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Distribution and Abundance of the Southwestern Willow Flycatcher at Selected Southern California Sites in 2001

Final Report

Prepared for:

California Department of Fish and Game
Wildlife Management Division
Species Conservation and Recovery Program Report 2004-05

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
WESTERN ECOLOGICAL RESEARCH CENTER

Distribution and Abundance of the Southwestern Willow Flycatcher at Selected Southern California Sites in 2001

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INTRODUCTION

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) is a neotropical migrant that breeds primarily in southern California, Arizona, New Mexico and the extreme southern portions of Nevada, Utah, and Colorado (Figure 1, Unitt 1987). The Southwestern Willow Flycatcher is one of four subspecies of the Willow Flycatcher that breed throughout the continental United States and southern Canada. The southwestern subspecies is a riparian obligate, restricted to the dense mesic vegetation that characterize river systems throughout the southwest.

According to Unitt (1984, 1987), Southwestern Willow Flycatchers were once widespread in coastal riparian woodlands of lowland California, and were commonly found in San Diego County, the Los Angeles basin and throughout the San Bernardino/Riverside region. However, survey data indicate that flycatcher populations have experienced significant declines over the past 50 years, with a marked decline from 1965 to 1979 (USFWS 1993). Unitt (1984) estimated that in 1984 the total breeding Willow Flycatcher population in San Diego County numbered fewer than 15 pairs. In response to this decline, the state of California listed the species as endangered in 1992. By 1993, it was estimated that the total flycatcher population in California numbered approximately 70 pairs (USFWS 1993). The U.S. Fish and Wildlife service subsequently listed the Southwestern Willow Flycatcher as endangered in 1995.

Possible causes for the flycatcher's decline include riparian habitat loss and degradation, cowbird brood parasitism, and the alteration of natural riverine flow regimes associated with the construction of dams and other water projects. At present, flycatcher populations within southern California remain small, isolated, and disjunct.

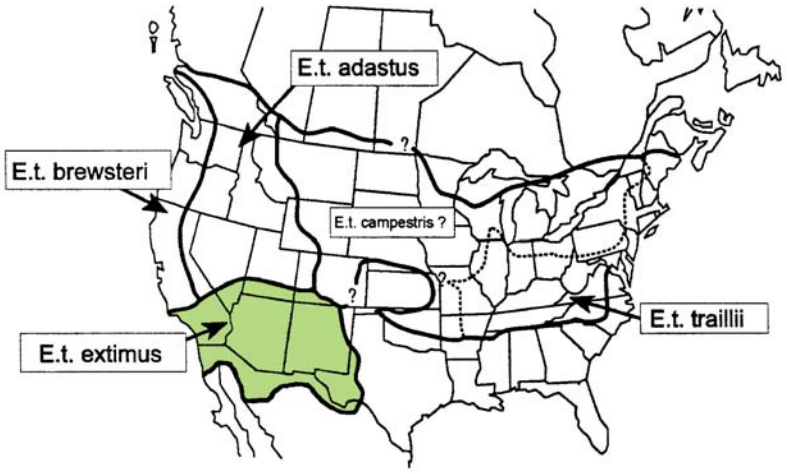

Figure 1. Distribution of Willow Flycatcher subspecies.
Adapted from Unitt (1987) and Browning (1993)

The objectives of this study were to 1) document Southwestern Willow Flycatcher abundance and distribution at a select number of sites in southern California that were believed to contain suitable habitat for nesting flycatchers, 2) document to the extent possible the breeding status of birds located on surveys, 3) describe the habitat at bird locations and throughout the survey sites, and 4) resight and band as many flycatchers as possible to enhance demographic data on dispersal and flycatcher movement.

METHODS

Field Surveys

Between May and August 2001, 20 sites on 15 drainages were surveyed for the endangered Southwestern Willow Flycatcher in southern California (Figure 2). All surveys were conducted following established protocols, using tape playback techniques to elicit flycatcher vocalizations (Sogge et al. 1997). All data were recorded on standardized forms

