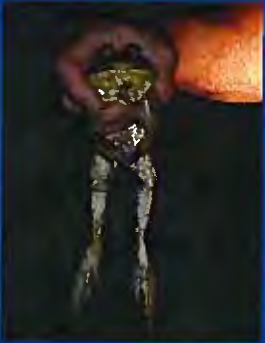


Las Vegas Wash Coordination Committee



Las Vegas Wash Amphibian Survey, 2004-2005



SOUTHERN NEVADA
WATER AUTHORITY

July 2007



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Las Vegas Wash
Coordination
Committee



**Las Vegas Wash Amphibian Survey
2004-2005**

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

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Las Vegas Wash Coordination Committee

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July 2007

Las Vegas Wash Amphibian Survey, 2004-2005

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1.0 INTRODUCTION

The Las Vegas Wash (Wash) is the most significant riparian waterway in Las Vegas Valley, Clark County, Nevada. The Wash, located southeast of downtown Las Vegas, in the southeast corner of Clark County within the boundaries of the Clark County Wetlands Park (Wetlands Park; Figure 1), is the primary drainage channel for the Las Vegas Valley hydrographic basin, approximately 1,600 miles². It carries a combination of highly treated wastewater, urban runoff, stormwater, and shallow groundwater from the valley to Lake Mead. Historically, the Wash was an ephemeral desert channel that only carried periodic stormwater from the valley.

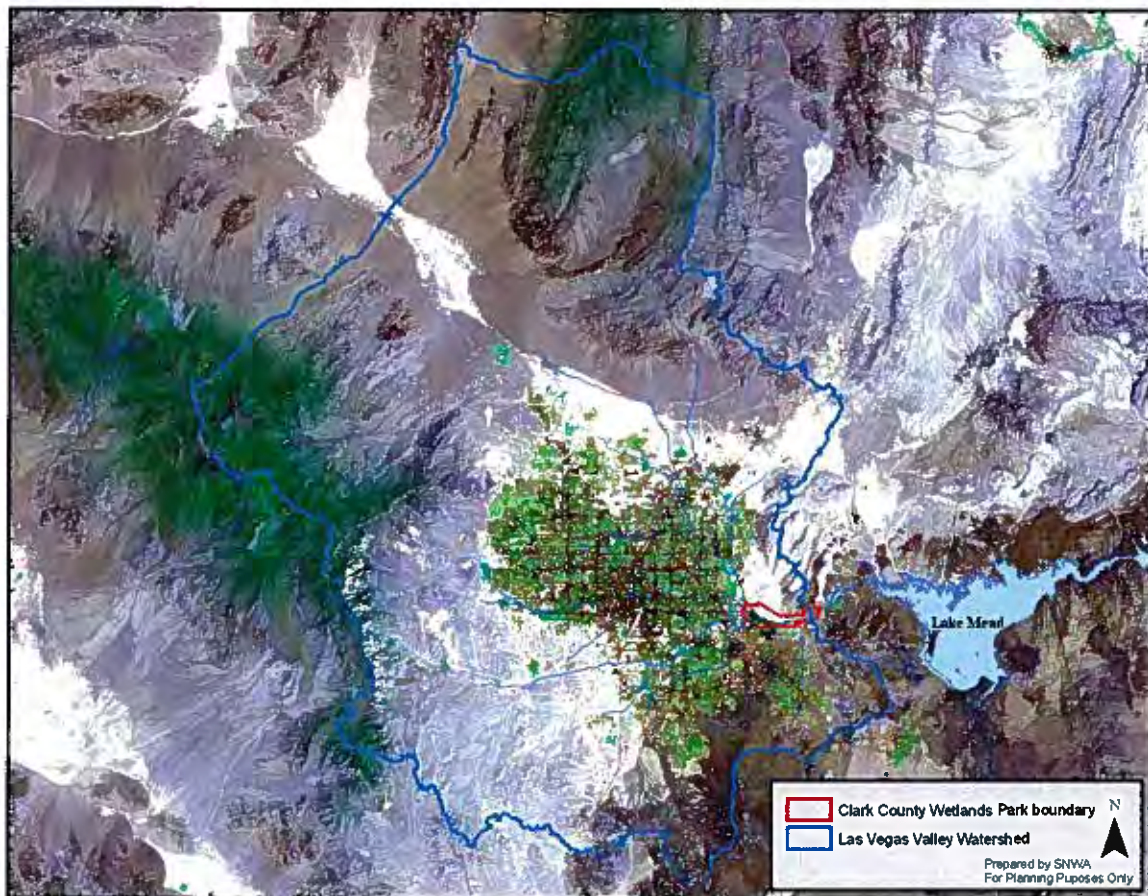


Figure 1: Las Vegas Valley map.

Prior to modern settlement of Las Vegas in 1905, the floodplain of the Wash consisted of a mixture of native phreatophytic plants including mesquites (*Prosopis* sp.), salt grass (*Distichlis spicata*), and alkali sacaton (*Sporobolus airoides*; Malmberg 1965). As a result of rapid urbanization in Las Vegas in the 1930s, 1940s, and 1950s, surface water flows discharging into the Wash increased dramatically. Runoff from the valley saturated the floodplain, thereby creating an extensive (approximately 2,000 acres) wetland environment consisting of tules (*Schoenoplectus* sp.), cattails (*Typha domingensis*), and common reed (*Phragmites australis*) and bordered by the invasive salt cedar (*Tamarix ramosissima*). Since the 1970s, the once extensive wetland environment has been reduced by erosion to less than 200 acres. Erosion caused severe

environmental disturbance and unfortunately triggered the further invasion of salt cedar into the Wash. In 1998, the Las Vegas Wash Coordination Committee (LVWCC), a 29-member group consisting of government agencies, businesses, environmental groups, and citizens, was formed to stabilize the Wash ecosystem.

The LVWCC prepared the Las Vegas Wash Comprehensive Adaptive Management Plan (CAMP) that outlined a strategy for the long-term stabilization and management of the Wash, including an action item to develop a long-term wildlife management plan. Several wildlife studies have been carried out to meet the goals of the CAMP including studies for reptiles, small mammals, bats, birds, and fish. To support the development of a long-term wildlife management plan, a baseline study on amphibians was needed.

Lowland riparian habitats that are suitable for amphibians in Clark County are found along the Colorado, Virgin, and Muddy Rivers and along the Wash. These riparian environments provide essential habitat for a diversity of wildlife species in the arid southwest environment, but little is known about amphibian species diversity along the Wash. Preliminary evaluations indicated that two species, bullfrog (*Rana catesbeiana*) and Woodhouse's toad (*Bufo woodhousii*), comprised the most common amphibians within the system. Other amphibian species known to be present in the Las Vegas Valley and the eastern Mohave Desert (Bradford et al. 2005) include the red-spotted toad (*B. punctatus*), Great Plains toad (*B. cognatus*), Arizona toad (*B. microscaphus*), Pacific chorus frog (*Pseudacris regilla*), Great Basin spadefoot (*Spea intermontana*), and the relict leopard frog (*R. onca*).

This report summarizes amphibian inventory activities conducted on the Wash, from the northern boundary of the Clark County Nature Preserve downstream to Lake Las Vegas Resort. This area of the Wash covers various habitat types available for amphibian species. Because the Wash has been dramatically altered over the last 30 years since the last known studies (Bradley and Niles 1973), a reliable set of baseline information on species occurrence and abundance is greatly needed to fill in this gap. It also provides an inventory that will assist the Las Vegas Wash Project Coordination Team with management of these amphibians along the Wash for the future.

2.0 METHODS

2.1 Study Area

The study area for this project is within the Wetlands Park located between the Clark County Water Reclamation District (CCWRD) and Lake Las Vegas Resort (Figure 2). Study sites were chosen to represent the stretch of the Wash that encompasses the Wetlands Park boundary spatially along the Wash, reaching from the northern tip of the Clark County Nature Preserve to the Lake Las Vegas wetland at Lake Las Vegas Resort.

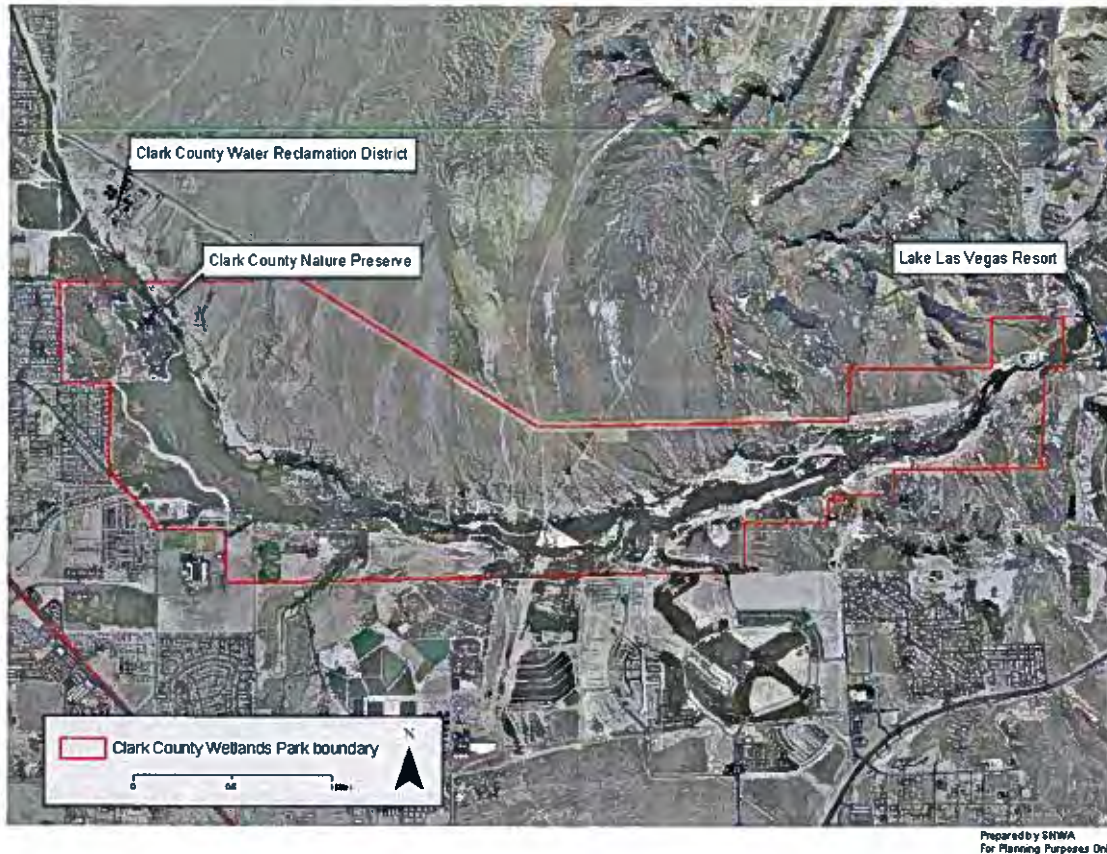


Figure 2: Study area.

2.2 Survey Protocol

To determine the presence of amphibians along the Wash, teams of 2-3 biologists conducted surveys for 2-3 nights each month during two consecutive years in the spring, summer, and fall using the visual encounter survey technique (VES; Crump and Scott 1994). These surveys are an effective method to find amphibians and have been previously used in this region (Bradford et al. 2003). A total of 11 months were interpreted, 4 months during 2004, and 7 months during 2005. Due to an increase in the West Nile virus within Clark County, the 2004 surveys were ended early to ensure the safety of personnel. During 2005, preventative measures, such as protective clothing and preventative sprays, were taken to complete the survey. Sampling dates were determined by weather conditions to optimize sampling results and avoid poor access and hazardous conditions. Site surveys began at sunset, allowing time to prepare equipment, which included headlamps, high intensity flood-lights (~50,000 lux; Figure 3) and a global positioning system (GPS) unit. All surveyors wore waders to more easily search along the water's edge. Transects were walked at all 11 sites during the time of peak amphibian activity, after sunset. Approximately four to five sites were visited a night, and amphibians were searched for along the water's edge and terrestrial habitats within several feet of the water's edge. Surveyors used aural searches for calling amphibian individuals



Figure 3: Survey equipment used.

and to identify breeding sites. Within any particular area, the actual length of a survey transect would vary. These data provided an evaluation of species presence, relative abundance, breeding activity by transect, site and habitat type, and a general indication of health.

2.3 Site Selection

Before the study began, aerial photographs were used in ArcMap (ESRI, Redlands, CA), a geographic information system (GIS) program, to identify possible amphibian survey sites. Sites were selected based on habitat parameters that are important for amphibians. Important habitat parameters included slow-moving, relatively shallow backwater areas (Figure 4). Sites were also chosen based on location to weirs, also known as grade control structures. Weir sites were chosen to determine if abundance of amphibians is influenced near these man made structures. In addition to habitat parameters, sites were chosen based on accessibility. For example, surveyors needed to safely walk and survey all sites in a two to three-night period. Eleven sites were chosen to conduct the survey within the study area (Table 1; Figure 5). Site abbreviations are used herein.



Figure 4: A suitable habitat search location.

2.4 Data Collection

Data were collected using data sheets (Appendix A) or a GPS unit. Recorded data consisted of site name, transect number, date, observers, cloud cover, wind speed, air temperature, recent precipitation, search-start time, search-end time, species detected, life stage, number of species, calling, amplexus, and noted if a voucher was collected. For the second year of the study, a data dictionary was created and downloaded onto the GPS unit to facilitate data collection. This data dictionary allowed all information from the data sheet to be recorded onto the GPS unit. Transects, the survey routes walked at each site, were recorded on the GPS unit so that actual lengths (feet) would be known and data could be standardized by the length and location of area searched. Time (minutes) was recorded at the start and end points of each transect to analyze survey effort. The transect data recorded each of the species aurally and visually and as present by life stage (i.e., egg, larva, juvenile, adult). Documentation of breeding activity (i.e., calling, amplexus) was recorded as well as an examination for malformations. Vouchers were collected with an extendable net when possible.

Site Names	Site Abbreviations
Nature Preserve	NP
Duck Creek	DC
Pabco Road Weir	PRW
Cottonwood Cell	CC
Historic Lateral Weir	HLW
C-1 Channel	C-1
Bostick Weir	BW
Lower Narrows Weir	LNW
Demonstration Weir	DW
Rainbow Gardens Weir	RGW
Lake Las Vegas Wetland	LLVW

Table 1: Survey sites and abbreviations.

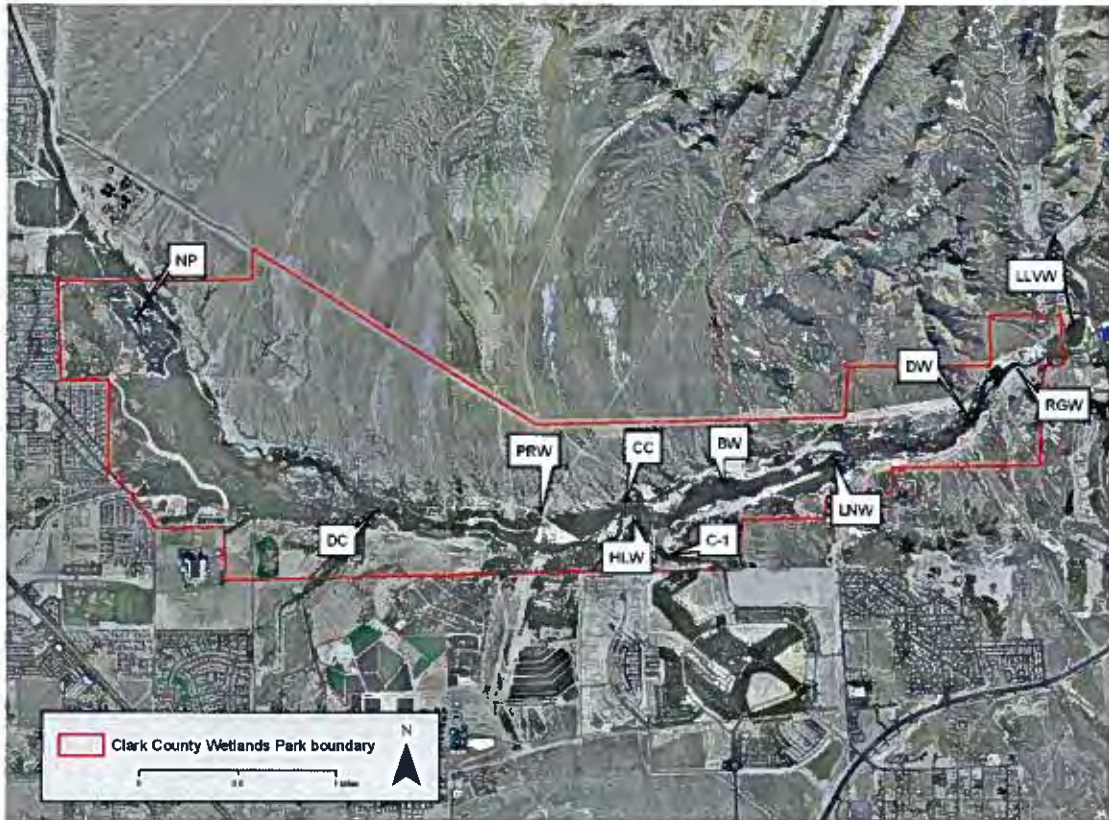


Figure 5: Site locations.

