

# **Washoe Lake Wetland Mitigation Site**

**5-year Monitoring Report  
2003-2007**

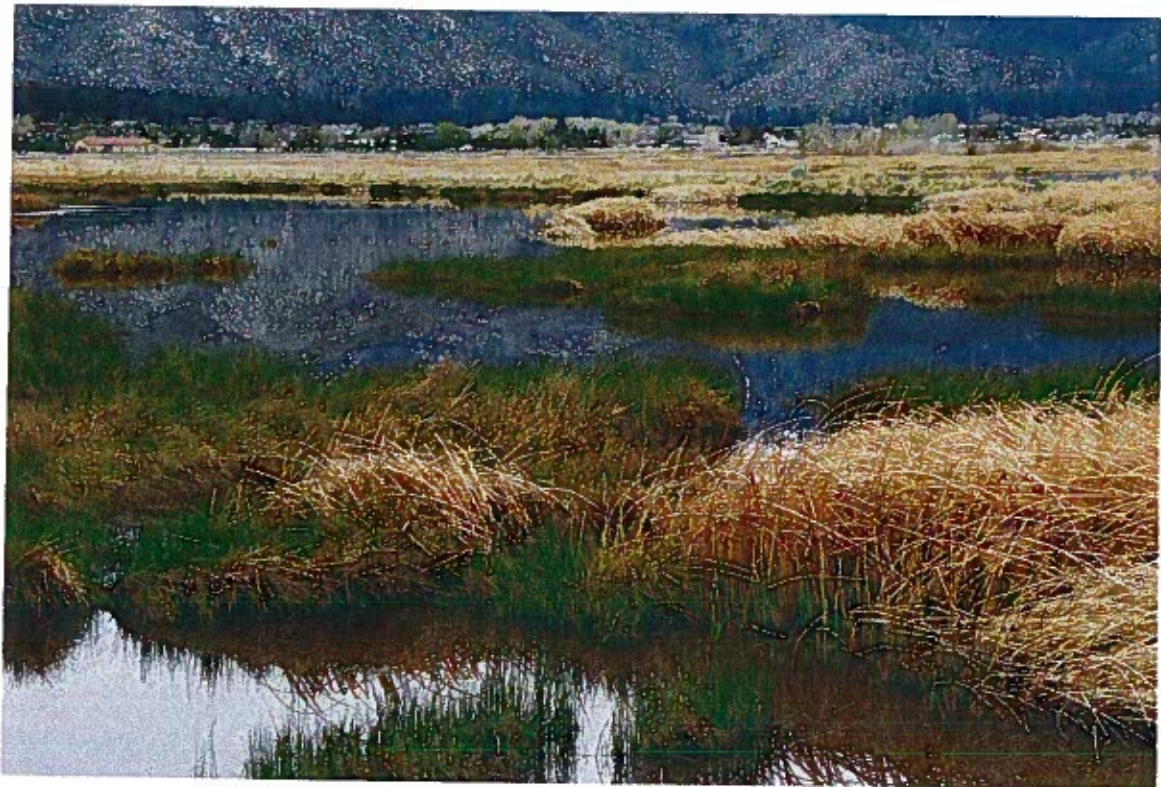


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Environmental Services Division

March 2008



**Washoe Wetlands – April 2007**



Washoe Lake Wetland Mitigation Site  
NDOT 5-year Monitoring Report

## Project Overview

U.S. Army Corp of Engineers (USACE) Clean Water Act Section 404  
Permit No. 0209620 issued in 1988.

### Permittee Contact Information:

Nevada Department of Transportation (NDOT) in association with the  
Federal Highway Administration (FHWA)

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### Site Location:

South end of Washoe Lake in Washoe Valley, Washoe County, Nevada  
15 miles south of Reno and 2 miles north of Carson City  
USGS Carson City 7.5" quad T16N R19E Sec 23, 24, 25, 26  
T16N R20E Sec 19 & 30  
access via US 395: Exit at south end of Washoe Valley.  
Turn east on East Lake Blvd., turn-out for viewing area in one mile

### Project Purpose:

The Washoe Lake Wetland Mitigation Site was created as a mitigation bank to offset impacts to wetlands resulting from Federal highway construction projects along the US 395 corridor from north of Reno to south of Gardnerville. Table 1 lists all USACE permits with wetland impacts which are mitigated for using the wetlands created and enhanced at this site.

### Background:

The 335 acre site was developed in two phases over an 11 year period from 1988 to 1999. A series of 5 east-west main levees and 4 north-south cross-levees form 17 varied-depth "impoundments," or ponds. These ponds create a diverse mosaic of open water, wetland, and upland habitat that benefits plant and wildlife species diversity. Water enters the wetlands naturally from McEwen Creek along the western edge. Supplemental water comes from Washoe Lake via a surface pump on the eastern edge. When the lake level is too low to operate the surface pump, a ground water pump in the wetlands is used to keep water levels consistent in the ponds from March through September. Water levels are controlled via irrigation channels and head-gates.