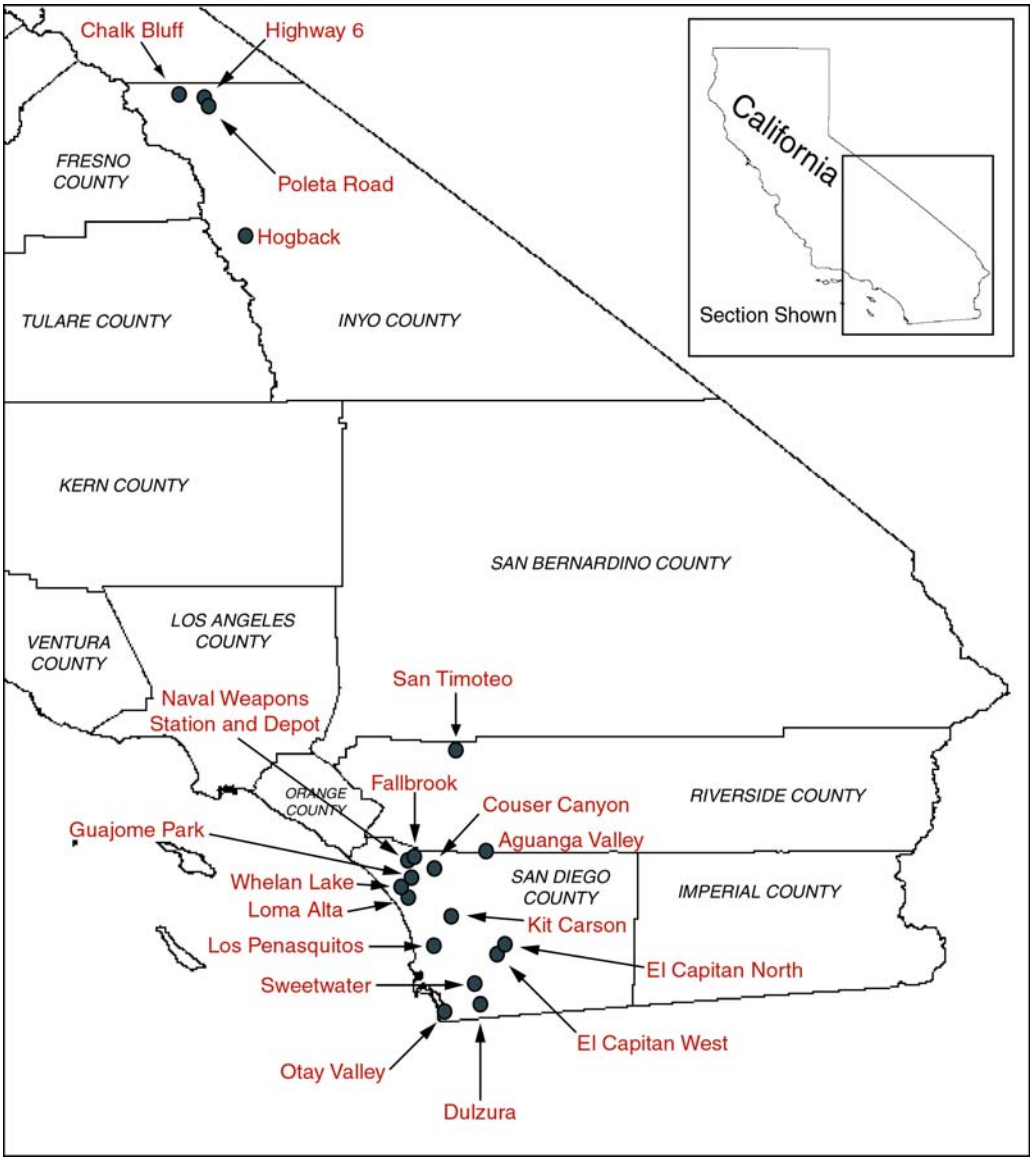

Figure 2. Location of survey sites for Southwestern Willow Flycatchers in California, 2001.

(Appendix 1 and 2). Surveys were conducted at least six days apart. Most sites were surveyed in a single morning; however larger sites typically took two mornings to survey in their entirety. Because of limited resources, the number of surveys at a site varied from one to three; however, an effort was made to survey all sites during the third survey period, after migration of non-*extimus* subspecies had ceased and any flycatcher detected could be reliably determined to be a

Southwestern Willow Flycatcher. The following dates designate the survey periods used in this project:

Survey Period I: 15 May to 31 May

Survey Period II: 1 June to 21 June

Survey Period III: 22 June to 20 July

Field surveys were conducted by Thea Benson, Shelby Howard, David Kisner, Janet Lynn, Bonnie Peterson, James Rourke, Jenny Turnbull, Michael Wellik, Jeff Wells, and Mary Whitfield. All surveyors had attended the Willow Flycatcher survey workshop and obtained all appropriate permits prior to conducting surveys.

Sites selected for surveys were those believed to have the greatest potential of supporting resident Willow Flycatchers, based on habitat quality, proximity to known breeding locations, and recent occupancy history. Permission to access private property was obtained from landowners or administrators prior to conducting surveys. Sites were initially surveyed in their entirety and habitat was visually assessed for suitability for flycatchers. To maximize coverage and increase the probability of detecting Willow Flycatchers, portions of river that were deemed unsuitable were not surveyed on subsequent surveys so that more effort could be spent in areas with higher potential. Unsuitable areas included those comprised solely of young or emergent vegetation not exceeding 2 m in height; habitats composed exclusively of cattail (*Typha* spp.), sedge (*Carex* spp.), and rush (*Juncus* spp.); and reaches of more mature, shrub-like vegetation that formed very dense stands, were less than 2 m tall, and did not possess an overstory (e.g. mule fat (*Baccharis glutinosa*) thickets). Upstream and downstream boundaries of each survey were recorded using a Garmin 12 Global Positioning System (GPS) unit. All surveys were

conducted on foot and were typically initiated at sunrise and were completed by 12:00 pm. The specific areas surveyed were:

Owens River:

1) Chalk Bluff – from the Pleasant Valley Creek confluence to 2.4 km downstream (Figure 3). Survey length: 2.4 km.
2) Highway 6 – 1.5 km stretch of habitat along west side of river upstream from Highway 6 (Figure 4). Survey length: 1.5 km.
3) Poleta Road – 1.7 km stretch of habitat along the west side of the river downstream of Poleta Road (Figure 5). Survey length: 1.7 km.

Hogback Creek: North and west of Lone Pine, off Moffat Ranch Road, approximately 4 km from highway 395 (Figure 6). Survey length: 2.4 km.