2.5 Data Analyses

Data collected during the two-year study period was analyzed spatially and temporally. Analyses included total number of detections (absolute abundance); species richness (the number of species detected within the year, month, habitat and site); relative abundance (the number of detections per survey time); and survey effort (the time searched or the transect length searched). Descriptive statistics were used to analyze the data.

3.0 RESULTS AND DISCUSSION

3.1 Site Descriptions and Habitat Types

Four habitat types were used to group the 11 sample locations. The habitat types were: (1) weirs, (2) tributaries, (3) off-channel wetlands, or (4) other. The sites chosen included 5 weir sites, 2 tributary sites, 2 off-channel wetland sites, and 2 other sites. Each of the sites had one or more of the following habitat characteristics: permanent ponds (man made, year round ponds); temporary ponds (stormwater or seeps); seasonal drainages (urban runoff/stormwater drainages); backwater ponds (off channel ponds); open-water channel; or slow- or fast-moving water.

3.1.1 Habitat Type - Weirs

Pabco Road Weir (PRW)

PRW, completed in 2000, is a concrete capped gabion grade-control structure located downstream of the City of Henderson (COH) Water Reclamation Facility and Basic Management Inc. discharge points. This site has multiple habitat characteristics including open water channel, temporary backwater ponding, and slow- and fast-moving water. This site allowed observers to walk different types of habitat at one site. Upstream of the weir consisted of an impoundment approximately one-acre in size with willows (*Salix* spp.), cattails and reeds along the edge. Downstream vegetation consisted of willows along the banks and cottonwoods (*Populus fremontii*) within several feet of the water's edge (Appendix B and C).

Historic Lateral Weir (HLW)

HLW, completed in 2000, is a rock riprap grade-control structure located a half-mile downstream of PRW. Fast moving water along the water's edge consisted of cattails, reeds and willows as the primary vegetation. The backwater ponding at this site had a depth of approximately three to four feet consisting solely of salt cedar and common reeds along the edge (Appendix B and C).

Bostick Weir (BW)

The BW site, completed in 2003, is a rock riprap grade-control structure located a half-mile downstream of HLW. Habitat types at this site are primarily of the open-water channel variety with some fast-moving water and a small portion of backwater ponding. The open water channel located upstream of the weir is approximately 600 feet wide with depths of up to six to seven feet (Appendix B and C). Downstream consisted of some fast moving water with willows and common reed as the main vegetation cover. The water's edge of both the north and south side had common reed and willows as the primary vegetation cover and some salt cedar mixed in.

Demonstration Weir (DW)

DW, completed in 1999, is a temporary rock riprap structure located 1.2 miles downstream of BW. The site was solely open-water channel, approximately 70–200 feet wide with dense willows, cattails, salt cedar, common reeds, and quailbush (*Atriplex lentiformis*) within several feet of the water's edge (Appendix B and C).

Rainbow Gardens Weir (RGW)

RGW, completed in 2004, is a concrete grade-control structure located 0.4 miles downstream from DW. This site has slow and fast-moving water with tules and willows along the bank and emergent areas. This site changed monthly due to the change of flows through the site. For example, after rain events the site would have partial inundations and would create new channels through the site (Appendix B and C).

3.1.2 Habitat Type - Tributaries

Duck Creek (DC)

DC is a perennial tributary feeding into a narrow reach of the Wash (15–20 feet wide) located one mile upstream of PRW. The tributary carries urban runoff, stormwater, and shallow groundwater with both slow- and fast-moving water. Vegetation consists of dense stands of salt cedar, cattails and common reeds (Appendix B and C). This site had the highest total dissolved solids (TDS) levels, which average 4,500 milligrams liter⁻¹(mg L⁻¹). All other sites along the Wash range from 1,700-2,000 mg L⁻¹ in TDS.

C-1 Channel (C-1)

C-1 is a tributary carrying urban runoff, stormwater and shallow groundwater from the COH. Located directly downstream of HLW, it consists of backwater ponding and slow-moving water. Vegetation consists primarily of cattails, common reeds, and patches of salt cedar (Appendix B and C).

3.1.3 Habitat Type - Off-Channel Wetlands

Nature Preserve (NP)

The NP site is an off-channel recreational park with permanent ponds, seasonal drainages, and slow-moving water habitats throughout. The ponds and seasonal drainages are surrounded by stands of willows, cattails, and common reeds (Appendix B and C). In 2004, when this site was surveyed, water at the site was from the saline Monson Channel. After the 2004 survey period, the source water at the NP was changed to highly treated wastewater from the CCWRD.

Lake Las Vegas Wetland (LLVW)

The LLVW site is a five-acre off-channel area created as a mitigation requirement by the U.S. Army Corps of Engineers to restore wetlands inundated or filled during creation of Lake Las Vegas. This site has both permanent and temporary ponding surrounded by willows, cattails and common reeds (Appendix B and C).

3.1.4 Habitat Type - Other

Lower Narrows Weir (LNW)

The LNW site consisted of an open-water channel approximately 60 feet wide and some fast-moving water with salt cedar as the primary vegetation cover (Appendix B and C). This site was visited only twice due to lack of encounters.

Cottonwood Cell (CC)

The CC site was created in 2002 as a nursery location for harvested cottonwood poles. The approximately one-acre site was designed for native revegetation efforts along the Wash and consists solely of temporary ponding with cottonwoods, sandbar willows, salt cedar, and common reeds (Appendix B and C). The temporary ponding was observed only after rain events. This site was only visited twice; once the temporary ponding was gone there were no encounters.

3.2 Species Detections

Anurans (frogs and toads) were the only species detected along the Wash. Over the two-year study, 924 adult anurans were identified with most observed in 2005. Two species were readily identified as the non-native bullfrog (Figure 6) and the native Woodhouse's toad (Figure 7). The native Woodhouse's toad is listed under the Clark County Multiple Species Habitat Conservation Plan as a watch list species. Eight individuals that were observed could only be identified to genus; however, these individuals were likely either the bullfrog or Woodhouse's toad. Of the 924 detections, 17% were juveniles, indicating reproduction in the study area. A distinction between adults and juveniles was based solely on size in the field and is therefore a qualitative assessment. Larvae stage animals (tadpoles), all identified as bullfrog tadpoles, were estimated to be a total of 947. Because estimations were made at night and in large pools that were obscured by adjacent vegetation, the actual number of tadpoles is likely much higher than this value. Of the 916 adult and juvenile bullfrogs and Woodhouse's toads that were detected during this study, their abundance was variable both temporally and spatially (Table 2).



Figure 6: Bullfrog (*Rana catesbeiana*).

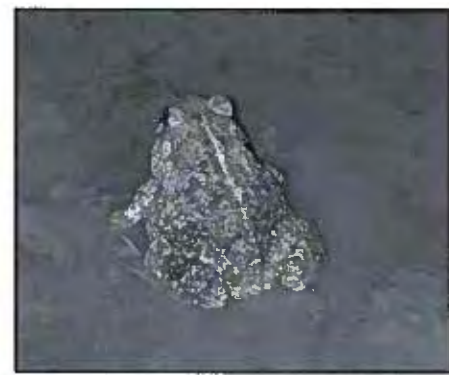


Figure 7: Woodhouse's Toad (*Bufo woodhousii*).

Both the bullfrog and Woodhouse's toad were encountered at weirs, tributaries, and off-channel wetland habitat types, but only the bullfrog was encountered in the other habitat category. Of the four habitat types, weir habitats had the greatest absolute abundance for the survey with 597 detections. Site PRW had the most anurans detected over the two-year period with 319: 219 bullfrog and 100 Woodhouse's toad (Table 2). Sites DC and LNW had the fewest anuran occurrences, with one bullfrog detected at LNW and none at DC. During 2004, 360 anurans were detected: 322 bullfrogs and 31 Woodhouse's toads. During 2005, 564 anurans were identified: 451 bullfrogs and 112 Woodhouse's toads. Detections in 2004 and 2005 varied spatially (Appendix D).

The greatest numbers of anurans (218) were detected during the July months. Of that number, 158 were bullfrogs and 60 were Woodhouse's toads. The May months detected the least number with 143 anurans (131 bullfrogs and 12 Woodhouse's toad). In May and June, 12 Woodhouse's toads were detected. March and May had similar detections of bullfrogs, with March having 132 and May having 131. There was a general trend that monthly absolute abundance decreased year to year for bullfrogs (Figure 8). Woodhouse's toad absolute abundance increased moderately between years in May and June and a considerable increase observed from July 2004 to 2005. During March, May, June, and July a decrease of 12% was detected of the total individuals from 2004-2005.

Habitat Type	Site Name	Year	Bullfrogs	Woodhouse's toads
Weirs	PRW	2004	70	10
		2005	149	90
Weirs	HLW	2004	38	1
		2005	33	3
Weirs	BW	2004	29	8
		2005	68	9
Weirs	DW	2004	25	0
		2005	25	0
Weirs	RGW	2004	10	0
		2005	27	2
Tributaries	DC	2004	0	0
Tributaries	C-1	2004	34	6
		2005	83	0
Off-Channel Wetlands	NP	2004	6	2
		2005	5	5
Off-Channel Wetlands	LLVW	2004	110	4
		2005	50	3
Other	LNW	2004	0	0
		2005	1	0
Other	CC	2005	10	0
Grand Total			773	143

Table 2: Absolute abundance of anurans detected at all 11 sites in 2004 and 2005.

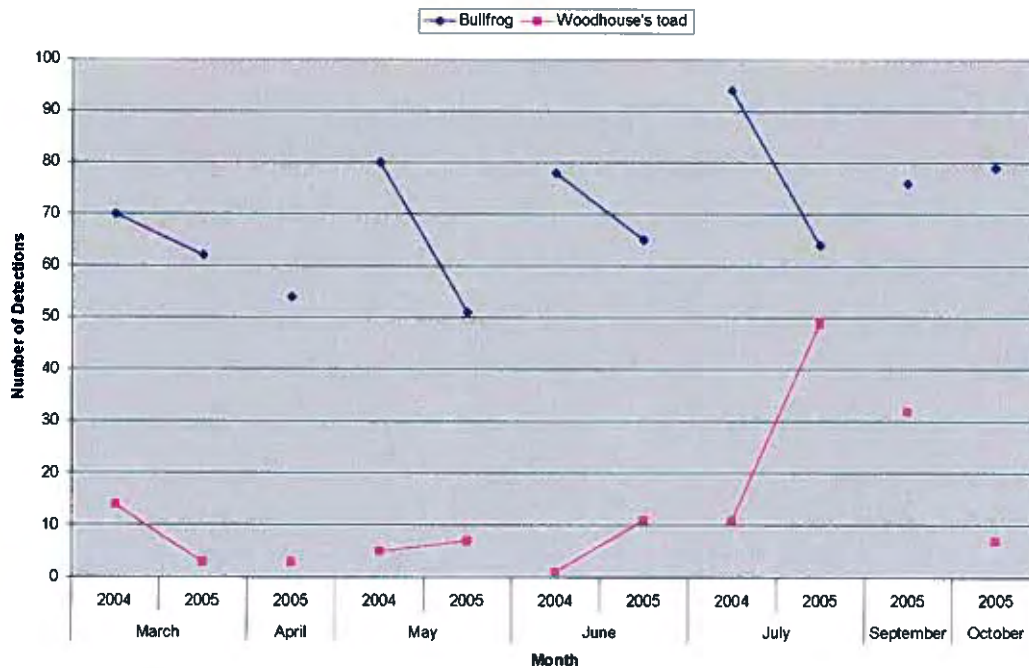


Figure 8: Monthly absolute abundance comparison between 2004 and 2005.

Besides monthly differences in absolute abundance, there were habitat differences too. Weir habitats observed a decrease of 8% of bullfrogs but a 71% increase of Woodhouse's toads (Figure 9). This increase was due to the PRW site. On one survey night in July 2005, the PRW site alone accounted for greater than 29% of the total Woodhouse's toads found for both years, an increase of 600% compared to the July 2004 survey period. Woodhouse's toad amplexus was documented during April 2005. Only one other habitat experienced amplexus. The tributary habitat at the C-1 site experienced Woodhouse's toad amplexus during March 2004, but this site had a subsequent 100% decrease of Woodhouse's toad absolute abundance during the remainder of the survey. Tributary habitats had a 37% increase of bullfrogs in 2005 compared to 2004. Off-channel wetland habitats decreased in both bullfrogs at 76% and Woodhouse's toads at 33% from 2004 to 2005. The LLVW site accounted for the largest number of bullfrogs, with 34% of total encounters in 2004, but that number declined by 54% in 2005. This result could have been due to the release of water in the mitigation area from 2004 to 2005 leaving less suitable habitat for amphibians in 2005. The other habitat category was only visited a total of four times and could not be compared by months.

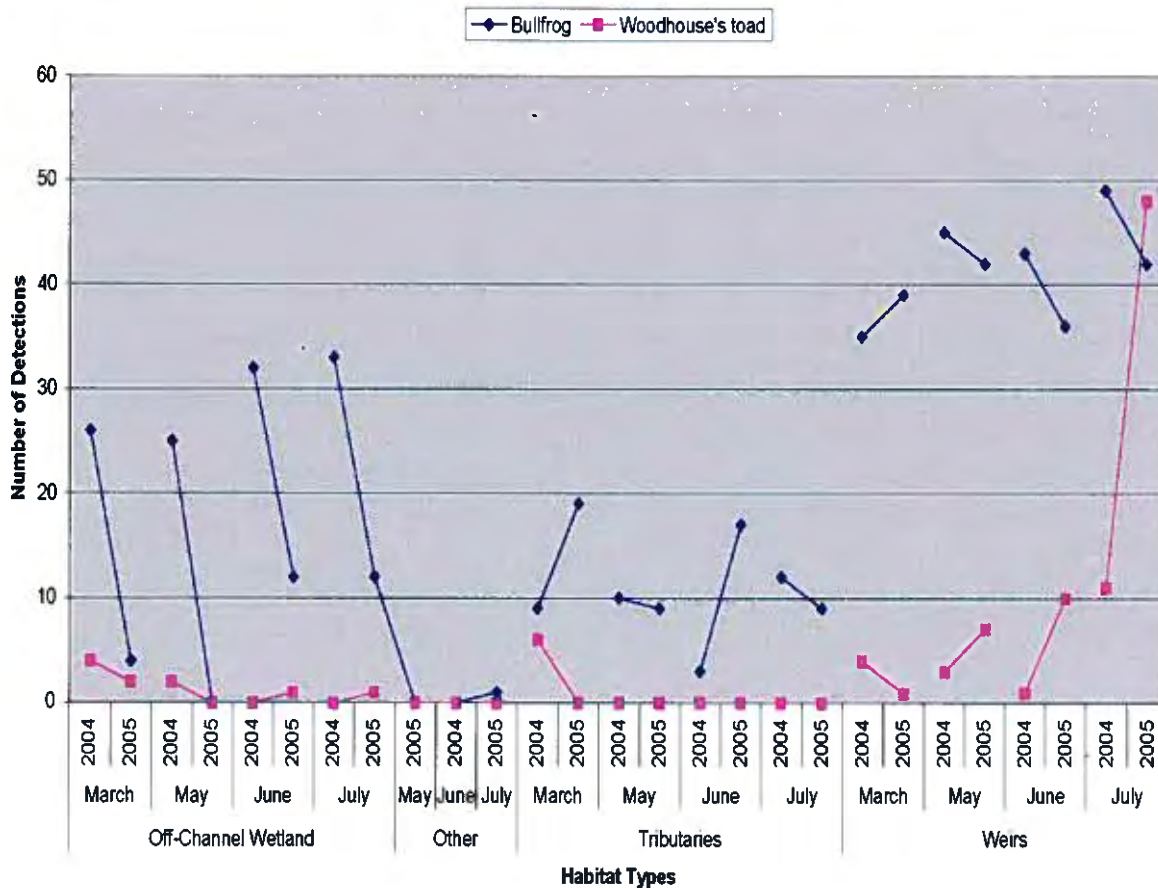


Figure 9: Absolute abundance of anurans detected at four habitat types in 2004 and 2005.

Relative abundance was analyzed using the number of individuals detected divided by time surveyed (hour; Appendix E). Sites RGW and C-1 showed a considerable increase of bullfrogs detected hour⁻¹ from 2004 to 2005. Site RGW increased by 16 bullfrogs hour⁻¹ and C-1 by 17 bullfrogs hour⁻¹ between 2004 and 2005. For Woodhouse's toads, PRW was the only site with a dramatic difference from 2004 to 2005, with an increase of seven individual's hour⁻¹. BW site showed an increase of 6 bullfrog's hour⁻¹ from 2004 to 2005. For Woodhouse's toads, the BW site had a decrease of two individual's hour⁻¹ from 2004 to 2005. HLW site had an increase of seven bullfrog's hour⁻¹ and a one individual increase hour⁻¹ for the Woodhouse's toad from 2004 to 2005.

The majority of survey effort was spent at the NP and PRW sites (Table 3). Site NP had the largest amount of effort spent as measured by transect survey length measured in feet, but a low number of individuals detected (18) for that effort. PRW had the most encounters at 319, as well as the most effort in time spent. Some sites were only visited a couple times due to low anuran activity, high flow rates, accessibility (DC and LNW), and areas of temporary ponds that had dried up over time (CC).

Site Names	Total Distance Surveyed (feet)	Total Time Surveyed (minutes)
BW	78,737	917
C-1	54,908	691
CC	1,093	10
DW	35,397	344
DC	728	11
HLW	29,800	446
LLVW	55,207	720
LNW*	0	58
NP	105,282	1013
PRW	102,825	1312
RGW	15,170	179

Table 3: Measure of survey effort.