### Monitoring:

A Mitigation and Monitoring Plan was created and submitted to the USACE in April 2003. Please refer to that document for detailed descriptions of the wetland design, the monitoring plan and protocol used. The site has been monitored yearly from 2003 through 2007. It will continue to be monitored through 2010, or as long as the site is used by NDOT as a wetlands mitigation bank.

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**Table 1**

<b>USACE PERMIT</b>	<b>ISSUE DATE</b>	<b>IMPACTED ACREAGE</b>	<b>MITIGATION RATIO</b>	<b>MITIGATION ACREAGE</b>
9680 US 395 Douglas County	11/12/1987	5.23	4:1	20.5
9620 US 395 S Virginia - DaMonte Washoe County	1/26/1988	3.7	2:1	8.0
9620A US 395 Patriot to SR 431 Washoe County	2/25/1991	27.9	1:1	27.9
199825089 Zolezzi Interchange Washoe Valley Bike Trail Washoe County	4/26/1996 7/30/1998	7.4 0.16	2:1 1:1	14.8 0.16
199825095 I-580 S. Reno to Bowers Washoe County	05/28/03	16.2	3:1	48.6
199400539 Carson City Bypass Phase 1 Carson City County	2001/2002	9.75	3.5:1	34.2
Carson City Bypass Phase 2 Carson City County	applied 11/14/2005 09/13/2006	1.36	pending	pending
<b>Totals</b>		<b>71.70</b>		<b>154.16</b>

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**Performance Standard Results:**

5-year Success Criteria	Result	Criteria Met?
<b>Wildlife</b>		
25 species of birds	75 species 2003-2007 average 1,478 birds per month avg in 2006	Yes
10 species migratory birds	61 species 2007	Yes
10 species nesting birds	25 species 2003-2007 average	Yes
<b>Vegetation</b>		
251 acres of wetlands	223.6 acres 2007 215.1 acres 2003	No *
10 native wetland plant species	32 species OBL + FACW	Yes
<b>Recreation &amp; Education</b>		
	The site is used by hunters, hikers, birders, equestrians, school groups, & conservation groups	Yes
<b>Water Quality</b>		
NAC445A.126, Class C Standards	All 4 outfall discharges (WQSL-0-1 – WQSL-0-4) to Washoe Lake met the standards during 3.5 years of quarterly monitoring (results included)	Yes

\* The mitigation site provides 223.6 acres of wetlands, which is 27.4 acres short of the 251 acre goal set in 2003. See Wetland delineation maps and discussion.

	Acres
Developed	10
Upland	101
Wetland	224
Site Total	335

	Acres
Total Wetland	223.6
Mitigation requirements	154.2 for 71.7 acres impacted
Credits remaining	69.4

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**Discussion:**

The site exceeds criteria established for meeting wetland vegetation diversity, wildlife habitat, recreation and education, and water quality standards. Although the site does not meet wetland acreage expectations, it exceeds the mitigation requirements.

After 5 years of monitoring, which has included drought years as well as good water years, this site has reached its capacity for wetland generation. Because the site requires irrigation from April through September to maintain water levels in the ponds, it is unlikely the wetland areas will expand much beyond their present size. The upland areas to the south and west are too high in elevation and too well-drained to maintain the hydrology necessary for wetland formation. These areas are of value as uplands because they function as buffer areas between the highway and the wetlands and they also provide habitat diversity for a wider variety of bird species and other wildlife.

Water quality monitoring began in March of 2003 and continued through the second quarter of 2006. Samples were taken quarterly at all inflow points to the wetland and all outflow points which discharge to Washoe Lake. There were eight inflow points to the mitigation site (six surface water and two ground water: WQSL-I-1 – WQSL-I-8) and four outflow points from the site (WQSL-O-1 – WQSL-O-4). Dry conditions existed during 4<sup>th</sup> Quarter 2003; 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> quarters 2004; 3<sup>rd</sup> quarter 2005; and 1<sup>st</sup> quarter 2006; consequently, samples were not taken. Also, not all locations were sampled during the quarterly monitoring event because sample locations were dry, outflow gates closed, etc.

At each location a grab sample was obtained. The samples were placed in a chilled ice chest and transported under chain-of-custody to a Nevada certified laboratory. A flow measurement was taken where feasible. Field parameters included pH, electrical conductivity, turbidity, and temperature.

Qualitative analysis of the data indicates that all inflow and outflow discharges comply with NAC445A.126, Class C water standards.

