bowl Weirs was deposited on approximately 12 acres. This will hopefully improve the soil conditions enough to allow for increased success when the site is replanted in upcoming years.

Funding Areas	Growing Season[3]	Acreage	Wetland Status[1]	Total Cover	Noxious Species Cover	Number of Species	WPI[2]
NDEP	7	5.31	non-wet	57.4%	1.2%	9	4.11
NDSP	8	12.05	non-wet	77.5%	2.7%	11	3.78
SNPLMA IV	7 – 8	9.78	non-wet	64.9%	8.9%	11	2.68
SNPLMA V	7 – 8	11.13	non-wet	54.7%	4.1%	9	3.45
TOTAL	7 – 8	40.63	non-wet	64.4%	4.4%	17	3.47

[1]Wetland 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

[2]Wetland 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

[3]Portions 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 17. Vegetation monitoring results for Site 108 revegetation site in 2014.

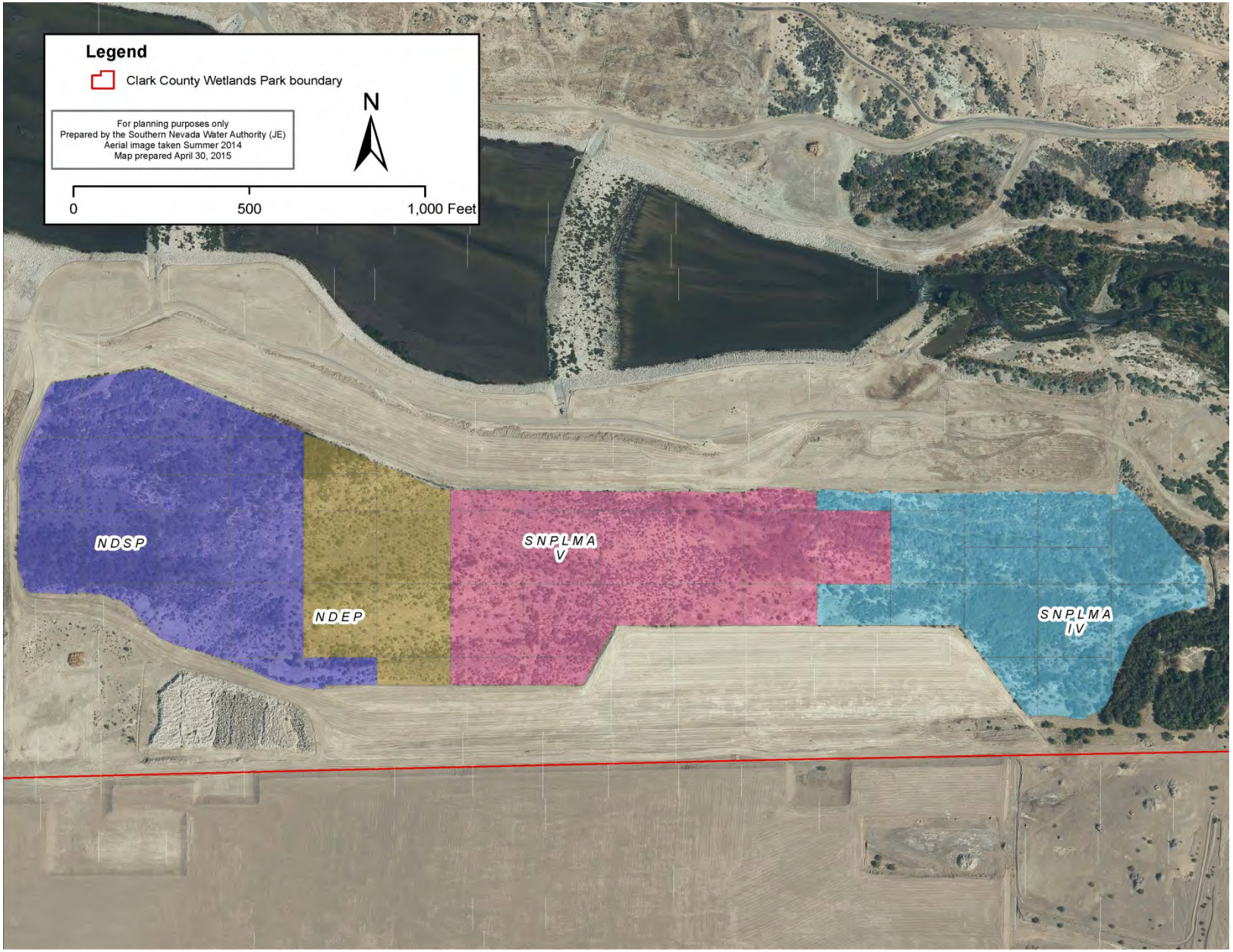

Figure 32. Aerial photograph of Site 108 with 2014 delineations based on funding source.

3.16 Site 111

Site 111 is an upland site with a diversity of plant groupings that makes separating it into multiple monitoring areas beneficial. In its eighth growing season (Table 18), the site is very established and much of the plant material is mature. Like many of the sites along the Wash, Site 111 has part of the CCWP bike trail passing through it (Figure 33). The trail passes through the northern part of the site bisecting 8 of the 24 areas (Figure 34) monitored in the field in 2014. There has been very little change in the attributes of the site in the past few seasons. Additionally, there has been very little maintenance required to keep the site in good condition.

Site Code	Growing Season	Acreage	Wetland Status	Total Cover	Noxious Species Cover	Number of Species	WPI[2]
S111	8	14.91	non-wet	75.7%	2.8%	14	3.64

[1]Wetland 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
[2]Wetland 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 18. Vegetation monitoring results for Site 111 revegetation site in 2014.

Figure 33. The Clark County Wetlands Park trail bisects much of Site 111.