*Length was not measured at the LNW site

During 2004, four months of observations totaled a surveyed distance of 155,597 feet over 42.8-hours, while during 2005 a total of 324,934 feet (52.2 hours) were surveyed over a seven-month period (Figure 10, Appendix C). During the second year of the study, time was saved because surveyors became familiar with where anurans were at the study sites.



Figure 10: Example of transects surveyed during a two to three night period

4.0 RECOMMENDATIONS

The amphibian survey data provided herein is important information for the development of the long-term wildlife management plan. This report summarizes data collected from two years of monitoring amphibians in and adjacent to the Wash. Species richness and abundance are different both spatially and temporally and as reported in this report such community measures will change over time. Nevertheless, a baseline dataset for amphibians has been established and will prove useful for management along the Wash.

As enhancement activities continue in the Wash and as part of invasive species control strategies, salt cedar will be replaced by native vegetation (willows and cottonwoods) and will alter large

acres of habitat suitable for amphibians. This study did not represent a large effort to survey dense habitats of salt cedar, a highly invasive weed that dominates most riparian drainages in Southern Nevada. Qualitative estimates of Woodhouse's toad abundance in salt cedar habitats suggest that this plant may be important for these species. A more intense study to investigate the relationship between Woodhouse's toad populations within salt cedar habitats should be part of any future efforts because this information could be important for the long-term conservation of this species.

5.0 LITERATURE CITED

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APPENDIX A
2004 Data Sheets

Data sheet used during 2004

General Amphibian Wash Site Visit Information (v. 27 Mar 04)

Site Name/Location:					
Date: ___ / ___ / ___ (dd/mm/yy) <input type="checkbox"/> Daylight <input type="checkbox"/> Night				Observers:	
Description/Directions:					
Cloud Cover: 0-20% 21-40% 41-60% 61-80% 81-100%			Wind: <1 1-3 4-7 8-12 13-18 >18		
Air Temp: °C °F		Rel. Humidity: %		Water Temp: °C °F	
Recent Precipitation: <input type="checkbox"/> None <input type="checkbox"/> Sprinkles <input type="checkbox"/> Light <input type="checkbox"/> Heavy					
Search Starting Time: _____ (24 hr)		Ending Time: _____ (24 hr)		Total Time: _____ min	
Search Start Easting _____		Northing _____		End Easting _____	
Northing _____		End Easting _____		Northing _____	
GPS File Name: _____		<input type="checkbox"/> None		Approx. Length of Search Path: _____ meters	
Survey Notes:					
Amphibian Species Observations					
Species*	Certainty	Life Stage**	Number	Notes	Voucher Photo
	Yes No	Adult Juvenile Larvae Egg			
	Yes No	Adult Juvenile Larvae Egg			
	Yes No	Adult Juvenile Larvae Egg			
	Yes No	Adult Juvenile Larvae Egg			
	Yes No	Adult Juvenile Larvae Egg			
	Yes No	Adult Juvenile Larvae Egg			
	Yes No	Adult Juvenile Larvae Egg			
	Yes No	Adult Juvenile Larvae Egg			
Calling <input type="checkbox"/> Yes Species: _____ / _____			Amplexus <input type="checkbox"/> Yes Species: _____ / _____		
Vouchers: Species/Collection Number:					

* Indicate unusual species by name and for common species use the following Taxon Codes: BUFO = Bufo species, BUWO = Bufo woodhousii, BUMI = Bufo microscaphus (use BUWO/BUMI for hybrids), BUPU Bufo punctatus, RANA = Rana species, RACA = Rana catesbeiana
 ** For Larvae, estimate (count) up to 300, after that indicate simply 300+. For Eggs, count the number of masses or strings.

APPENDIX B
Photographic Comparisons of Vegetation Cover at the Site
Locations

Habitat Type 1- Weirs
Pabco Road Weir (PRW)



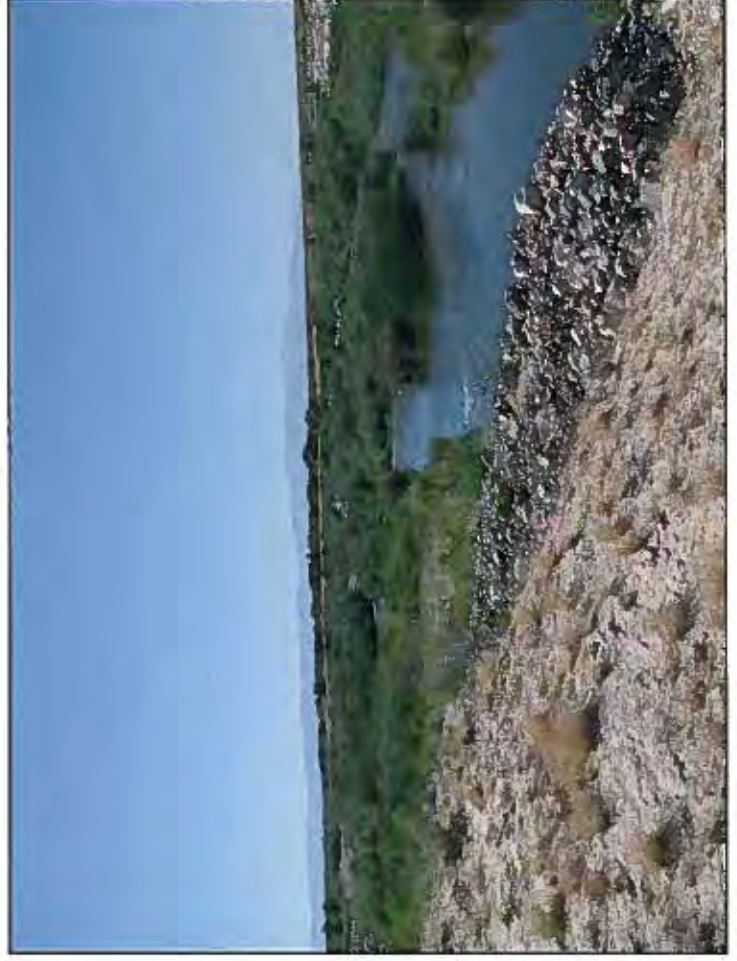
Habitat Type 1- Weirs

Historic Lateral Weir (HLW)



Habitat Type 1- Weirs

Bostick Weir (BW)



Habitat Type 1- Weirs
Demonstration Weir (DW)



Habitat Type 1- Weirs

Rainbow Gardens Weir (RGW)



Habitat Type 2- Tributaries

Duck Creek (DC)



Habitat Type 2- Tributaries

C-1 Channel (C-1)



Habitat Type 3- Off-Channel Wetlands

Nature Preserve (NP)



Habitat Type 3- Off-Channel Wetlands

Lake Las Vegas Wetland (LLVW)



Habitat Type 4- Other

Lower Narrows (LNW)



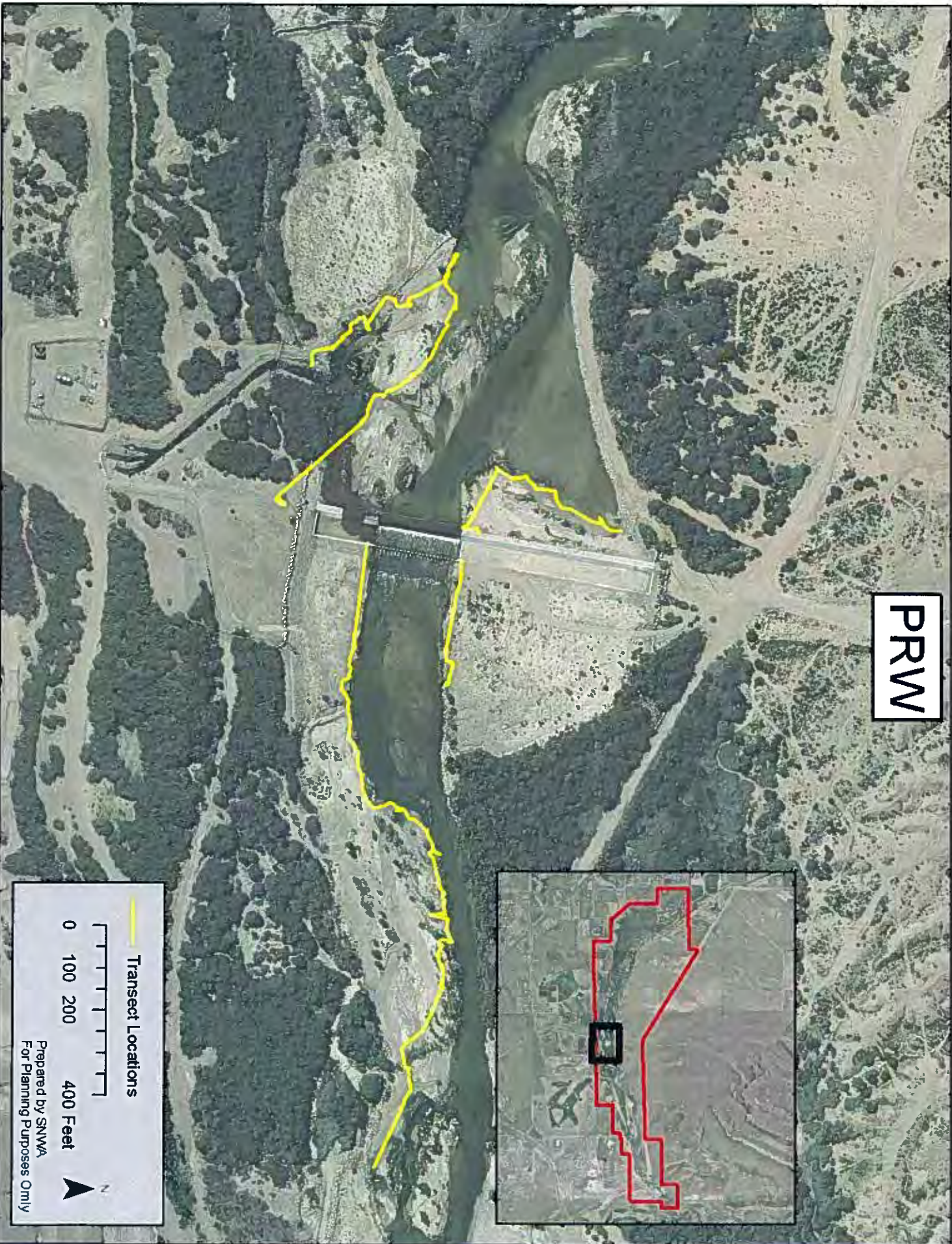
Habitat Type 4- Other

Cottonwood Cell (CC)



APPENDIX C
**Example of Transects Surveyed per Site Over a Two to
Three Night Survey Period**