This site presents two major challenges -- water management and noxious weed control. Although some water management activities were assumed when the wetlands were created, the amount of time to move water, the pumping cost, and the site maintenance are greater than expected. A Washoe State Parks employee devotes 8 hours a week to wetlands maintenance activities, particularly water control. NDOT spends up to \$10,000 a year for the operation, maintenance, and repair of the pumps and water control structures.

The perennial pepperweed (*Lepidium latifolium*) infestation requires intense, consistent yearly treatment. The areas of infestation have been reduced, but yearly noxious weed control will be necessary on the site for at least another 5 years. It is unlikely the perennial pepperweed will ever be eradicated from the site. The 2005 survey documented 35 acres of infestation (map included), which has decreased and will be re-mapped in 2009. Pictures from 2004 and 2005 showing treatment results adjacent to impoundment #2 are enclosed.

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From 2003 to 2005 the surface water pump could not be used because of low lake levels. Keeping all of the wetland impoundments filled to capacity using only the ground water pump was not possible by August. A strategy of operating the pump for 4 days and turning it off for 3 to allow for ground water recharge was necessary. Through monitoring, NDOT biologists found that seasonal fluctuations resulting in ephemeral ponds did not have a long-term detrimental affect on the vegetation or the wildlife as long as water levels could be maintained at least through mid-July.

In 2007, Washoe Lake was full enough to use surface water for irrigation through the season. Consequently, both the upland and wetland vegetation had a good growing season and were healthy and vigorous. Bird abundance and diversity remain high. White pelicans were seen in the ponds regularly in 2007, feeding on the carp. A flock of black crown night herons have been nesting in the site for 5 years. A pair of sandhill cranes have used the site as a stop over for the last few years. The tree line between Washoe Lake and the wetlands continues to mature, creating nesting and roosting sites for raptors and flocks of migratory song birds. A pair of foster's terns have been returning to the site for three years. The 2007 summary report from the bird surveys is included.

Although the site will never be completely naturalized, it is inhabited by a variety of other wildlife including deer, coyotes, muskrats, beaver, and other rodents and reptiles. Native frogs are found in the smaller ponds.

### **Observations**

The information in this section is based on observations made at the wetlands over the past 5 years of monitoring.

### **Successes**

The site is a mixed mosaic of wetlands, open water, and uplands within impoundments of varying sizes and shapes. The most productive areas in terms of vegetation and wildlife abundance and diversity are the larger impoundments closer to the lake (1, 2, & 3). These have islands, mud flats, shallow and deep water, and wetland vegetation dispersed throughout the site. The wetlands transition to upland areas gradually, providing a variety of different habitats. These areas are also the farthest away from the highway and observation deck.

The larger upland areas along US 395 and Eastlake Blvd. (15, 16, 17, 11, & 4) are advantageous to the site as a whole because they act as buffer areas for the wetlands. They also provide forage and cover for upland bird and mammal species. Unfortunately, these sites also have the largest infestations of perennial pepperweed.

The riparian vegetation, particularly the cottonwood trees, along the transition areas from wetland to upland provide forage and cover for an expanding variety of passerines and raptors, enhancing the overall site diversity.

The wetland vegetation is expanding into the open water areas in the northern and central impoundments. This vegetation is resilient through drought years even when the sites dry up in later summer and fall.

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The site is used extensively by the Washoe County School District for educational field trips. This program is supported by Lahontan Audubon and Washoe State Parks. Unfortunately, Nevada Dept. of Wildlife has been unable to continue their support of the program and NDOT has not been involved with it due to staffing limitations. This program is one of the best ways to expose children to the benefits of wetland areas and to the importance of maintaining habitat for wildlife.

**Challenges for future planning**

The impoundments require irrigation to maintain water levels, so site maintenance is labor intensive, expensive, and perpetual. Through the cooperative efforts of Washoe State Park and NDOT personnel, a system to support and sustain the site at its highest functional capacity has been developed.

Noxious weed control of perennial pepperweed requires ongoing and diligent efforts.

The small ponds on the east side are too small and homogenous (14, 8, & 7). A possible enhancement would be to plant willows and cottonwoods along the levee banks and allow vegetation to cover the levees, creating one continuous area. The same enhancement could work between impoundments 6, 9, and 13.


Every year hunters leave spent shells and other garbage at the site, use the impoundments to train their dogs before hunting season which could harass the wildlife, and a few have been openly hostile to NDOT personnel. A hunter education or awareness program for the site at the beginning of hunting season may help alleviate this problem.

The entire site is closed to the public from February through July for bird nesting season. It may be possible to open a walking route for pedestrians only - no dogs, through part of the site without having an adverse impact on the wildlife. The route would need to be well marked with limited access.