San Timoteo Creek: between Redlands and Hinda. Note: entire area not surveyed (Figure 7). Survey length: 16 km.

Temecula Creek: within the Aguanga Valley (Figure 8). Survey length: 4.8 km.

Santa Margarita River:

1) Fallbrook – from boundary with Fallbrook Naval Weapons Station east to confluence with Rainbow Creek (Figure 9). Survey length: 6 km.
2) Fallbrook Naval Weapons Station – Depot Lake – area surveyed is on a small tributary to the Santa Margarita River, west of Fallbrook Road (Figure 10). Survey length: 1.6 km.

Fallbrook Creek: Fallbrook Naval Weapon Station: from western base boundary with Marine Corps Base Camp Pendleton to approximately 0.3 km (0.2 miles) west of Fallbrook Road (Figure 10). Survey length: 4.5 km.

San Luis Rey River:

1) Couser Canyon – from 0.5 km (0.3 miles) west of Couser Canyon Road, east to Jamies Lane (Figure 11). Survey length: 1.5 km.
2) Guajome Park – from River Road, east to Melrose Drive (Figure 12). Survey length: 6 km.
3) Whelan Lake – from the Oceanside Airport east to River Road (Figure 13). Survey length: 5.2 km.

Loma Alta Creek: Hoover Street east to Arroyo Avenue (Figure 14). Survey length: 6.4 km.

Kit Carson Park: San Bernardo Valley: area east of Interstate 15 and north of Felicita Road (Figure 15). Survey length: 2.8 km.

Los Penasquitos Creek: Los Penasquitos County Park: 0.5 km (0.3 miles) east of Black Mountain Road, west to 0.3 km (0.2 miles) west of the sewage disposal ponds (Figure 16). Survey length: 2.7 km.

San Diego River:

1) El Capitan North – approximately 1 km (0.6 miles) north of confluence with Cedar Creek, south to the inflow of El Capitan Reservoir (Figure 17). Survey length: 9 km.
2) El Capitan West – El Capitan Dam to approximately 2.4 km (1.5 miles) west (downstream) (Figure 18). Survey length: 2.4 km.

Sweetwater River: 1.8 km (1.1 miles) south of the Steele Canyon Bridge north to Jamacha Road (Figure 19). Survey length: 3.5 km.

Dulzura Creek: between State Highway 94 and the inflow to Lower Otay Reservoir. Note: not all sections were surveyed because of private land ownership (Figure 20). Survey length: 9 km.

Otay River: between Interstate 5 and Interstate 805. Note: Section owned by Hanson PLC not surveyed (Figure 21). Survey length: 5 km.

When a flycatcher was encountered, the following information was recorded: age (adult or juvenile), sex, breeding status (paired, unpaired/territorial) and whether the bird was banded. If a flycatcher was detected prior to 21 June, the detection or lack of detection of a flycatcher in the same area on subsequent surveys was used to determine if the bird was a resident Southwestern Willow Flycatcher, or a transient/migrating bird. All Willow Flycatchers detected between 21 June and 20 July were considered resident Southwestern Willow Flycatchers. Flycatcher locations were recorded on USGS topographic maps and latitude/longitude coordinates were recorded using a Garmin 12 GPS unit.

Follow-up visits were made to sites with resident Willow Flycatchers to confirm breeding and uniquely color band as many individuals as possible to facilitate the collection of demographic data. Breeding was suspected if Willow Flycatchers were found exhibiting paired behavior (e.g., whit communication calls elicited between two flycatchers, or a male's tolerance of a second flycatcher in its territory), and was considered confirmed if one of the following occurred: 1) an adult flycatcher was observed carrying nesting material or food, 2) an active flycatcher nest was located, or 3) adults were observed with or actively feeding fledglings.

Adult Willow Flycatchers were captured using mist nets following techniques described by Sogge et al. (2001). Adults were coaxed into nets by playing flycatcher songs and calls.