PRW

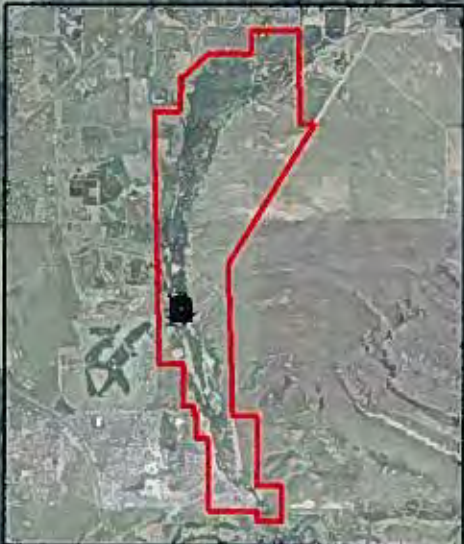


— Transect Locations

0 100 200 400 Feet

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HLW



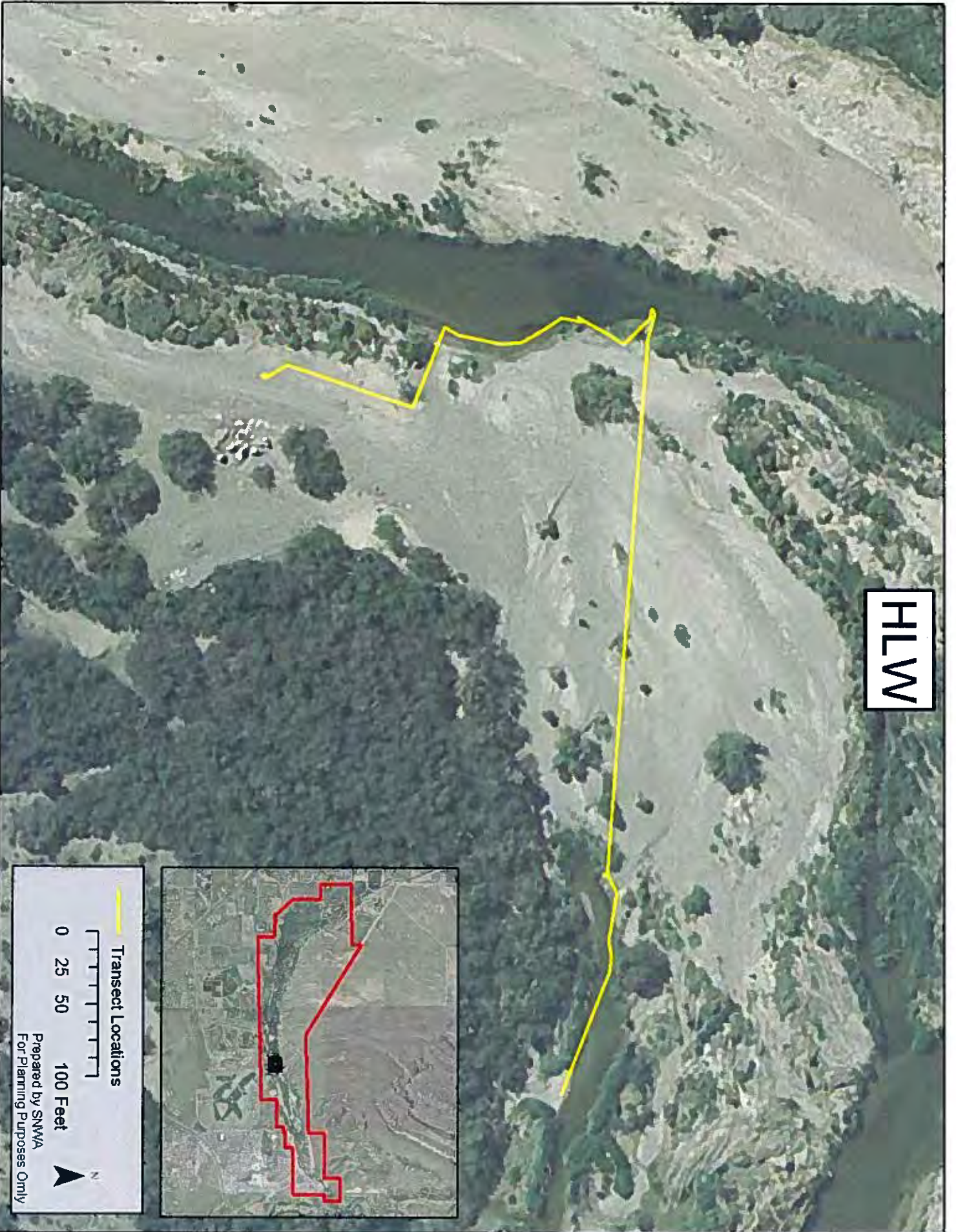
Transect Locations

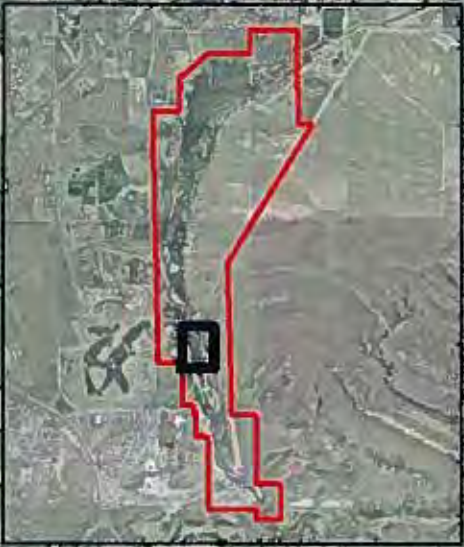


0 25 50 100 Feet



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BW

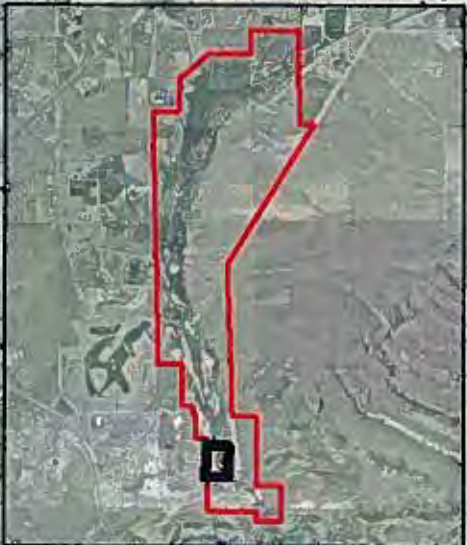
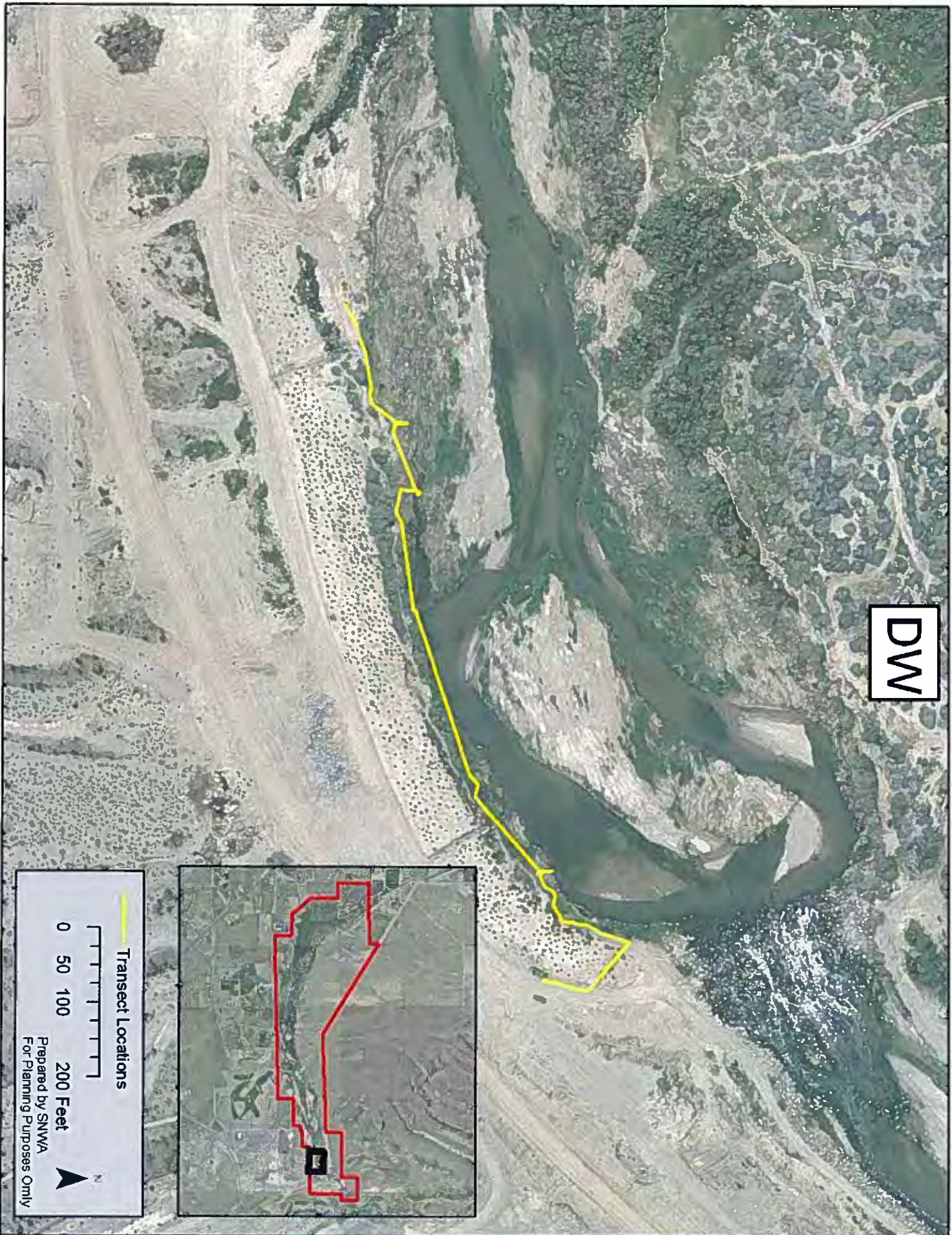
Transect Locations

0 75 150 300 Feet

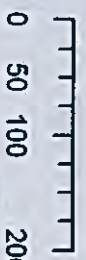


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DW

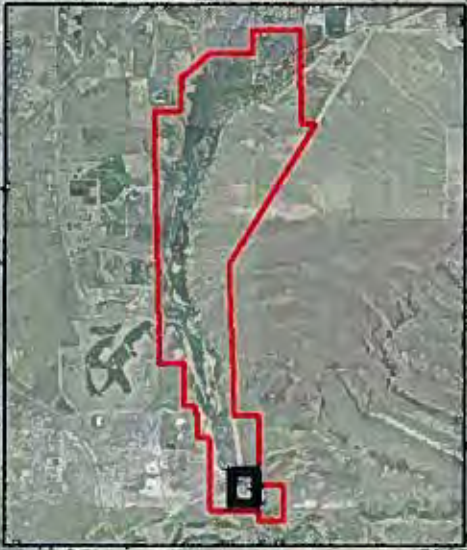
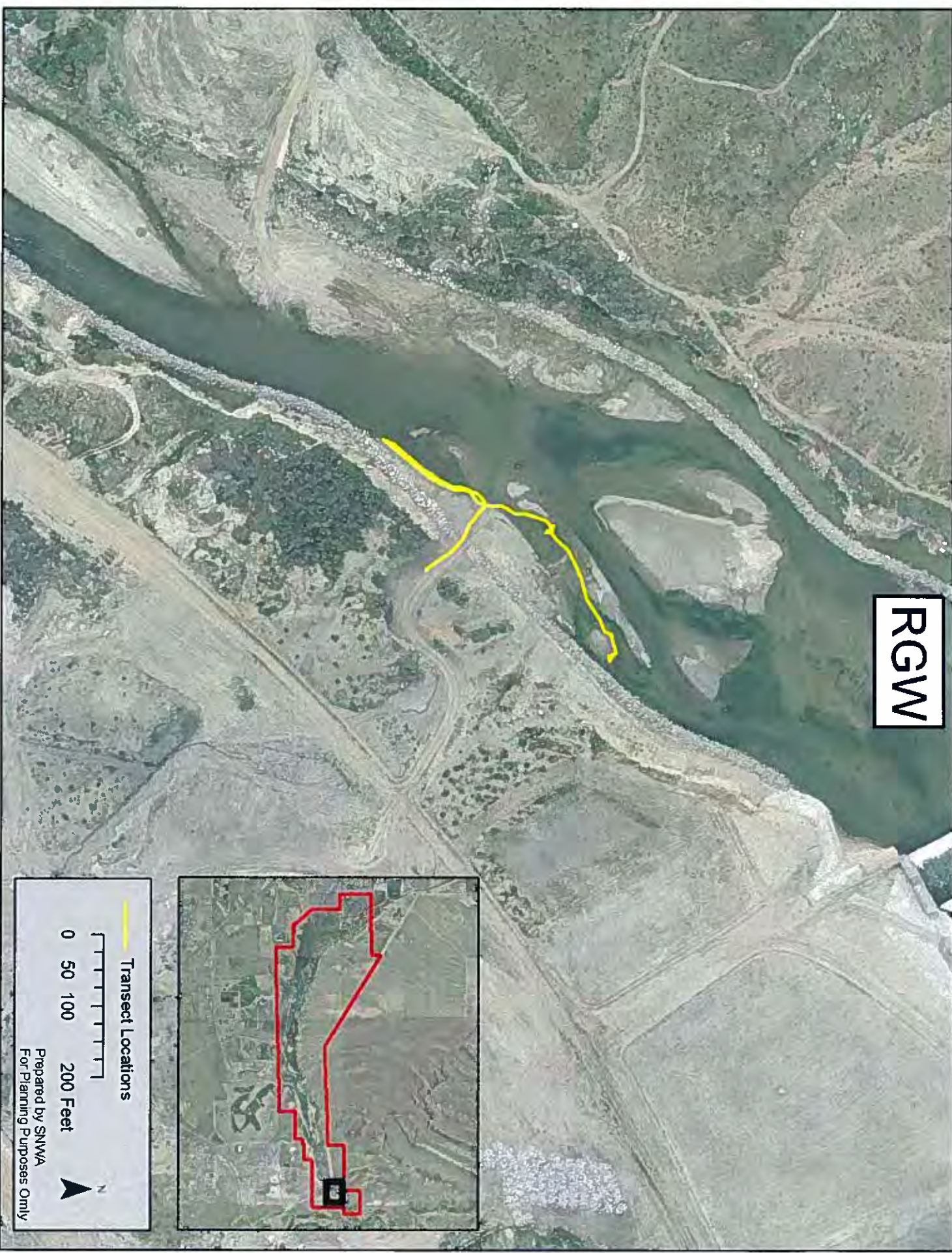


Transect Locations

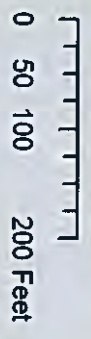


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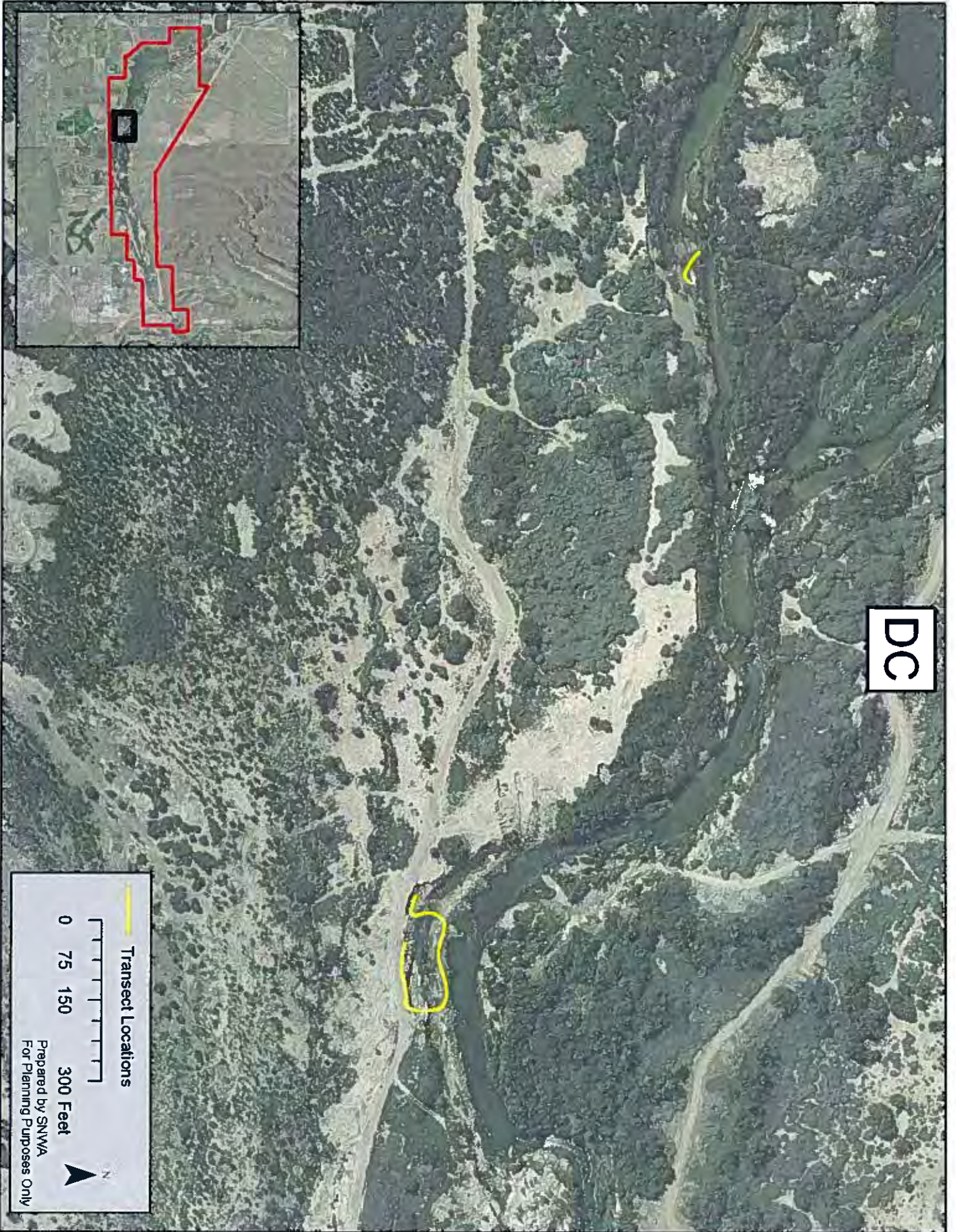
RGW



Transect Locations

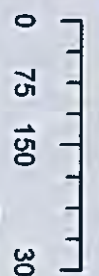


Prepared by SNWA
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DC

Transect Locations

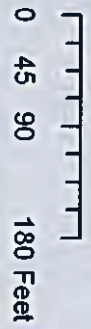


Prepared by SNVA
For Planning Purposes Only

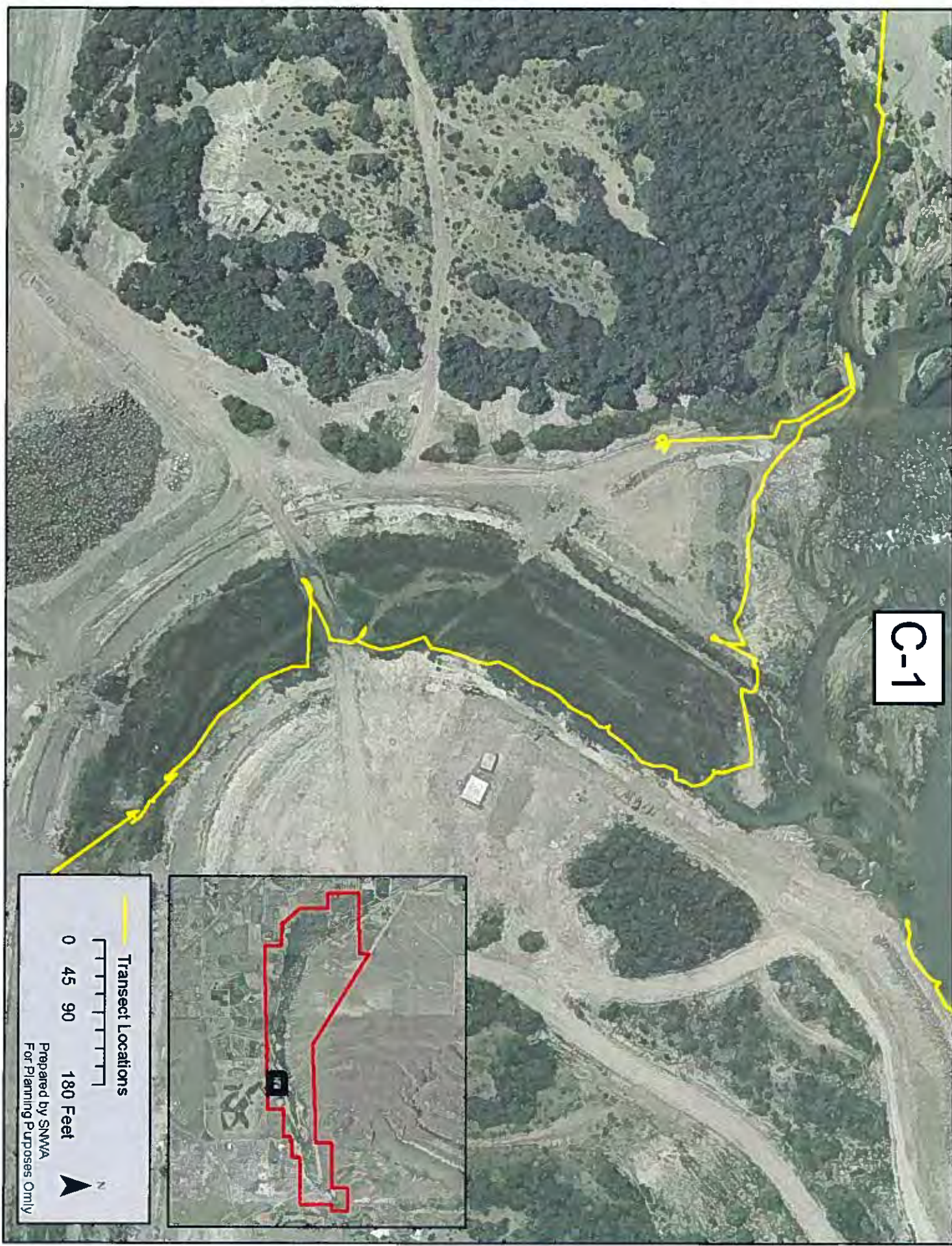
C-1



Transect Locations



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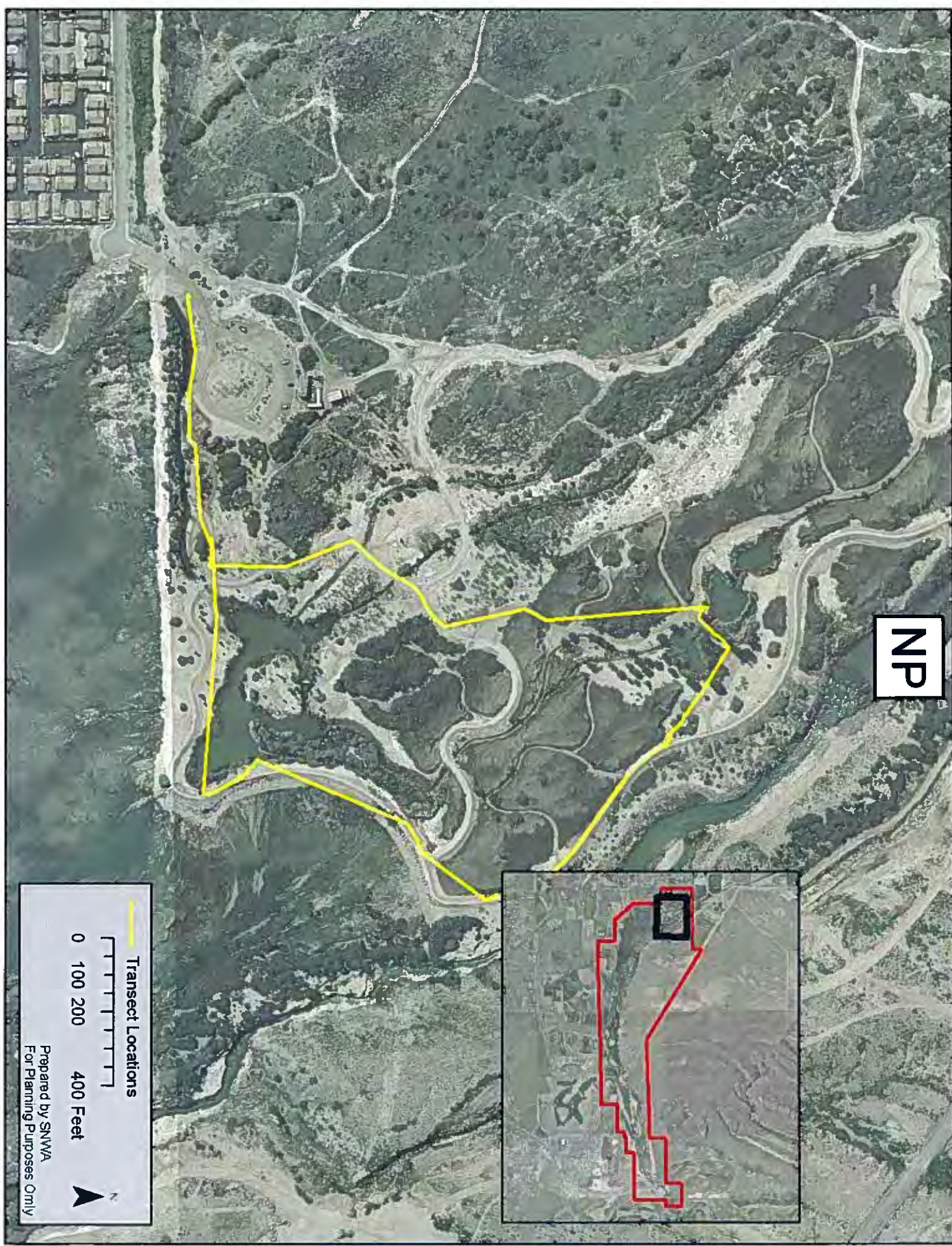
NP