# Southern Washoe Lake Wetlands



**Legend**

-  Wetlands
-  County Roads
-  NDOT Roads



**Wetland Area in Acres**

Wetland Number	Area	Wetland Number	Area
1	15.07	10	23.21
2	23.71	11	1.28
3	59.17	12	24.08
4	2.43	13	8.89
5	23.17	14	1.61
6	11.05	15	1.6
7	3.37	16	2.33
8	2.51	17	9.6
9	10.54		
<b>Total</b>		<b>223.62</b>	



# Southern Washoe Lake Wetlands Perennial Pepperweed (*Lepidium latifolium*) Infestations

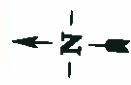


**Legend**

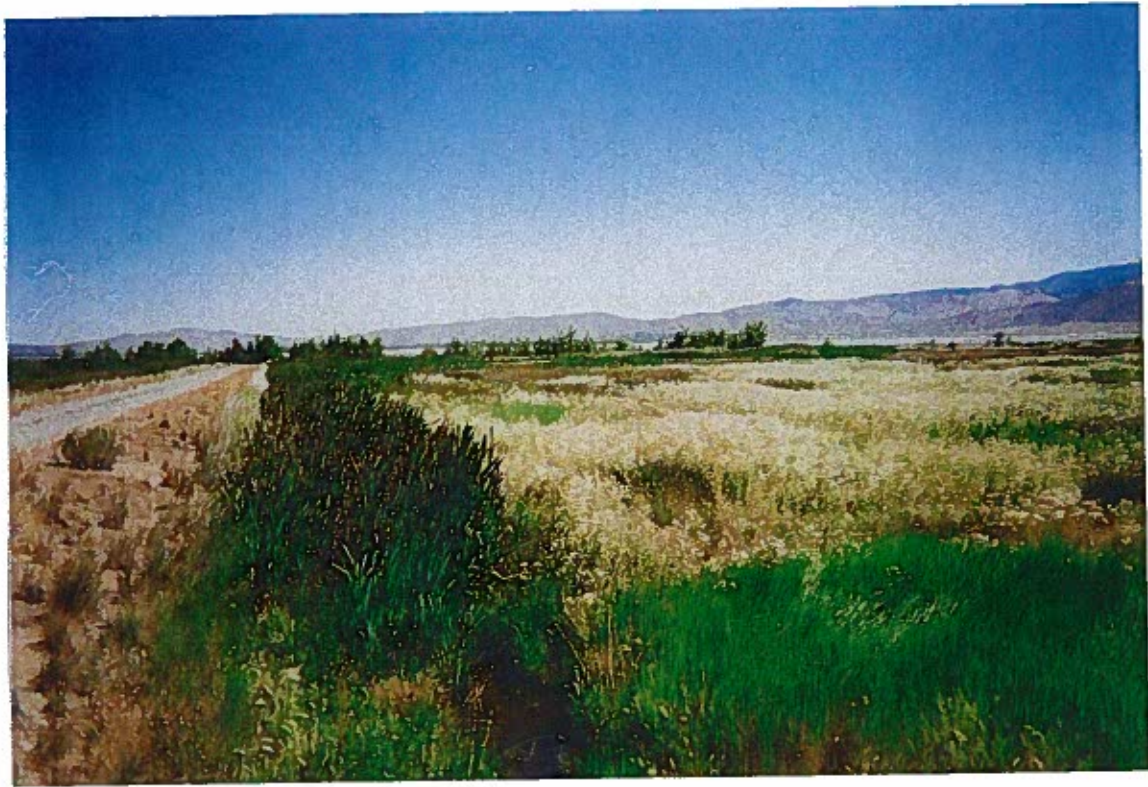
- Pepperweed Points
- Pepperweed areas
- Wetlands
- County Roads
- NDOT Roads

100 0 100 200 300 400  
Meters

<b>43 Area Features</b>	<b>34,040 Acres</b>
<b>232 Point Features</b>	<b>0.048 Acres</b>
<b>1 pt = 1 Sq. Meter</b>	
<b>Total</b>	<b>34,088 Acres</b>



2004



2005








**Washoe Wetlands**  
**2003 Vegetation Map**  
**Attachment #4**

Flight No. 2730  
 Frame No. 2-4, 7-19  
 Date Flown: 05/28/03  
 Print Finalized: 6/15/04  
 (+/-) 1"=500'  
 500 0 500 Feet  
 Mosaic NOT to Exact Scale