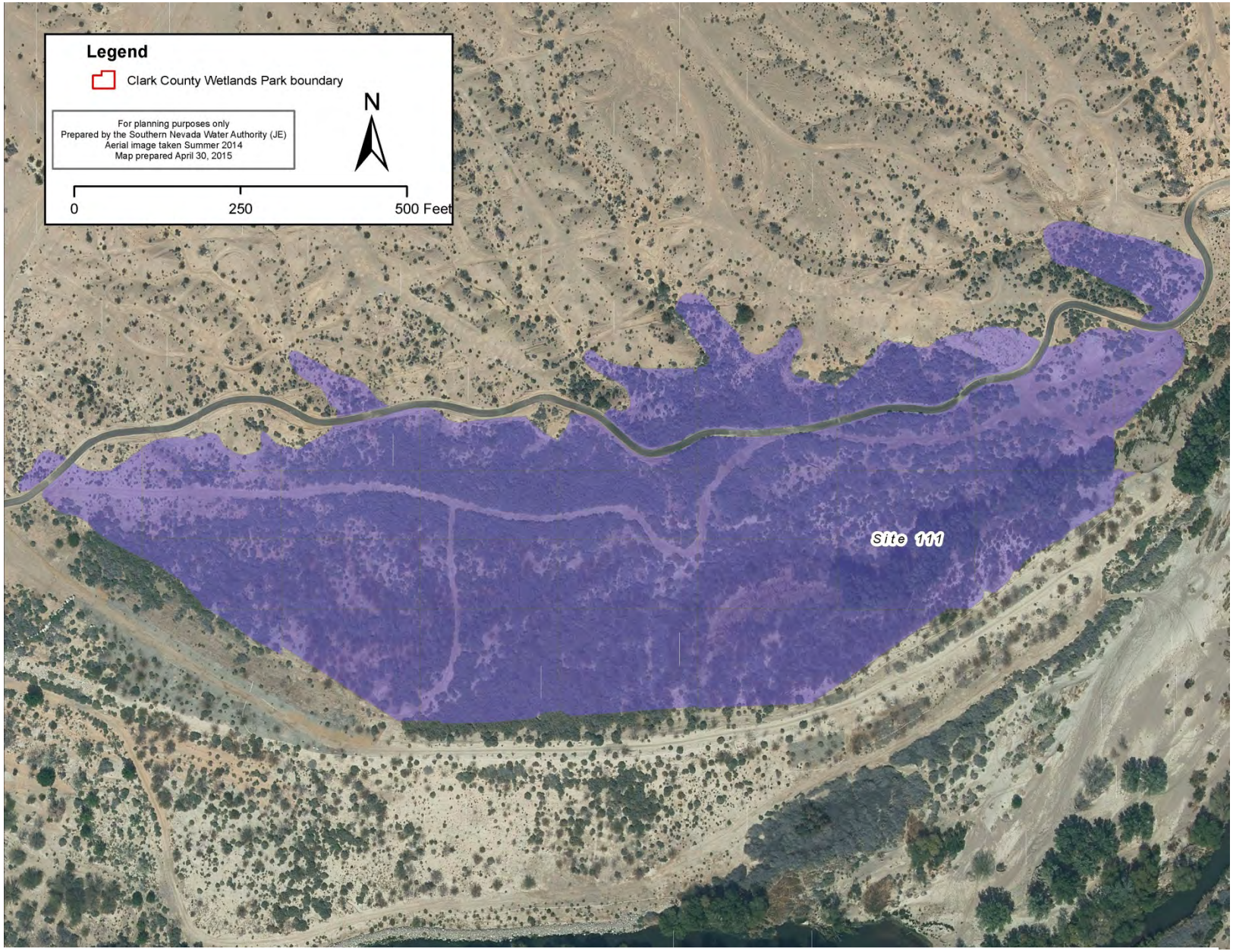

Figure 34. Aerial photograph of the 2014 delineated Site 111 revegetation site.

3.17 Upper Diversion Weir

All eight revegetation sites at the Upper Diversion Weir were in their sixth growing season in 2014 (Table 19; Figure 35) and all monitored in the field. All sites except for Downstream Upper Diversion North have the maximum cover value of 75-100%. They were either planted and/or hydroseeded in 2008 after completion of the Upper Diversion Weir. Downstream Upper Diversion North and Upper Diversion Island were part of the fall 2008 Green-Up. The dense vegetation (Figure 36) and low amounts of noxious weeds needed very little maintenance over the past few years. Some of the vegetation may be moderately impacted by construction of the Tropicana Outfall Weir downstream and channelization projects at the CCWRD property upstream, but neither project is anticipated to increase maintenance efforts on the site.

Site Code	Growing Season	Acreage	Wetland Status	Total Cover	Noxious Species Cover	Number of Species	WPI[2]
DUDE	6	4.10	wet	75-100%	1.5%	20	1.56
DUDN	6	9.53	non-wet	71.6%	0.0%	12	4.95
DUDS	6	1.36	wet	75-100%	1.7%	11	2.13
UDI	6	4.99	non-wet	75-100%	2.5%	15	3.86
UUDE	6	0.15	wet	75-100%	0.1%	14	1.76
UDIE	6	3.44	wet	75-100%	2.5%	14	1.36
UUDS	6	0.71	non-wet	75-100%	2.5%	4	1.13
UDIS	6	0.21	non-wet	75-100%	0.0%	2	4.94

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

[1]Wetland 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

[2]Wetland 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 19. Vegetation monitoring results for Upper Diversion Weir revegetation sites in 2014.

4.0 CONCLUSIONS

The status of revegetation sites along the Wash in 2014 demonstrates success in terms of growing plant cover, plant survivorship, reduction of noxious weeds, and overall ecological health. Of the 96 total sites monitored in 2013 and 2014, (S108, S111, and CCWRD are considered one site each), 70 (72.9%) had the same cover in both years, 16 (16.6%) increased in cover, and 10 (10.4%) decreased in cover. ArcGIS was used to measure total vegetative cover on 38 (38.0%) of the 100 sites monitored in 2014, which provides for improved efficiencies and accuracy in the overall monitoring effort.