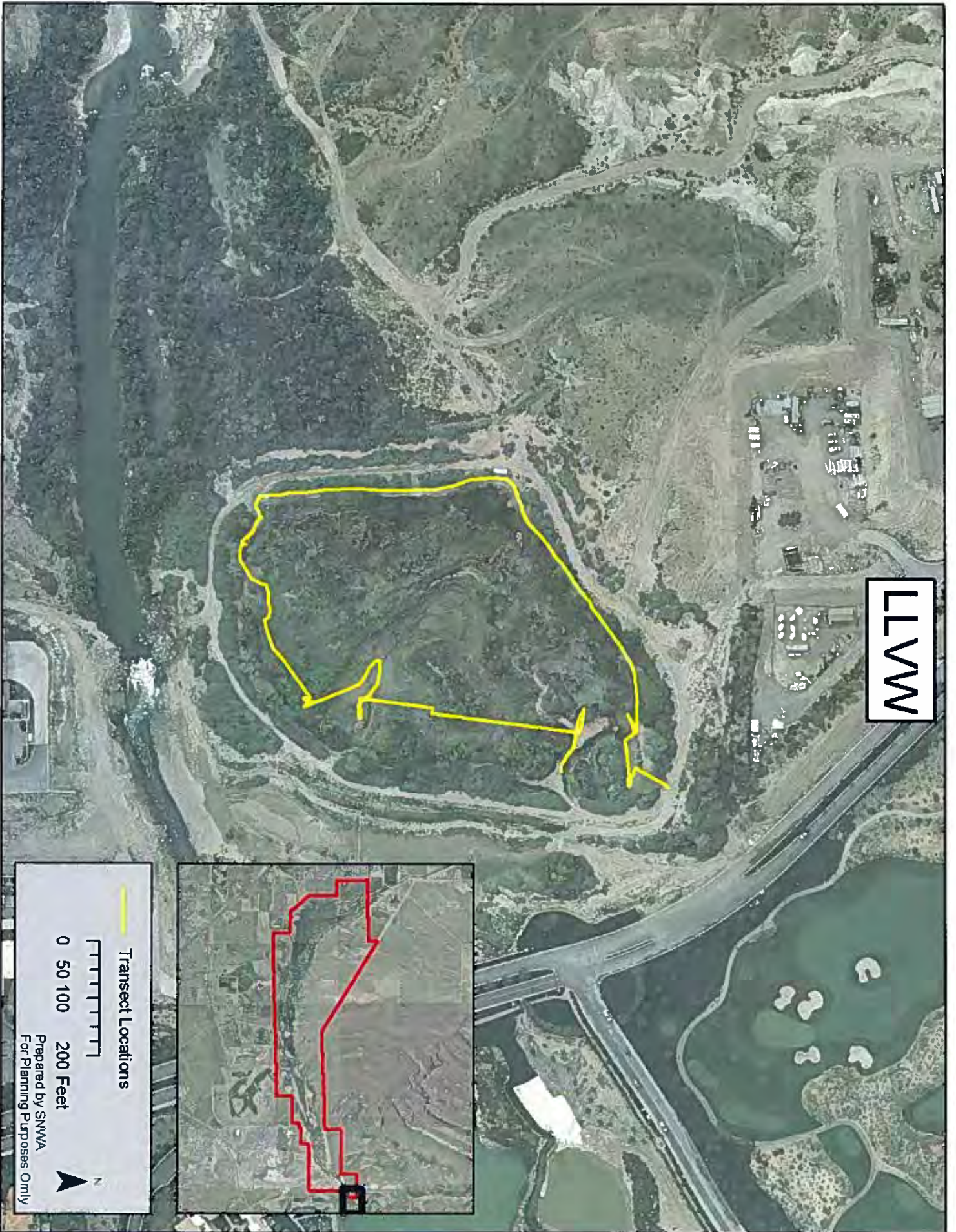


Transect Locations
0 100 200 400 Feet



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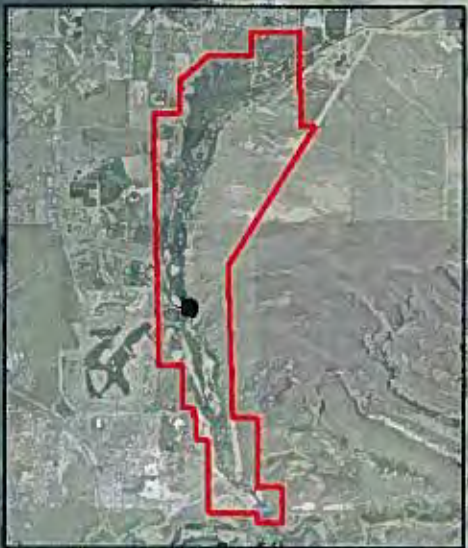
WATT

Transect Locations

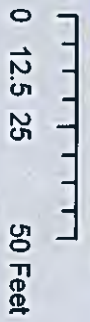
0 50 100 200 Feet

Prepared by SNWA
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CC



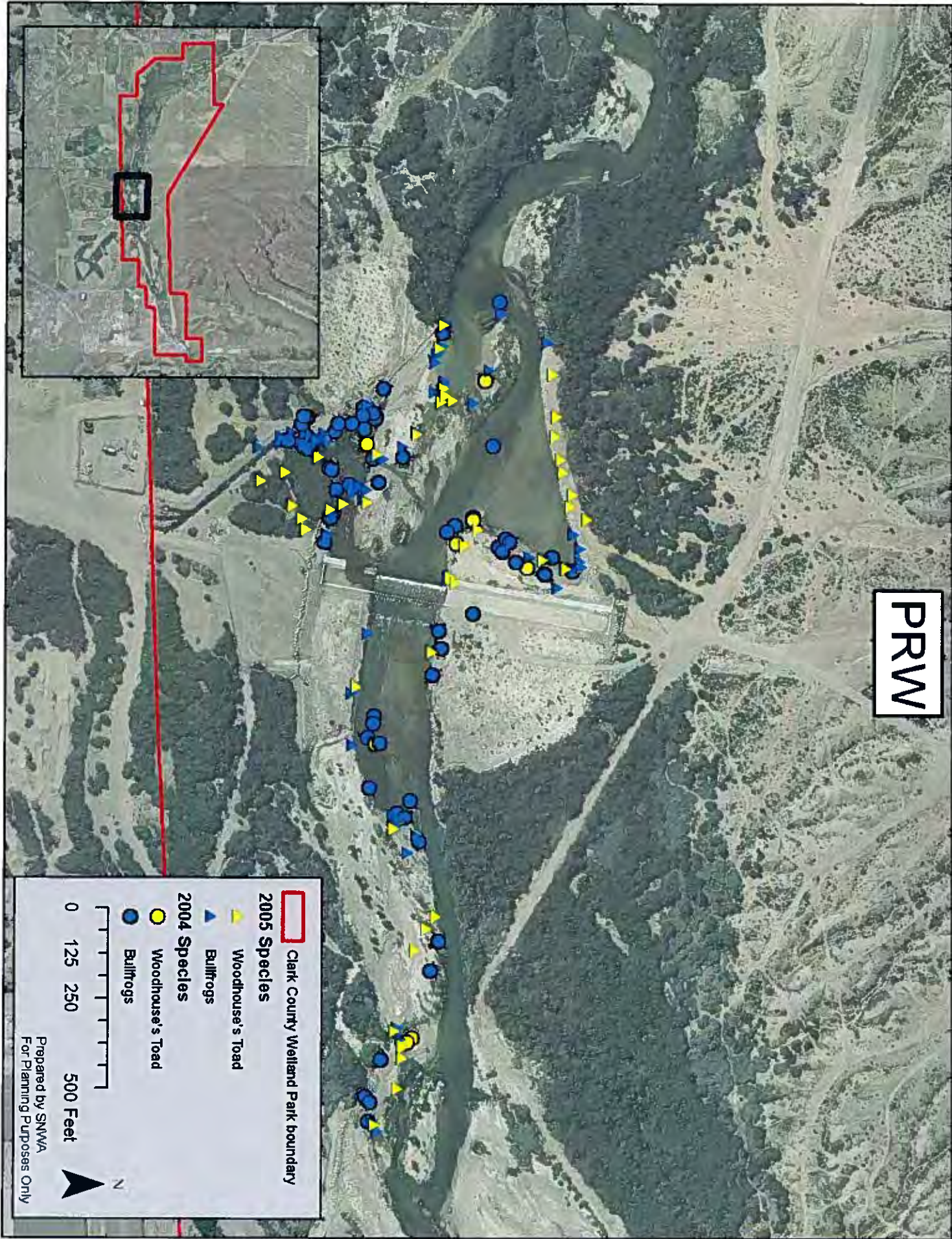
Transect Locations



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APPENDIX D
Total Species Encounters at Site Locations for
2004 and 2005 Survey