**LEGEND**

- Tall Whitetop
- Wetlands
- Uplands
- Impoundment Boundaries

## Washoe Wetlands 2007 Bird Survey Summary

<b>Waterfowl</b>	<b>Abundance</b>	<b>Nesting</b>		
American wigeon	R			
Blue-winged teal	R			
Bufflehead	R			
Cinnamon teal	A	Y	42 R = Rare	< 10
Gadwall	A	Y	29 C = Common	10-100
Lesser scaup	R		9 A = Abundant	>100
Green-winged teal	R			
Mallard	A	Y	80 Total Species	
Northern pintail	C	Y		
Northern shoveler	C		24 Nesting Species	
Redhead	C	Y		
Ring-necked duck	R			
Ruddy duck	A	Y		
Domestic goose	R			
Canada goose	C	Y		
<b>Marsh &amp; Shore birds</b>				
American avocet	C	Y		
American coot	A	Y		
Black-necked stilt	A	Y		
Common snipe	C	Y		
Killdeer	C	Y		
Greater yellowlegs	R			
Short-billed dowitcher	R			
Sora	R			
Least sandpiper	R			
Solitary sandpiper	R			
Spotted sandpiper	R			
Western sandpiper	R			
Virginia rail	C			
Willet	C			
Wilson's phalarope	A	Y		
<b>Seabirds</b>				
American White Pelican	C			
Double-crested Cormorant	C			
Clark's Grebe	C			
Eared Grebe	R			
Horned Grebe	R			
Pie-billed Grebe	C	Y		
Western Grebe	R			
Forster's Tern	R	Y		
Seagulls	C			
<b>Waders</b>				
American Bittern	R			
Black-crowned Night-Heron	C	Y		
Great Blue Heron	R			

<b>Waterfowl</b>	<b>Abundance</b>	<b>Nesting</b>			
Great Egret	R				
Snowy Egret	R				
Cattle Egret	R				
Sandhill Crane	R				
White-faced Ibis	A				
<b>Passerines</b>					
American robin	C				
House finch	C				
European Starling	C				
Black phoebe	R				
Say's phoebe	R				
Common raven	R				
Black-billed magpie	R				
Brewer's blackbird	C	Y			
Brown-headed cowbird	C	Y			
Red-winged blackbird	A	Y			
Yellow-headed blackbird	A	Y			
Bullock's Oriole	R				
California quail	C	Y			
Downy woodpecker	R				
Loggerhead shrike	R				
Marsh wren	C	Y			
Mourning Dove	C				
Northern flicker	R				
Sage sparrow	C				
Savannah sparrow	C	Y			
Song sparrow	R				
White-crowned sparrow	C	Y			
Barn swallow	A				
Bank swallow	C				
Cliff swallow	C				
Violet-green swallow	C				
Western kingbird	R				
Western meadowlark	R				
Yellow warbler	R				
Yellow-rumped warbler	R				
<b>Raptors, Nighthawks, Owls</b>					
American kestrel	R				
Common nighthawk	R				
Northern harrier	R				
Red-tailed hawk	R				
Turkey vulture	R				
	80	24			

## Washoe Wetland Plant List 2007

	<b>9 Grasses</b>
FACW	<i>Agrostis stolonifera</i>
OBL	<i>Beckmannia syzigachne</i>
FAC+	<i>Distichlis spicata</i>
FAC+	<i>Elymus triticoides</i>
FACW-	<i>Festuca arundinacea</i>
FACW-	<i>Hordeum brachyantherum</i>
FACW+	<i>Phalaris arundinacea</i>
FACW	<i>Poa palustris</i>
FACW+	<i>Polypogon monspeliensis</i>
	<b>12 Sedges &amp; Rushes</b>
OBL/FACW	<i>Carex spp.</i>
OBL	<i>Carex nebrascensis</i>
OBL	<i>Eleocharis spp</i>
OBL	<i>Juncus articulatus</i>
FACW	<i>Juncus balticus</i>
FACW	<i>Juncus nevadensis</i>
OBL	<i>Scirpus acutus</i>
OBL	<i>Scirpus maritimus</i>
OBL	<i>Scirpus nevadensis</i>
OBL	<i>Scirpus validus</i>
OBL	<i>Typha angustifolia</i>
OBL	<i>Typha latifolia</i>
	<b>2 Trees &amp; Shrubs</b>
FACW	<i>Populus fremontii</i>
FACW	<i>Salix exigua</i>
	<b>12 Herbaceous &amp; Aquatic</b>
FACW	<i>Asclepias speciosa</i>
OBL	<i>Cardamine breweri</i>
OBL	<i>Heliotropium curassavicum</i>
FACW	<i>Iris missouriensis</i>
FACW	<i>Iva axillaris</i>
OBL	<i>Lemna spp.</i>
OBL	<i>Mimulus guttatus</i>
OBL	<i>Polygonum lapathifolium</i>
OBL	<i>Potamogeton spp.</i>
OBL	<i>Trifolium wormskioldii</i>
OBL	<i>Veronica americana</i>
OBL	<i>Veronica anagallis-aquatica</i>