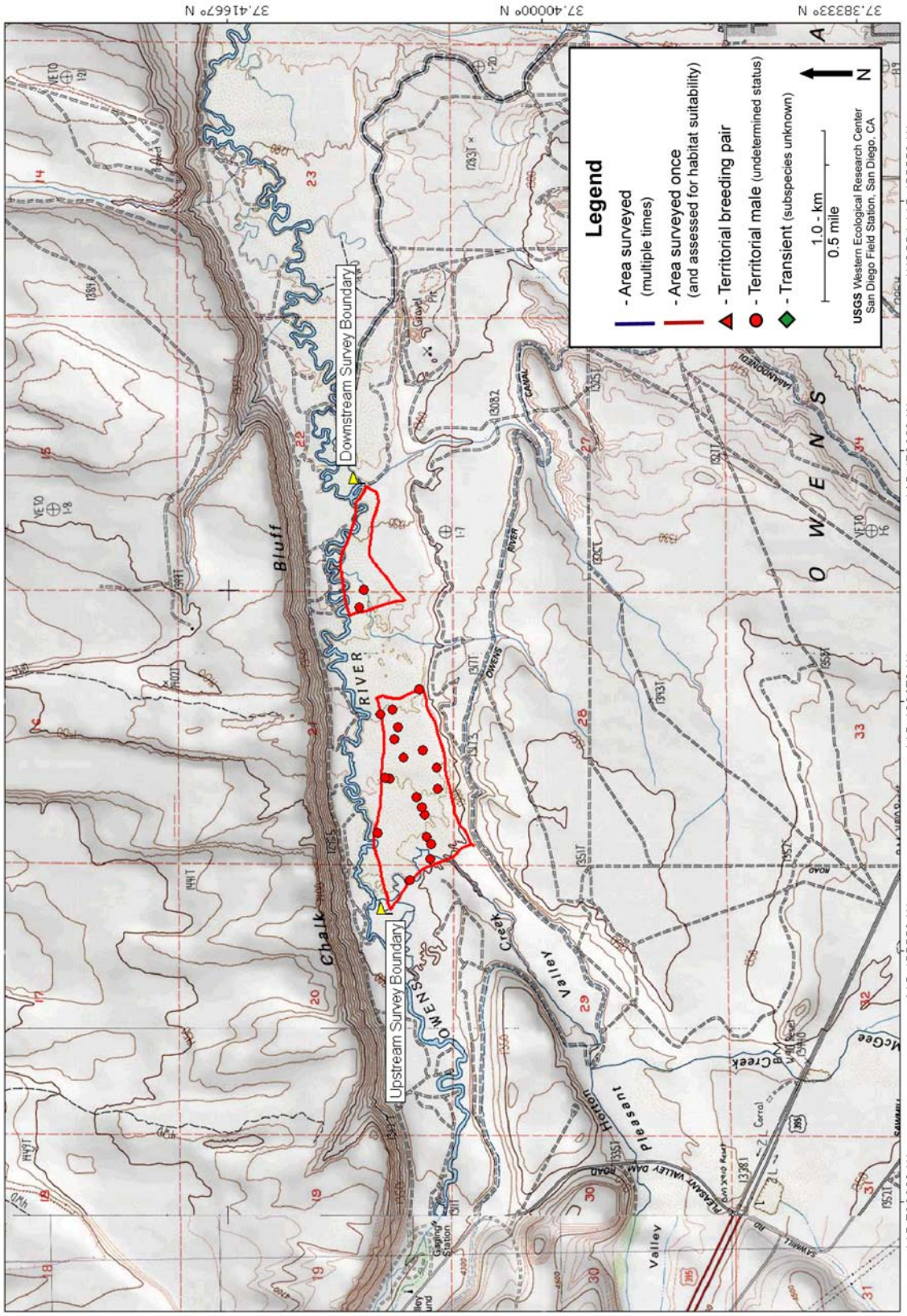

Figure 3. Survey limits and Southwestern Willow Flycatcher locations at the Owens River, Chalk Bluff, Inyo County. Eleven of the twenty-one territorial males shown were paired.