PRW



Clark County Wetland Park boundary

2005 Species

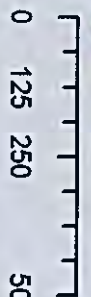
Woodhouse's Toad

Bullfrogs

2004 Species

Woodhouse's Toad

Bullfrogs



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HLW



Clark County Wetland Park boundary

2005 Species

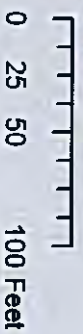
Woodhouse's Toad

Bullfrogs

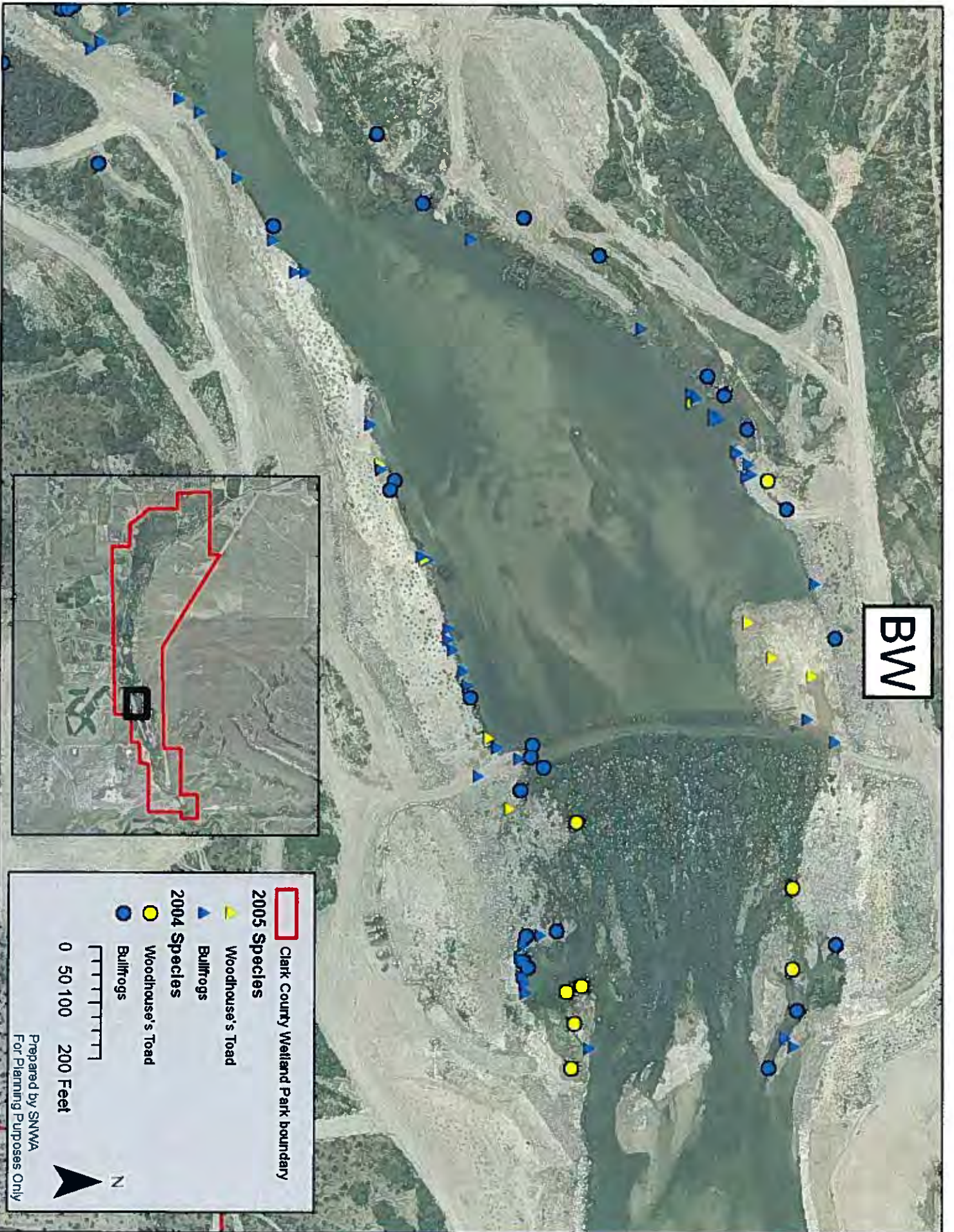
2004 Species

Woodhouse's Toad

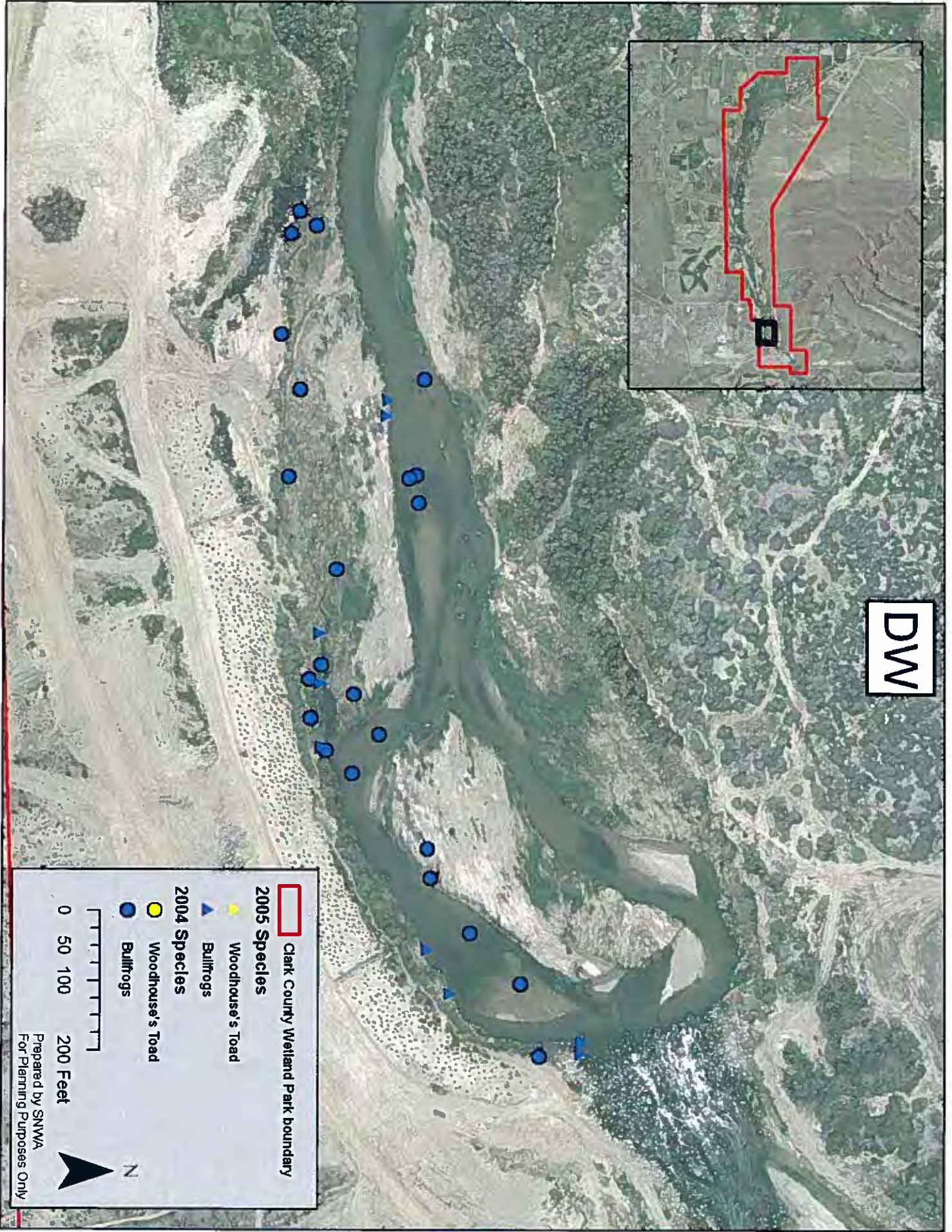
Bullfrogs




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DW





 Clark County Wetland Park boundary


2005 Species

-  Woodhouse's Toad
-  Bullfrogs

2004 Species

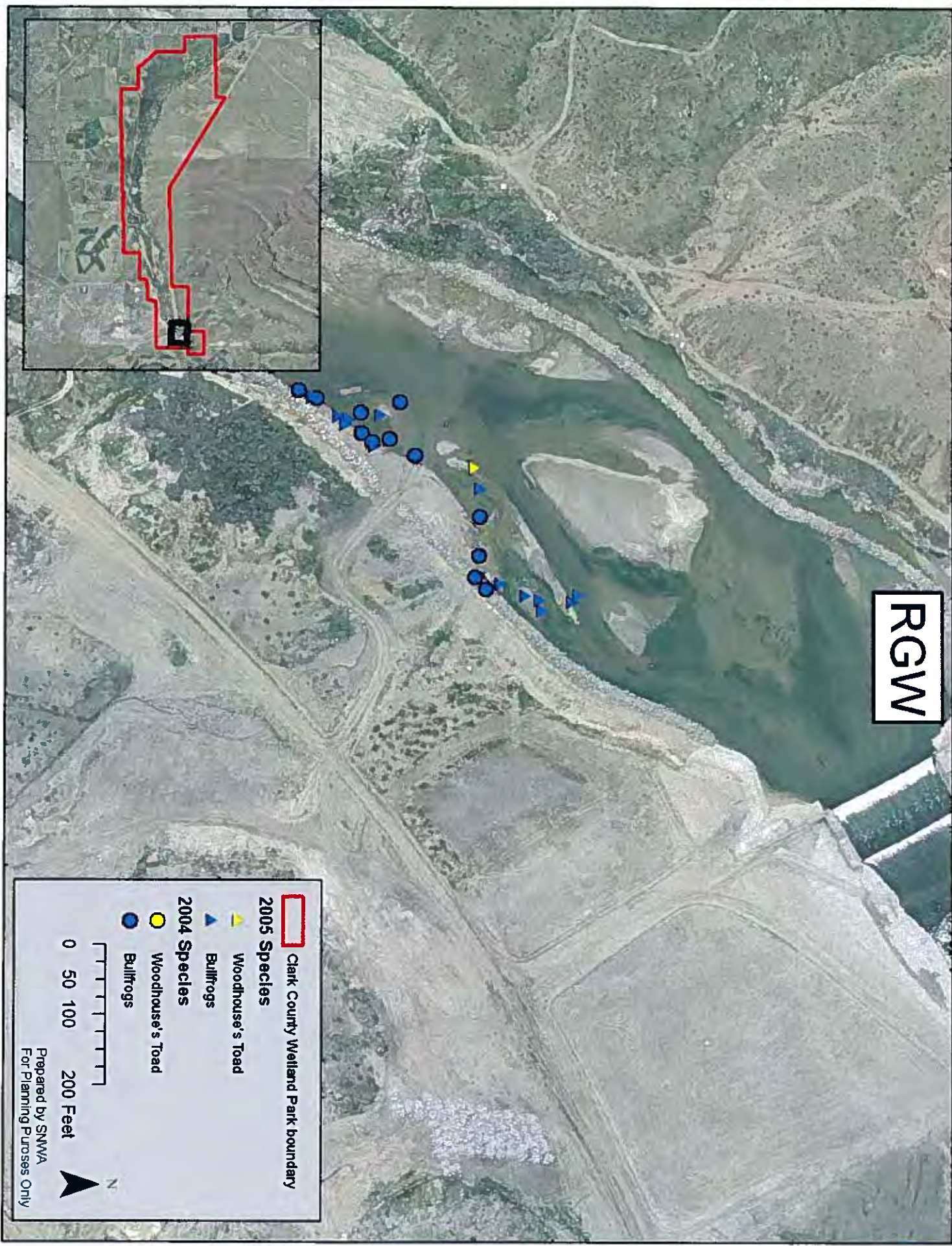
-  Woodhouse's Toad
-  Bullfrogs

0 50 100 200 Feet

 N

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RGW



Clark County Wetland Park boundary

2005 Species

- Woodhouse's Toad
- Bullfrogs

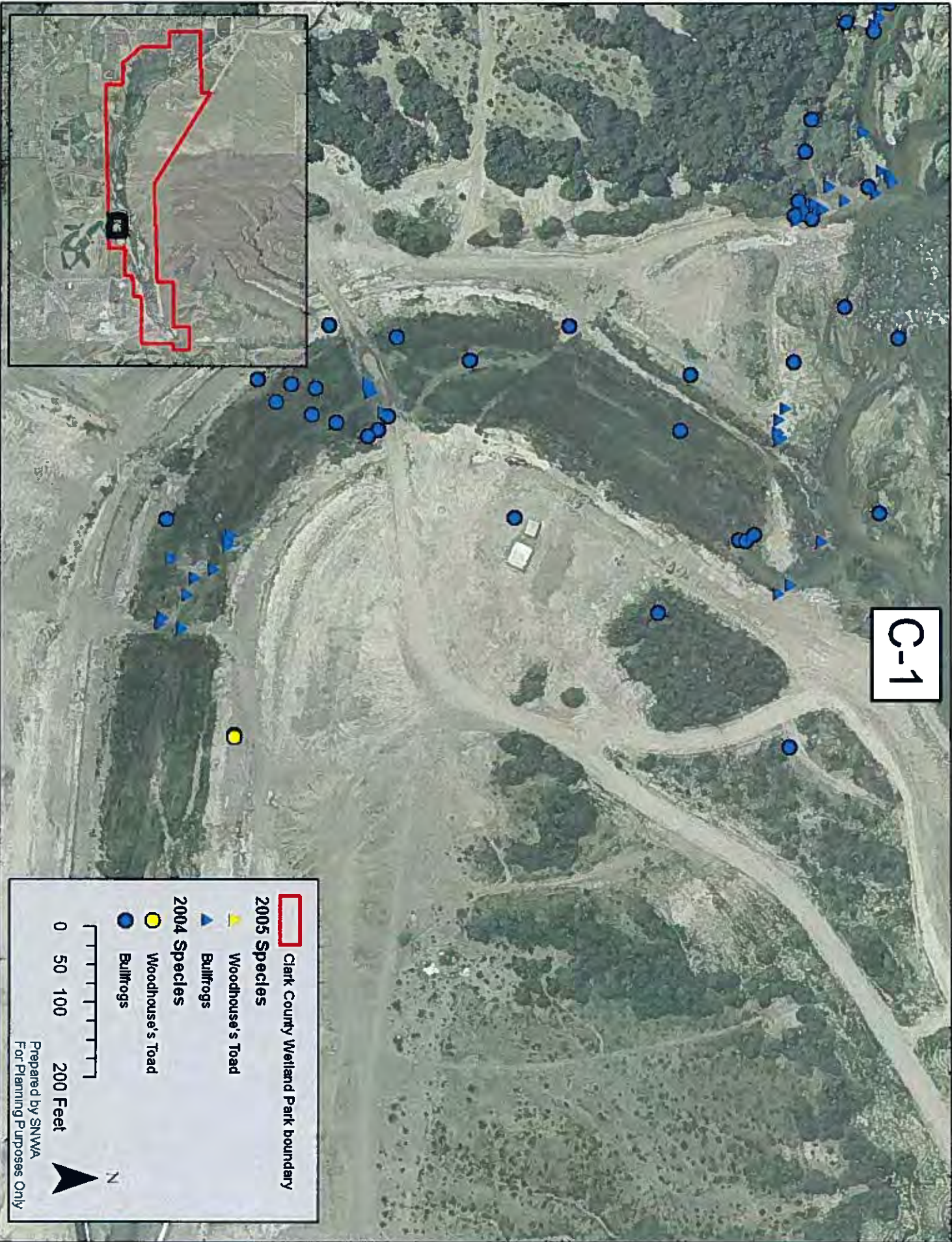
2004 Species

- Woodhouse's Toad
- Bullfrogs

0 50 100 200 Feet

Prepared by SNWA
For Planning Purposes Only

C-1



Clark County Wetland Park boundary

2005 Species

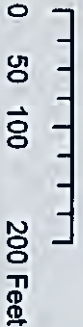
Woodhouse's Toad

Bullfrogs

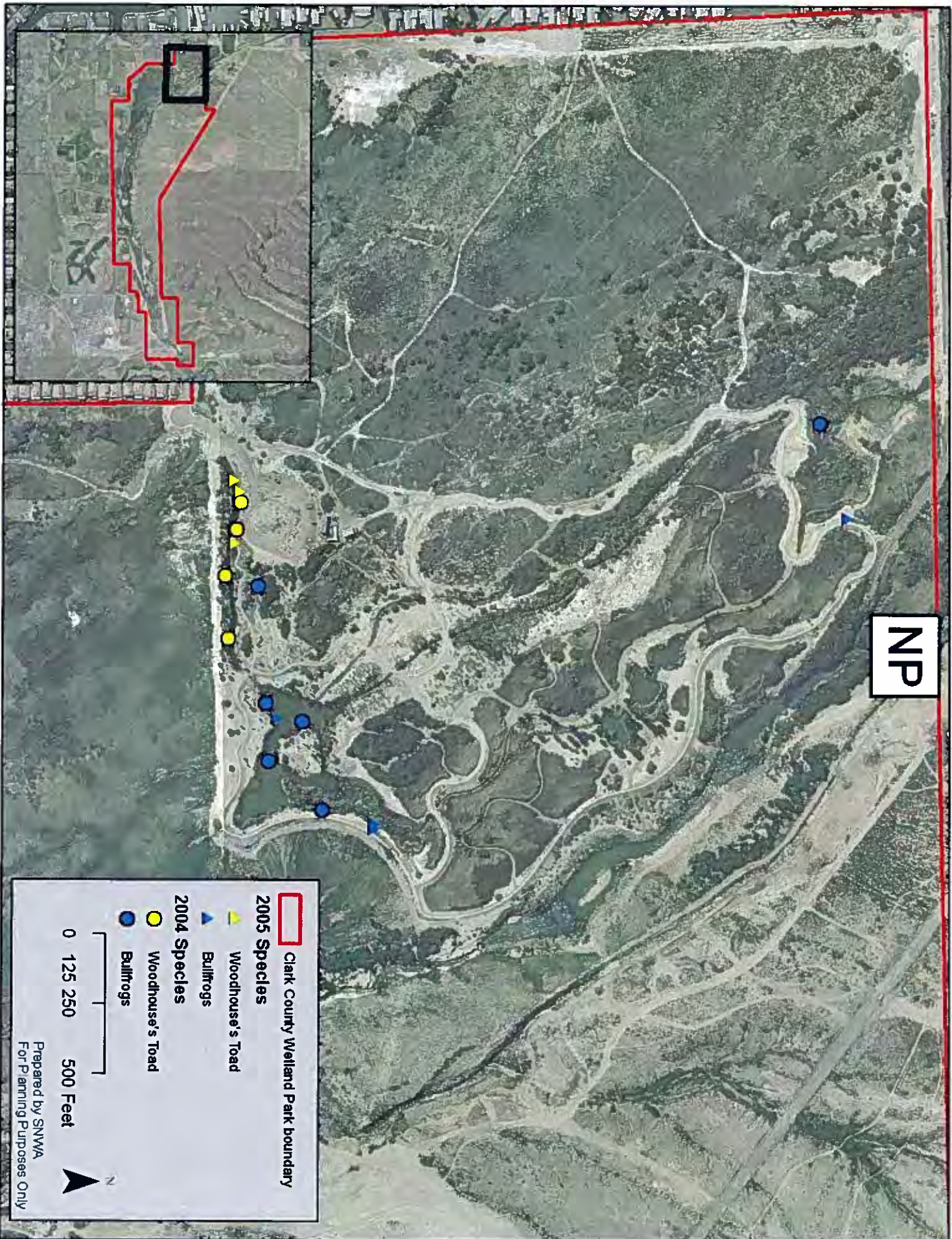
2004 Species