**NDOT Washoe Valley Wetland Mitigation Area Water Quality Monitoring Results WQSL-O-1**

<b>Analyte/Parameter</b>	<b>Units</b>	<b>Standards of Water Quality - Class C Waters (NAC 445A.126) Unless otherwise Noted</b>	<b>2003 Average n=2</b>	<b>March 4, 2004</b>	<b>2005 Average n=2</b>	<b>June 7, 2006</b>
Alkalinity, Total	mg/L CaCO3	None	130	134	119	171
Alkalinity/Bicarbonate	mg/L CaCO3	None	121	121	118	145
Alkalinity/Carbonate	mg/L CaCO3	None	9	13	2	26
Alkalinity/Hydroxide	mg/L CaCO3	None	Not Detected	Not Detected	Not Detected	Not Detected
Ammonia-N*	mg/L N	NAC 445A.118 Table 1 (Acute) Warm Water Fisheries* Ranged from 3.79 to 10.13	Not Detected	Not Detected	Not Detected	Not Detected
Arsenic - ICP-MS	mg/L	0.05	0.004	Not Detected	0.002	0.002
Boron - ICP-OES	mg/L	0.75	Not Detected	0.07	Not Detected	0.07
Cadmium - ICP-MS	mg/L	0.005	Not Detected	Not Detected	Not Detected	Not Detected
Calcium - ICP-OES	mg/L	None	25	20	24	19
Chloride - Ion Chromatography	mg/L	None	14	32	15	16
Chromium - ICP-MS	mg/L	0.1	Not Detected	Not Detected	Not Detected	Not Detected
Copper - ICP-MS	mg/L	0.2	Not Detected	Not Detected	Not Detected	0.003
E. coli Colifert Quanti-Tray	mpn/100ml	None	97	1	2	2
Hardness, as CaCO3	mg/L CaCO3	None	96	77	91	87
Iron - ICP-OES	mg/L	1	0.10	0.2	0.12	0.16
Kjeldahl Nitrogen	mg/L N	None	1.3	1.9	0.75	2
Lead - ICP-MS	mg/L	0.05	Not Detected	Not Detected	Not Detected	Not Detected
Magnesium - ICP-OES	mg/L	None	8.5	6.5	7.7	10.0
Mercury - AA Cold Vapor	mg/L	0.002	Not Detected	Not Detected	Not Detected	Not Detected
Nitrate-N - Ion Chromatography	mg/L N	None	Not Detected	Not Detected	Not Detected	Not Detected
Nitrite-N - Ion Chromatography	mg/L N	None	0.04	Not Detected	Not Detected	Not Detected
Phosphorus - Ortho	mg/L	None	0.14	0.14	0.13	0.06
Phosphorus - Total	mg/L	1.00	0.23	0.21	0.20	0.16
Selenium - ICP-MS	mg/L	0.02	Not Detected	Not Detected	Not Detected	Not Detected
Sodium - ICP-OES	mg/L	None	32	46	24	48
Sulfate - Ion Chromatography	mg/L	None	3.8	12.0	6.0	3.6
Total Coliform Quanti-Tray	mpn/100ml	None	1095	166	164	2419.2
Total Dissolved Solids	mg/L	500	205	250	195	240
Zinc - ICP-MS	mg/L	2	0.02	0.16	Not Detected	Not Detected
pH		6.5-8.5	8.46	7.90	8.28	8.97
Electrical Conductivity	µS/cm	None	421	407	342	386
Turbidity	NTU	None	6.5	33	4	2.4

\* Because the standard is pH dependent, a single value cannot be entered; therefore, the values are expressed as a range. In the case where a no-detect value was encountered, half of the detection limit was used for the average analysis.