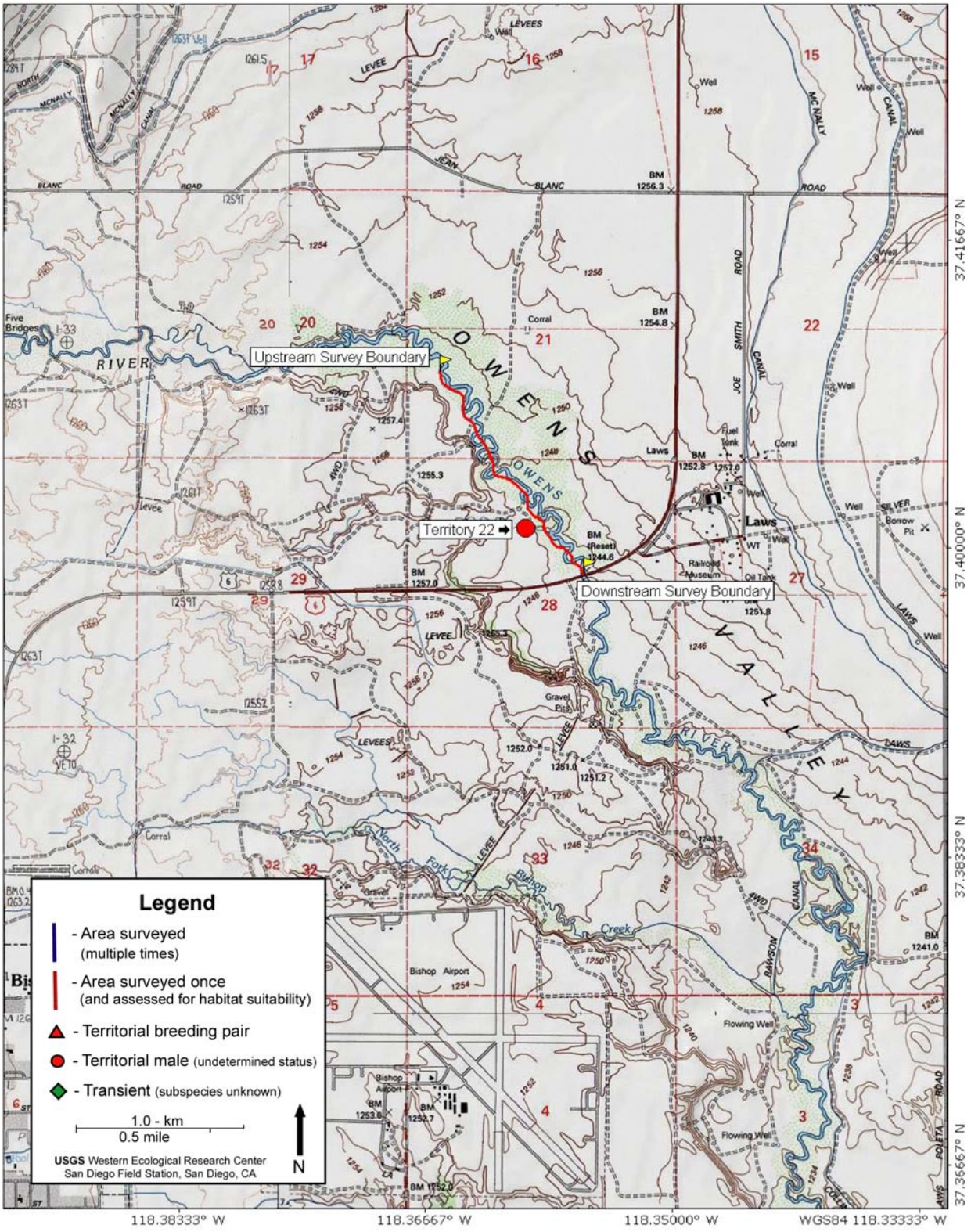

Figure 4. Survey limits and Southwestern Willow Flycatcher locations at the Owens River, Highway 6, Inyo County.

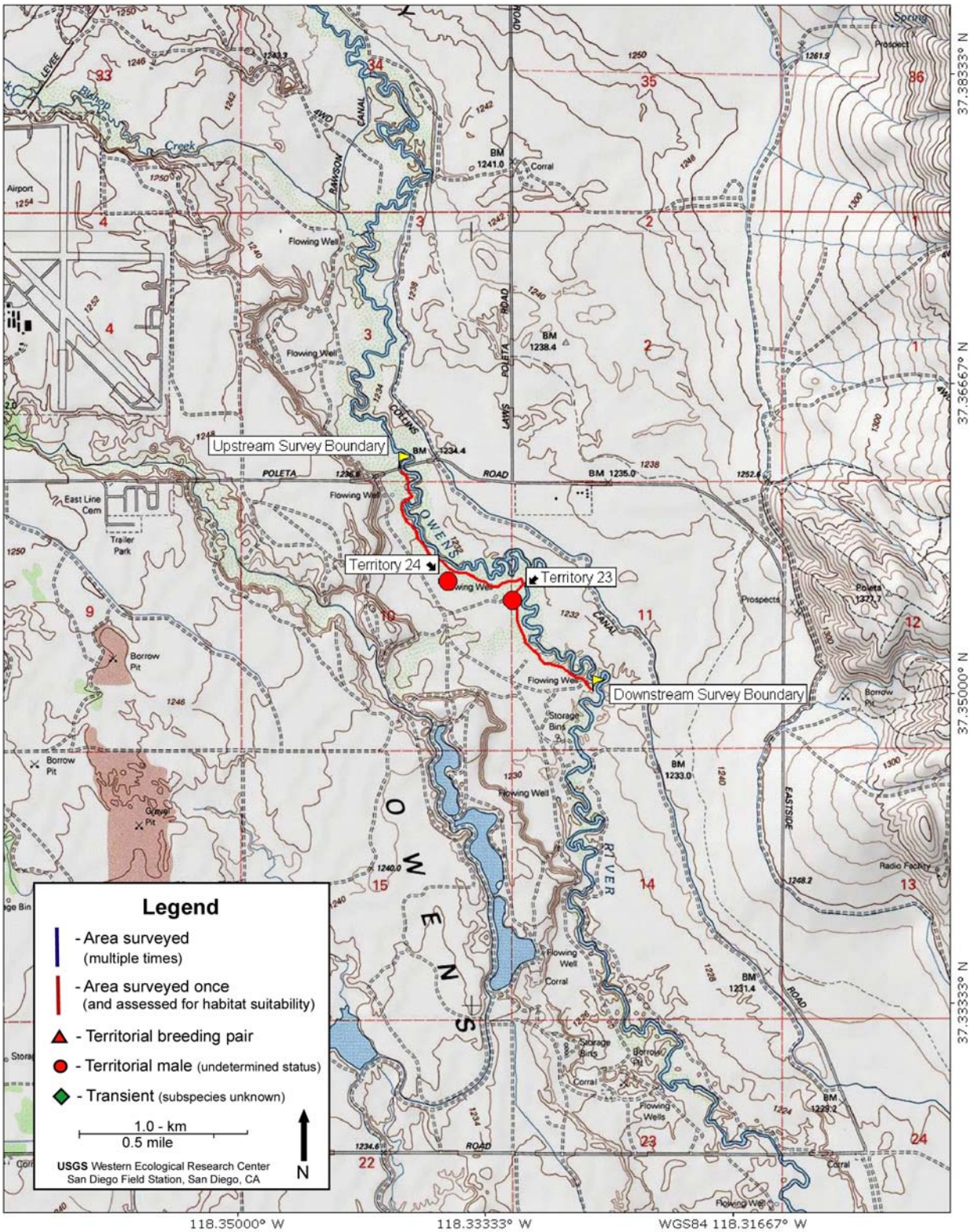

Figure 5. Survey limits and southwestern willows flycatcher locations at the Owens River, Poleta Road, Inyo County.