Woodhouse's Toad

Bullfrogs



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NP

Clark County Wetland Park boundary

2005 Species

- Woodhouse's Toad
- Bullfrogs

2004 Species

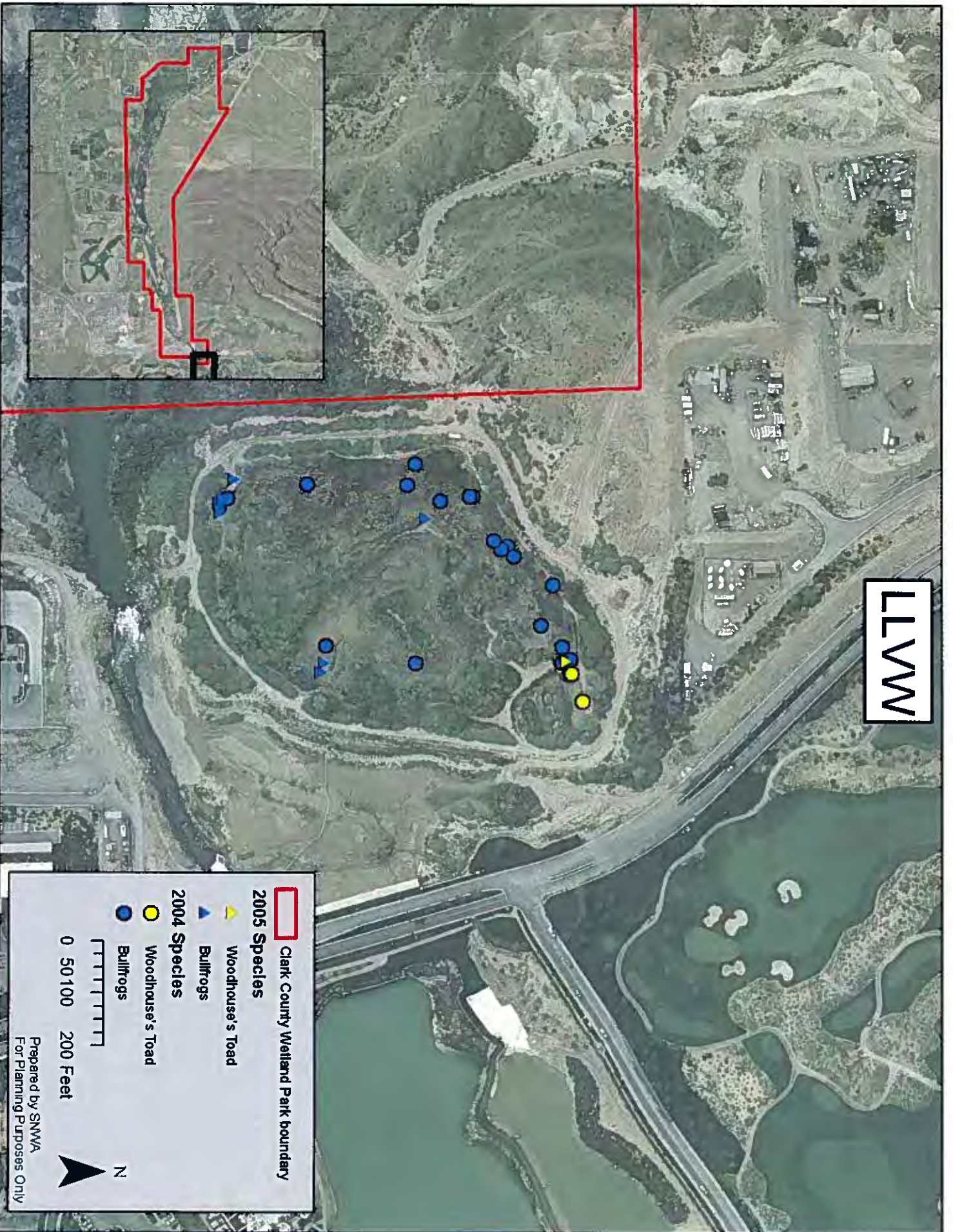
- Woodhouse's Toad
- Bullfrogs

0 125 250 500 Feet



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LLWV



Clark County Wetland Park boundary

2005 Species

Woodhouse's Toad

Bullfrogs

2004 Species

Woodhouse's Toad

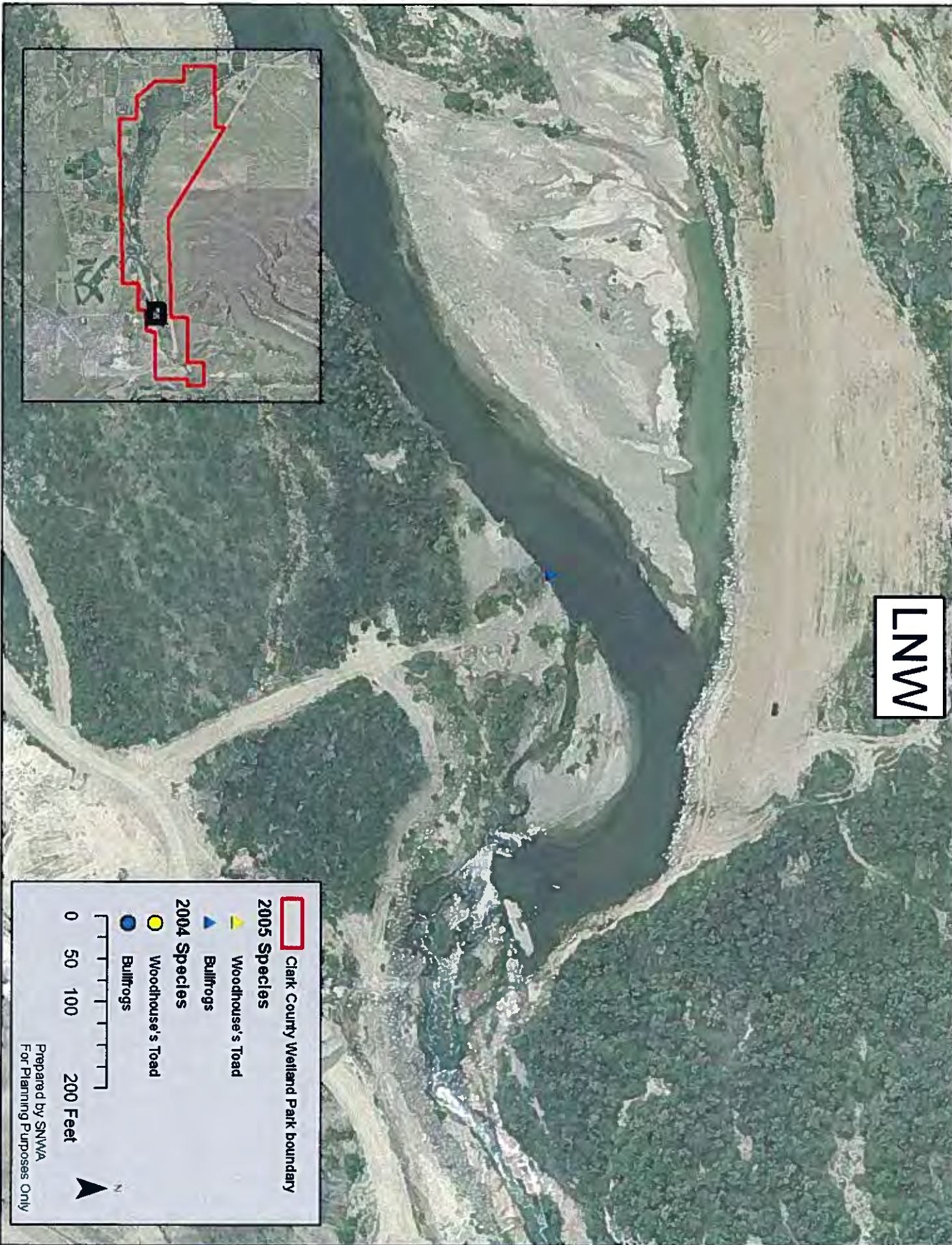
Bullfrogs


0 50 100 200 Feet



Prepared by SNWA
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LNW




 Clark County Wetland Park boundary


2005 Species

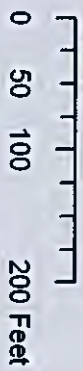
 Woodhouse's Toad

 Bullfrogs

2004 Species

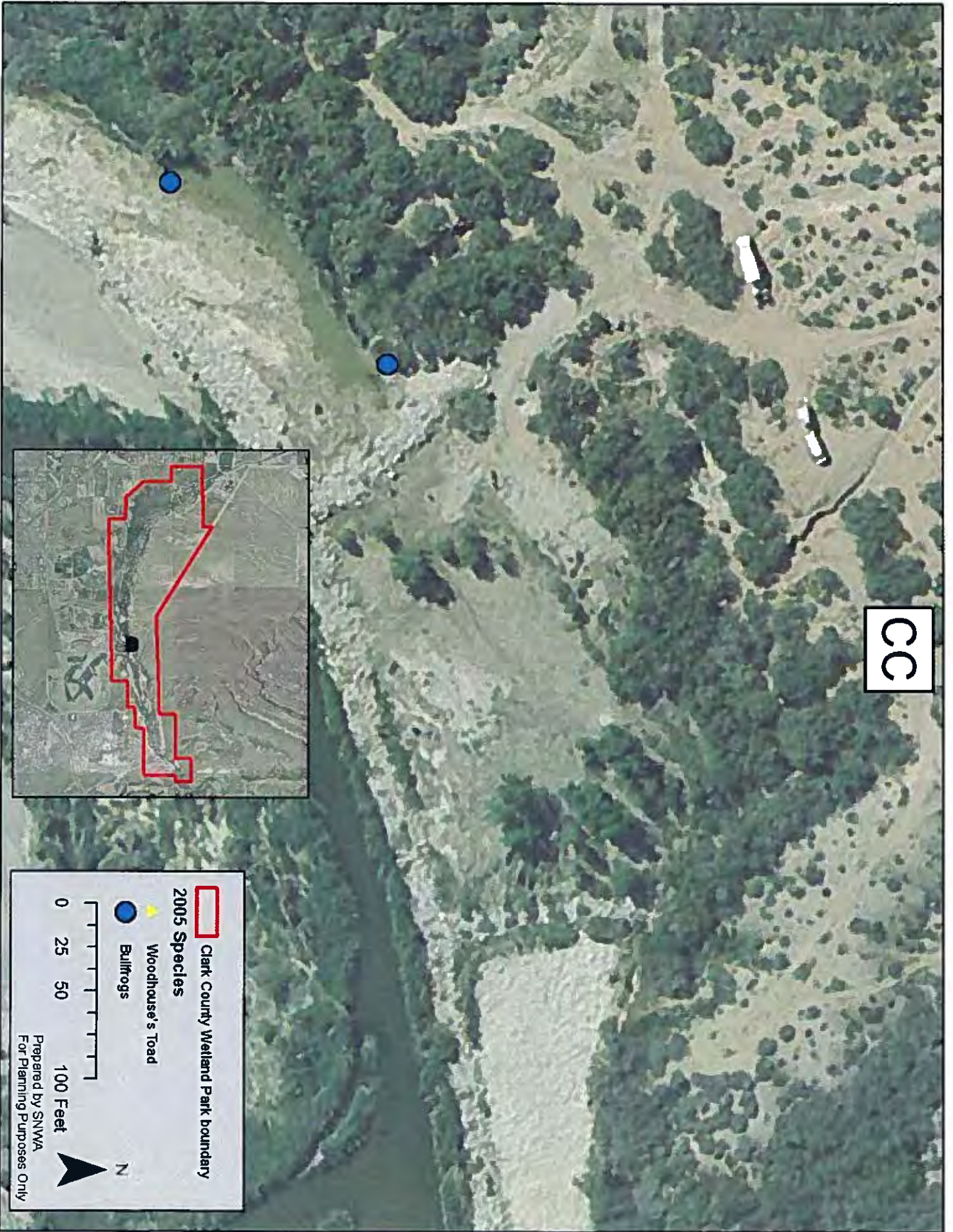
 Woodhouse's Toad

 Bullfrogs



Prepared by SNWA
For Planning Purposes Only

CC



Clark County Wetland Park boundary

2005 Species

Woodhouse's Toad

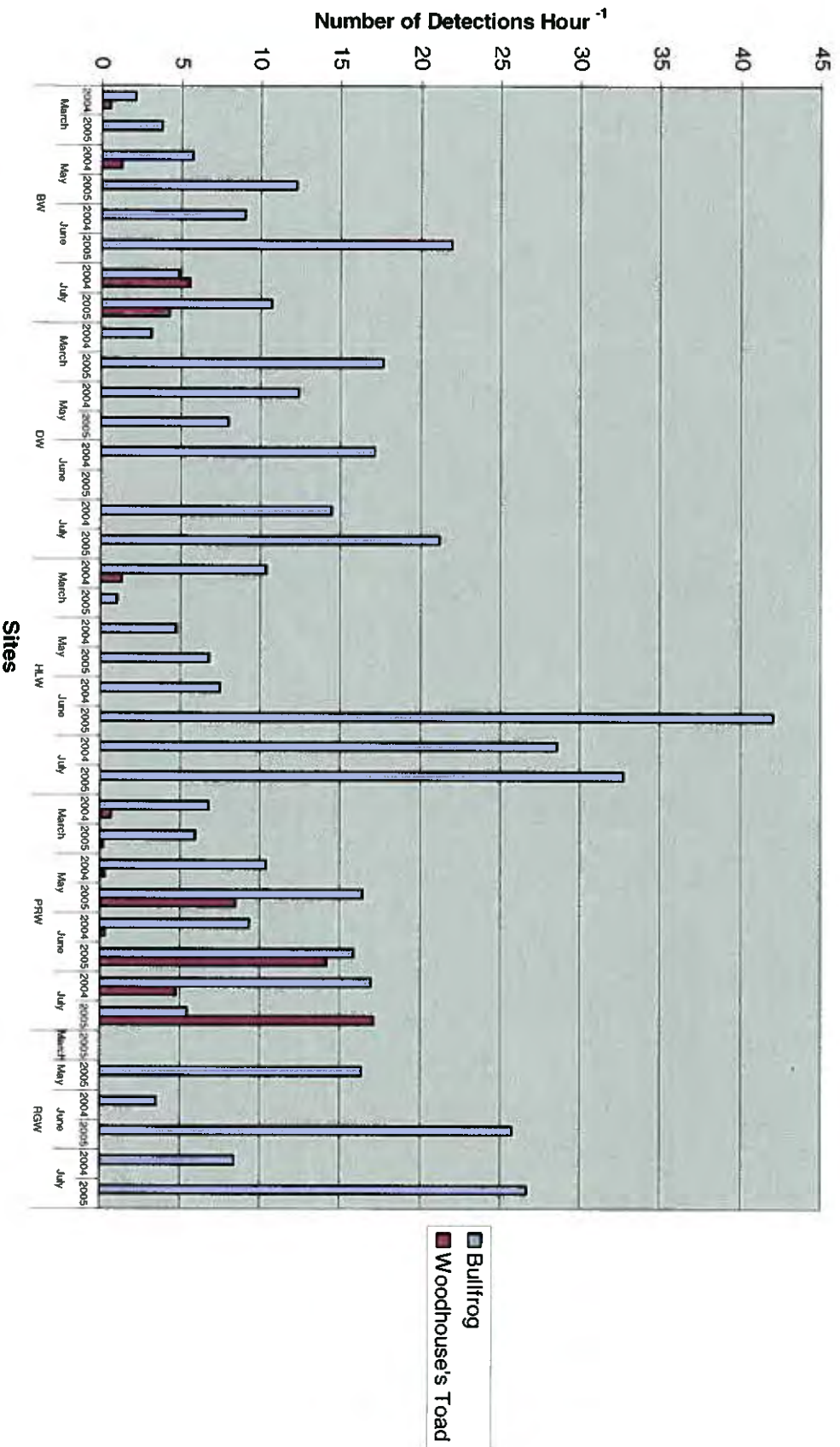
Bullfrogs

0 25 50 100 Feet

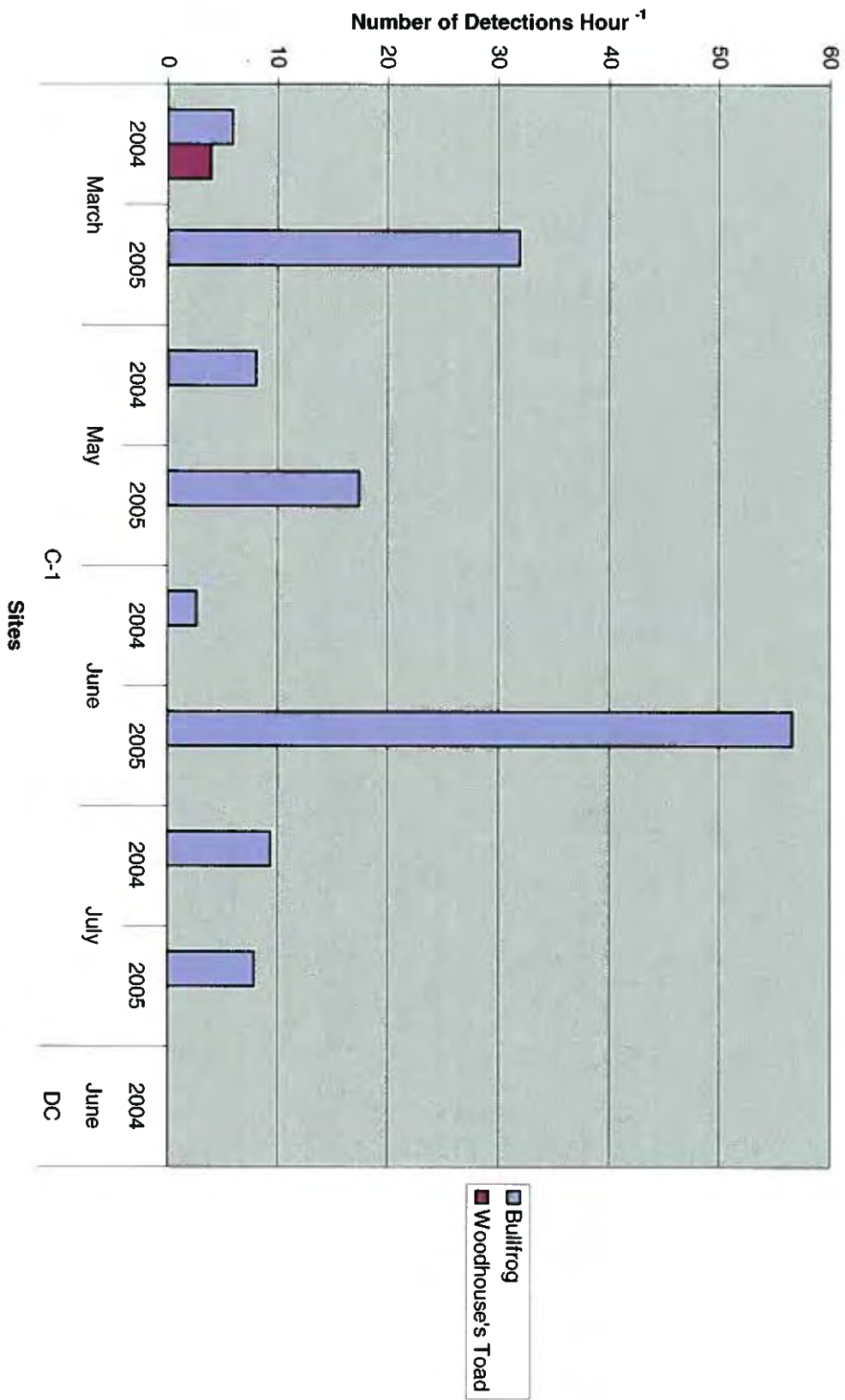
Prepared by SNWA
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APPENDIX E
The Total and Average Relative Abundance per Habitat
Type for 2004 and 2005