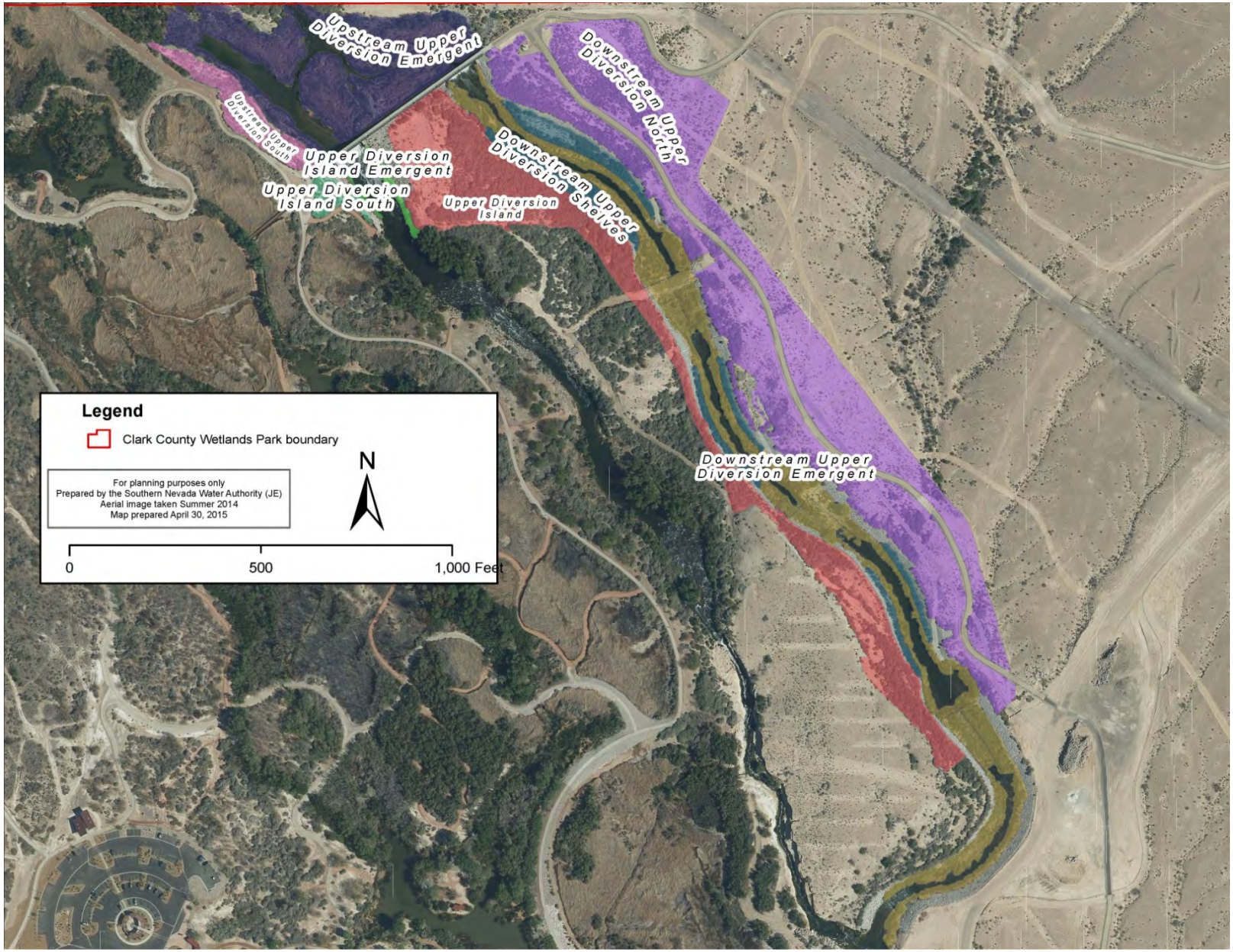

Figure 35. Aerial photograph of 2014 delineated Upper Diversion Weir revegetation sites.

Figure 36. Both non-wetland and wetland revegetation sites at the Upper Diversion Weir were densely vegetated with mature plants in 2014.

5.0 LITERATURE CITED

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