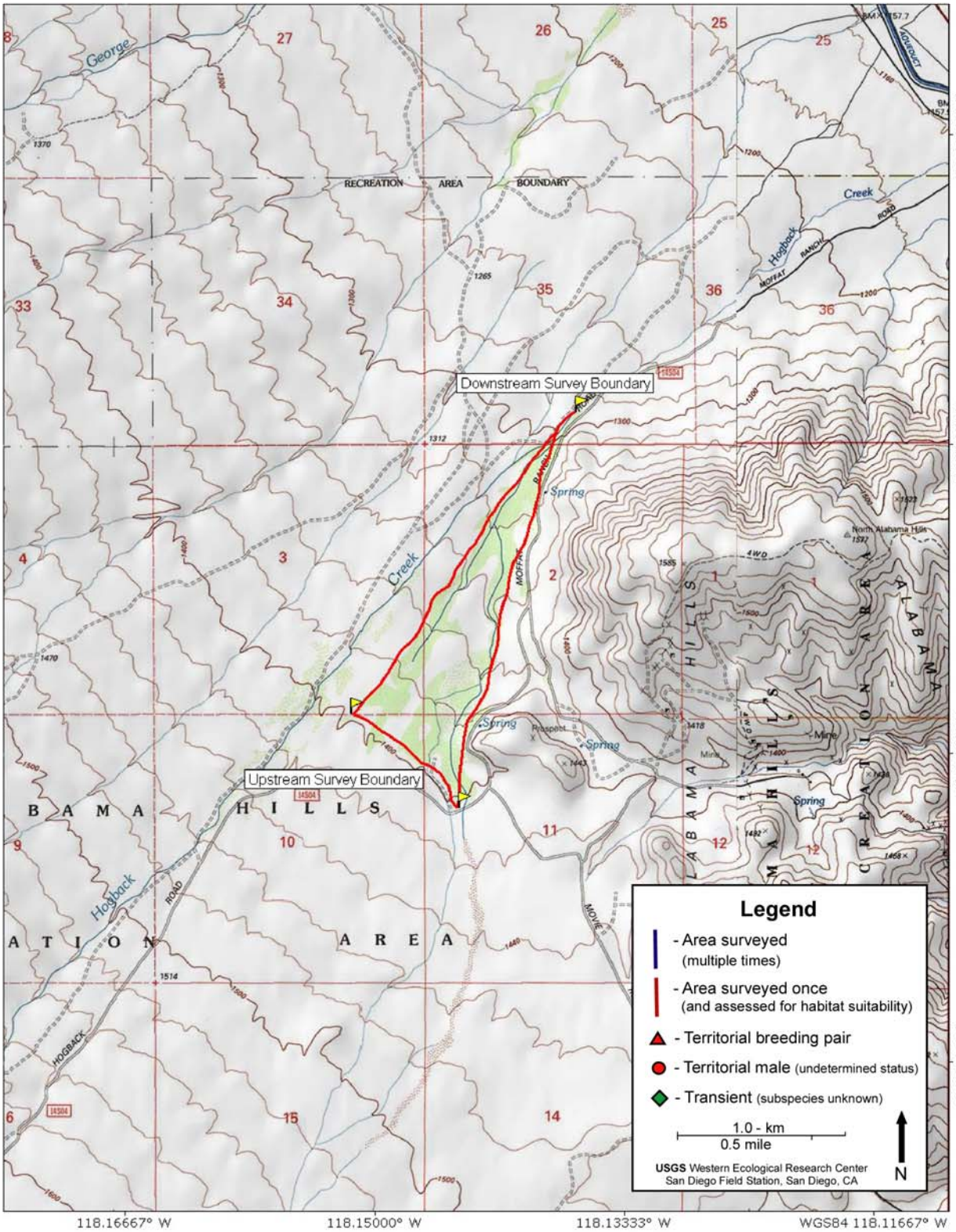

Figure 6. Survey limits and Southwestern Willow Flycatcher locations at Hogback Creek, Inyo County.