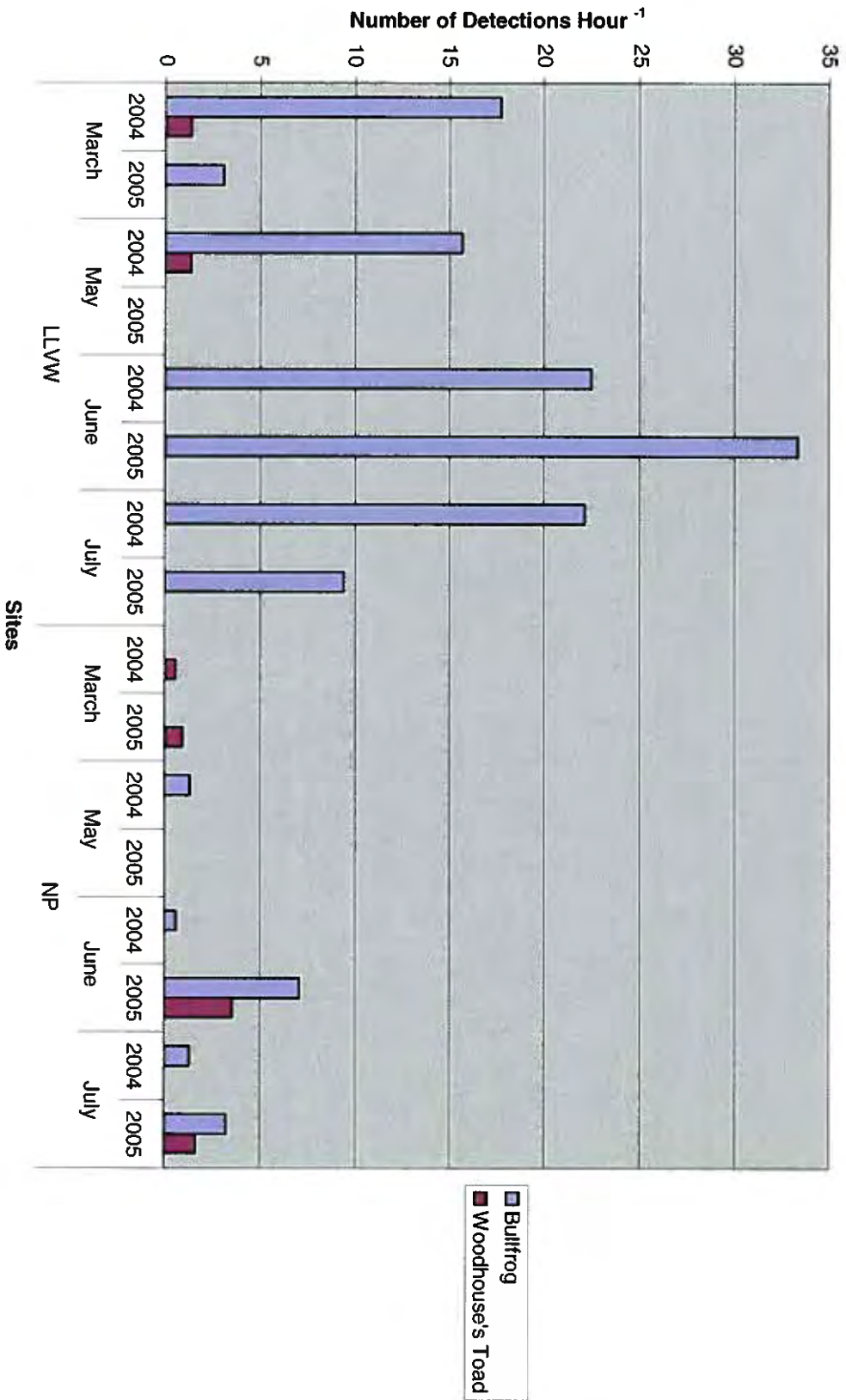
Weir Habitats



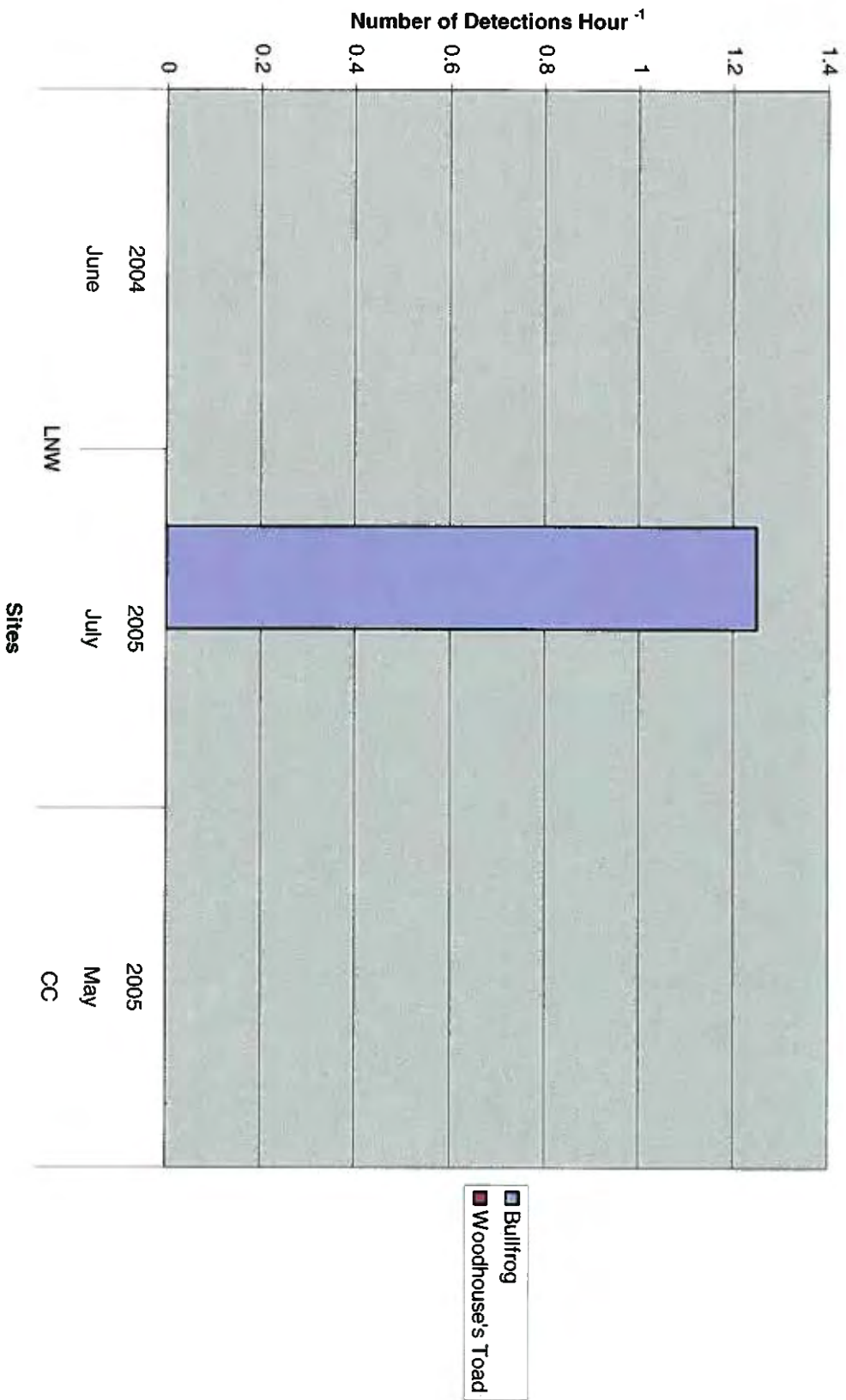
Tributary Habitats



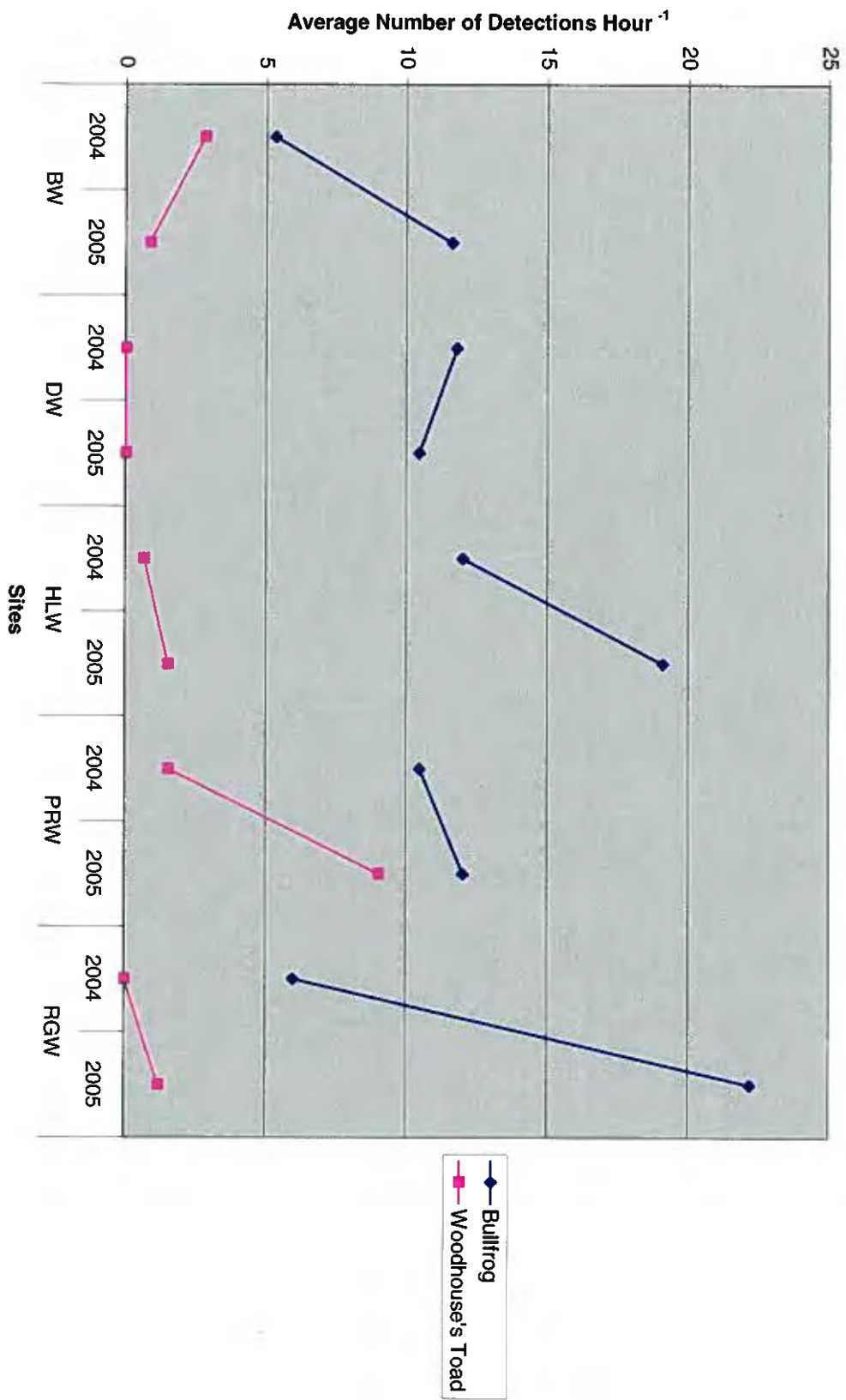
Off-Channel Wetland Habitats



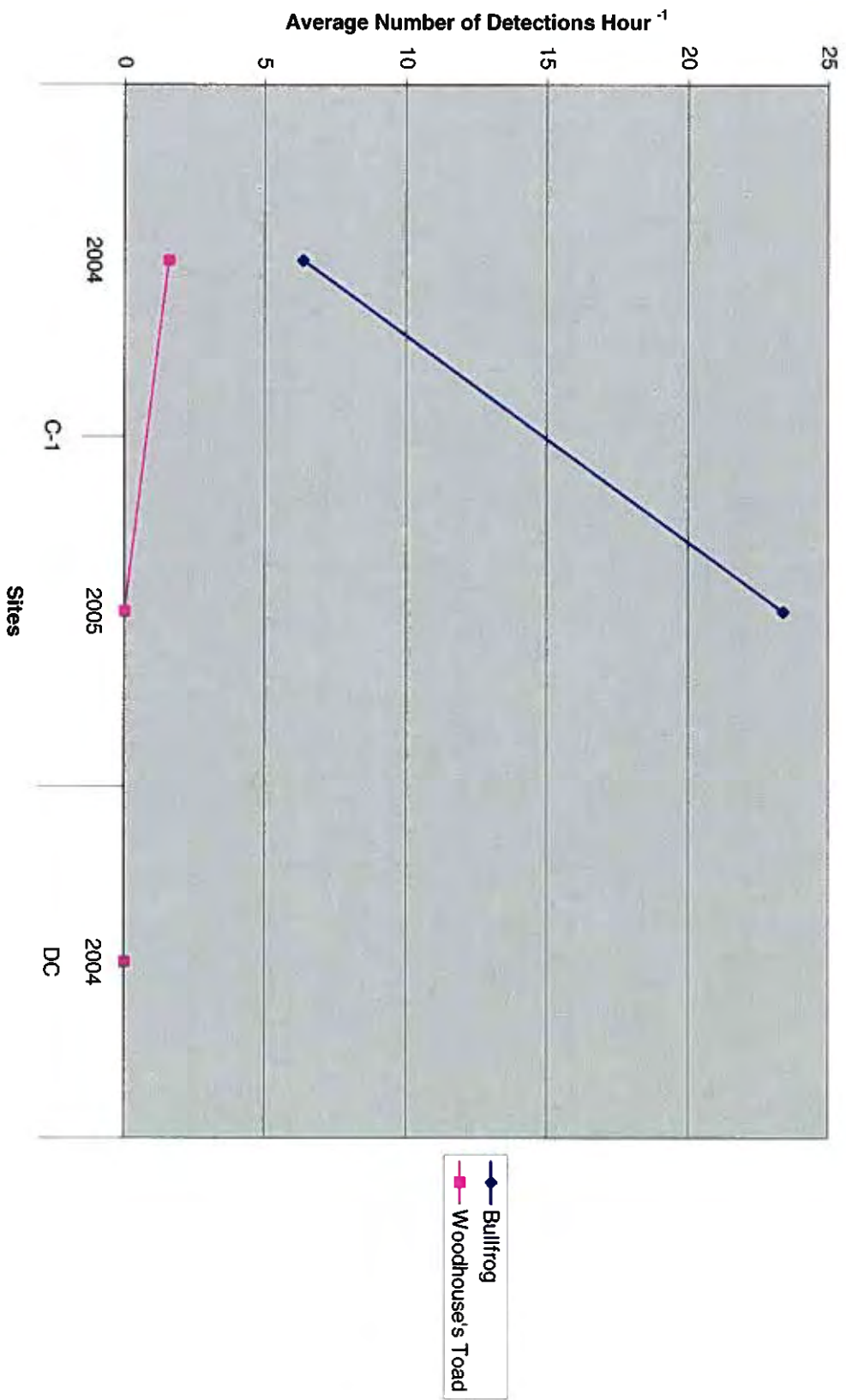
Other Habitats



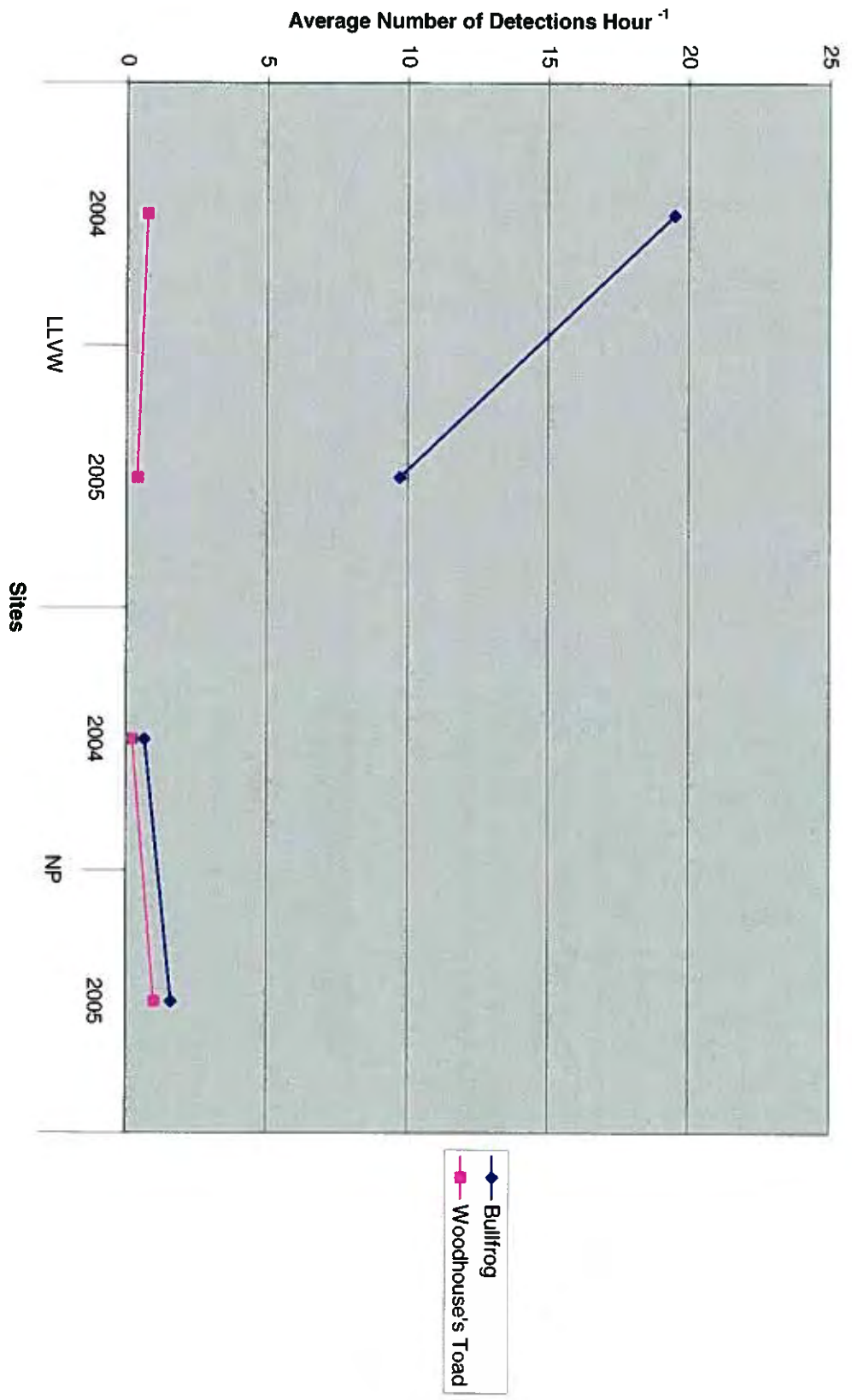
Weir Habitats



Tributary Habitats



Off-Channel Wetland Habitats



Other Habitats