Value in excess of water quality standard

**NDOT Washoe Valley Wetland Mitigation Area Water Quality Monitoring Results WQSL-O-2**

Analyte/Parameter	Units	Standards of Water Quality - Class C Waters (NAC 445A.126) Unless otherwise Noted	2003 Average n=2	March 4, 2004	2005 Average n=3	2005 STDDEV	June 7, 2006
Alkalinity, Total	mg/L CaCO3	None	190	140	116	12	218
Alkalinity/Bicarbonate	mg/L CaCO3	None	184	120	114	14	195
Alkalinity/Carbonate	mg/L CaCO3	None	6	20	2	2	23
Alkalinity/Hydroxide	mg/L CaCO3	None	Not Detected	Not Detected	Not Detected	-	Not Detected
Ammonia-N*	mg/L N	NAC 445A.116 Table 1 (Acute) Warm Water Fisheries* Ranged from 2.24 to 11.10	0.02	Not Detected	0.02	0.26	Not Detected
Arsenic - ICP-MS	mg/L	0.05	0.005	0.005	0.002	0.001	Not Detected
Boron - ICP-OES	mg/L	0.75	0.06	0.12	0.04	0.02	0.10
Cadmium - ICP-MS	mg/L	0.005	Not Detected	Not Detected	Not Detected	-	Not Detected
Calcium - ICP-OES	mg/L	None	29	20	22	4	27
Chloride - Ion Chromatography	mg/L	None	20	33	17	10	22
Chromium - ICP-MS	mg/L	0.1	Not Detected	Not Detected	Not Detected	-	Not Detected
Copper - ICP-MS	mg/L	0.2	0.003	0.008	0.003	0.002	0.004
E. coli Coliuret Quanti-Tray	mpn/100ml	None	21	11	6	4	4
Hardness, as CaCO3	mg/L CaCO3	None	128	77	81	15	120
Iron - ICP-OES	mg/L	1	0.10	0.3	0.08	0.02	0.05
Kjeldahl Nitrogen	mg/L N	None	7.3	1.9	0.83	0.38	0.1
Lead - ICP-MS	mg/L	0.05	Not Detected	Not Detected	Not Detected	-	Not Detected
Magnesium - ICP-OES	mg/L	None	13.5	6.6	6.6	1.3	12.0
Mercury - AA Cold Vapor	mg/L	0.002	Not Detected	Not Detected	Not Detected	-	Not Detected
Nitrate-N - Ion Chromatography	mg/L N	None	Not Detected	Not Detected	Not Detected	-	Not Detected
Nitrite-N - Ion Chromatography	mg/L N	None	Not Detected	Not Detected	Not Detected	-	Not Detected
Phosphorus - Ortho	mg/L	None	0.20	0.16	0.13	0.07	0.25
Phosphorus - Total	mg/L	1.00	0.30	0.36	0.22	0.09	0.35
Selenium - ICP-MS	mg/L	0.02	Not Detected	Not Detected	Not Detected	-	Not Detected
Sodium - ICP-OES	mg/L	None	52	50	28	10	59
Sulfate - Ion Chromatography	mg/L	None	5.5	14.0	7.0	5.0	8.3
Total Coliform Quanti-Tray	mpn/100ml	None	1177	365	252	196	1046
Total Dissolved Solids	mg/L	500	285	280	200	30	300
Zinc - ICP-MS	mg/L	2	0.06	0.18	Not Detected	-	Not Detected
pH		6.5-8.5	8.02	8.00	8.35	0.00	8.69
Electrical Conductivity	µS/cm	None	459	403	300	69	499
Turbidity	NTU	None	6.7	60	8	9	2.3

\* Because the standard is pH dependent, a single value cannot be entered; therefore, the values are expressed as a range. In the case where a no-detect value was encountered, half of the detection limit was used for the average analysis.

Value in excess of water quality standard

**NDOT Washoe Valley Wetland Mitigation Area Water Quality Monitoring Results WQSL-O-3**

<b>Analyte/Parameter</b>	<b>Units</b>	<b>Standards of Water Quality - Class C Waters (NAC 445A.126) Unless otherwise Noted</b>	<b>September 30, 2003</b>	<b>2005 Average n=2</b>	<b>June 7, 2006</b>
Alkalinity, Total	mg/L CaCO3	None	91	155	22
Alkalinity/Bicarbonate	mg/L CaCO3	None	91	155	210
Alkalinity/Carbonate	mg/L CaCO3	None	Not Detected	Not Detected	10
Alkalinity/Hydroxide	mg/L CaCO3	None	Not Detected	Not Detected	Not Detected
Ammonia-N*	mg/L N	NAC 445A.118 Table 1 (Acute) Warm Water Fisheries* Ranged from 5.10 to 8.68	0.1	Not Detected	Not Detected
Arsenic - ICP-MS	mg/L	0.05	0.003	0.002	0.005
Boron - ICP-OES	mg/L	0.75	0.05	Not Detected	0.10
Cadmium - ICP-MS	mg/L	0.005	Not Detected	Not Detected	Not Detected
Calcium - ICP-OES	mg/L	None	13	25	32
Chloride - Ion Chromatography	mg/L	None	1.7	21	23
Chromium - ICP-MS	mg/L	0.1	Not Detected	Not Detected	Not Detected
Copper - ICP-MS	mg/L	0.2	0.004	Not Detected	0.004
E. coli Coliort Quanti-Tray	mpn/100ml	None	45	3	185
Hardness, as CaCO3	mg/L CaCO3	None	44	95	120
Iron - ICP-OES	mg/L	1	Not Detected	0.06	Not Detected
Kjeldahl Nitrogen	mg/L N	None	0.5	1.05	1.4
Lead - ICP-MS	mg/L	0.05	Not Detected	Not Detected	Not Detected
Magnesium - ICP-OES	mg/L	None	2.9	8.3	11.0
Mercury - AA Cold Vapor	mg/L	0.002	Not Detected	Not Detected	Not Detected
Nitrate-N - Ion Chromatography	mg/L N	None	0.09	Not Detected	Not Detected
Nitrite-N - Ion Chromatography	mg/L N	None	Not Detected	Not Detected	Not Detected
Phosphorus - Ortho	mg/L	None	0.49	0.12	0.5
Phosphorus - Total	mg/L	1.00	0.49	0.19	0.58
Selenium - ICP-MS	mg/L	0.02	Not Detected	Not Detected	Not Detected
Sodium - ICP-OES	mg/L	None	24	41	56
Sulfate - Ion Chromatography	mg/L	None	2.4	8.1	11.0
Total Coliform Quanti-Tray	mpn/100ml	None	200	194	2613
Total Dissolved Solids	mg/L	500	130	250	330
Zinc - ICP-MS	mg/L	2	0.05	0.02	0.03
pH		6.5-8.5	8.21	8.03	8.26
Electrical Conductivity	µS/cm	None	181	390	520
Turbidity	NTU	None	27	2	10.8