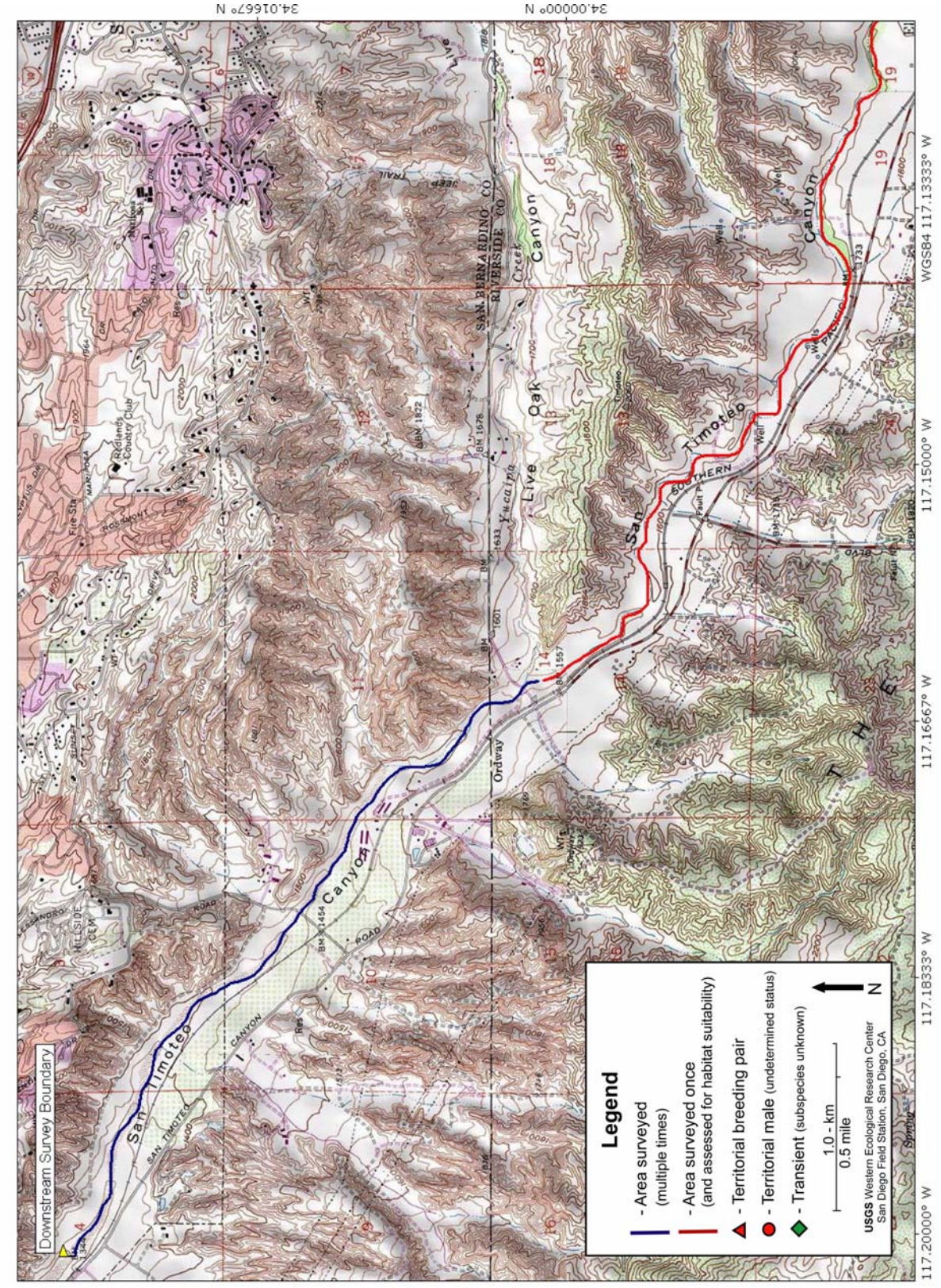

Figure 7. Survey limits and Southwestern Willow Flycatcher locations at San Timoteo Creek, Riverside County.