\* Because the standard is pH dependent, a single value cannot be entered; therefore, the values are expressed as a range. In the case where a no-detect value was encountered, half of the detection limit was used for the average analysis.

# NDOT Washoe Valley Wetland Mitigation Area Water Quality Monitoring Results WQSL-O-4

Analyte/Parameter	Units	Standards of Water Quality - Class C Waters (NAC 445A.126) Unless otherwise Noted	2003 Average n=2	2005 Average n=3	2005 STDDEV	June 7, 2006
Alkalinity, Total	mg/L CaCO3	None	217	215	37	196
Alkalinity/Bicarbonate	mg/L CaCO3	None	190	193	16	193
Alkalinity/Carbonate	mg/L CaCO3	None	27	23	38	3
Alkalinity/Hydroxide	mg/L CaCO3	None	Not Detected	Not Detected	-	Not Detected
Ammonia-N*	mg/L N	NAC 445A.118 Table 1 (Acute) Warm Water Fisheries* Ranged from 4.01 to 6.15	Not Detected	0.04	0.01	Not Detected
Arsenic - ICP-MS	mg/L	0.05	0.006	0.005	0.003	0.003
Boron - ICP-OES	mg/L	0.75	0.07	0.07	0.02	0.12
Cadmium - ICP-MS	mg/L	0.005	Not Detected	Not Detected	-	Not Detected
Calcium - ICP-OES	mg/L	None	23	24	4	33
Chloride - Ion Chromatography	mg/L	None	23	19	7	22
Chromium - ICP-MS	mg/L	0.1	Not Detected	Not Detected	-	Not Detected
Copper - ICP-MS	mg/L	0.2	Not Detected	0.002	0.001	0.006
E. coli Colifert Quanti-Tray	mpn/100ml	None	23	9	6	21
Hardness, as CaCO3	mg/L CaCO3	None	108	102	14	120
Iron - ICP-OES	mg/L	1	Not Detected	0.23	0.27	Not Detected
Kjeldahl Nitrogen	mg/L N	None	2.05	1.50	0.30	1.3
Lead - ICP-MS	mg/L	0.05	Not Detected	Not Detected	-	0.005
Magnesium - ICP-OES	mg/L	None	12.0	10.0	2.0	10.0
Mercury - AA Cold Vapor	mg/L	0.002	Not Detected	Not Detected	-	Not Detected
Nitrate-N - Ion Chromatography	mg/L N	None	Not Detected	0.04	0.03	Not Detected
Nitrite-N - Ion Chromatography	mg/L N	None	Not Detected	Not Detected	-	Not Detected
Phosphorus - Ortho	mg/L	None	0.15	0.24	0.16	0.55
Phosphorus - Total	mg/L	1.00	0.29	0.32	0.15	0.6
Selenium - ICP-MS	mg/L	0.02	Not Detected	Not Detected	-	Not Detected
Sodium - ICP-OES	mg/L	None	70	66	11	49
Sulfate - Ion Chromatography	mg/L	None	7.0	13.0	3.0	12.0
Total Coliform Quanti-Tray	mpn/100ml	None	1237	538	189	3255
Total Dissolved Solids	mg/L	500	320	310	26	300
Zinc - ICP-MS	mg/L	2	0.02	0.03	0.02	Not Detected
pH		6.5-8.5	8.20	8.53	0.53	8.18
Electrical Conductivity	µS/cm	None	508	492	71	470
Turbidity	NTU	None	9	9	1	23

\* Because the standard is pH dependent, a single value cannot be entered; therefore, the values are expressed as a range.

In the case where a no-detect value was encountered, half of the detection limit was used for the average analysis.

Value in excess of water quality standard