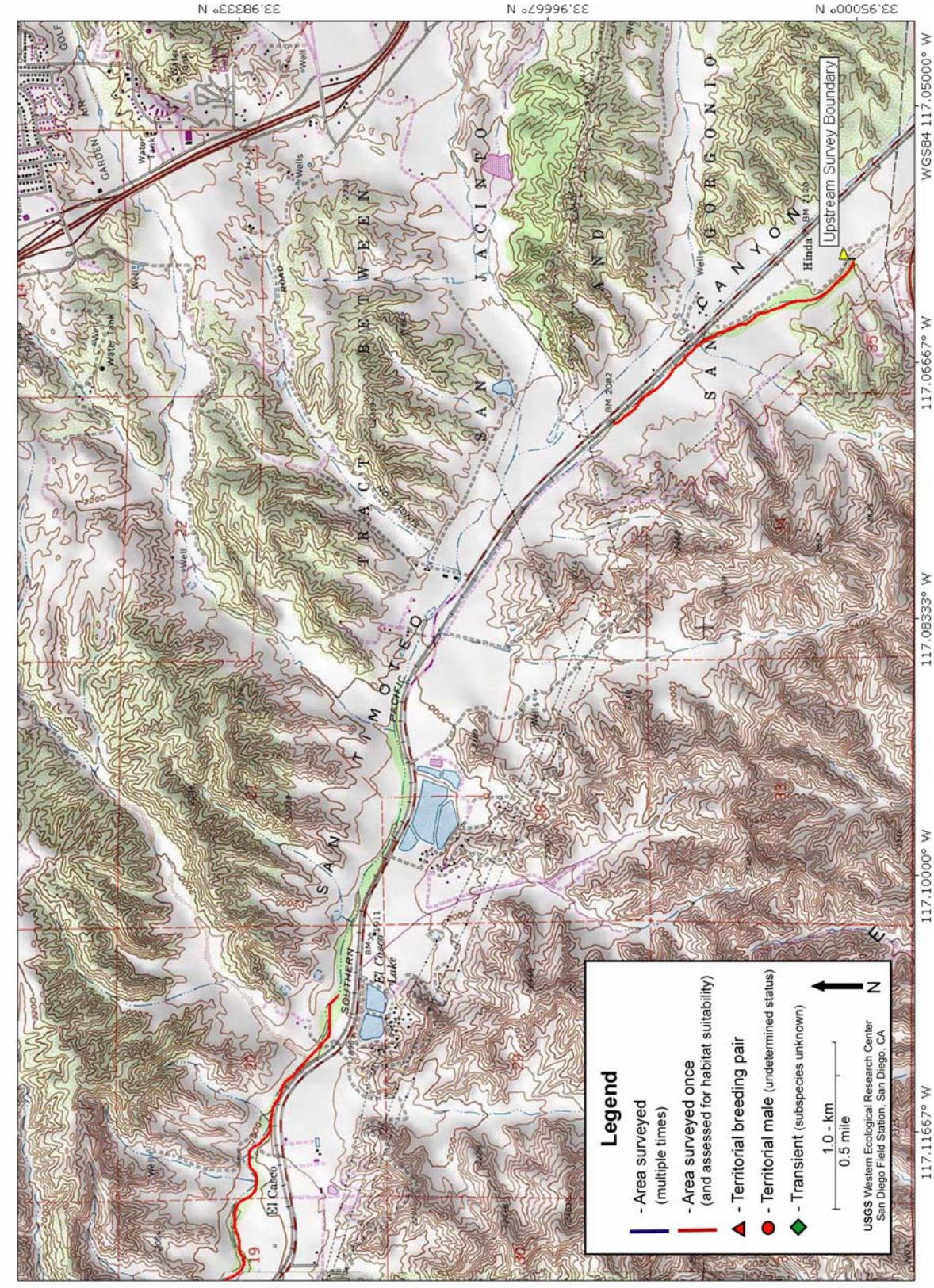

Figure 7 (continued). Survey limits and Southwestern Willow Flycatcher locations at San Timoteo Creek, Riverside

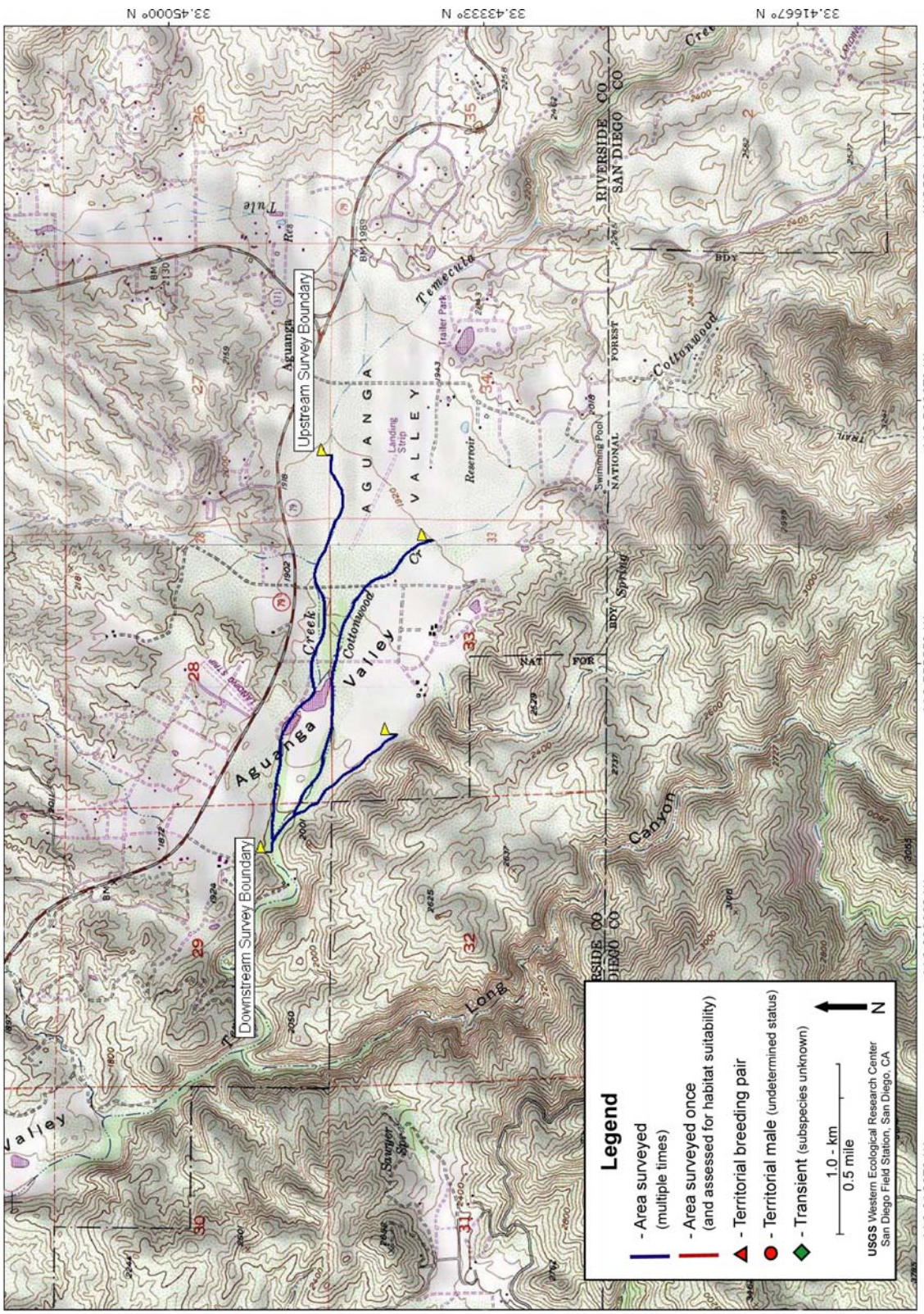

Figure 8. Survey limits and Southwestern Willow Flycatcher locations at Temecula Creek, Aguanga Valley, Riverside County.

Figure 9. Survey limits and Southwestern Willow Flycatcher locations at the Santa Margarita River, Fallbrook, San Diego County.

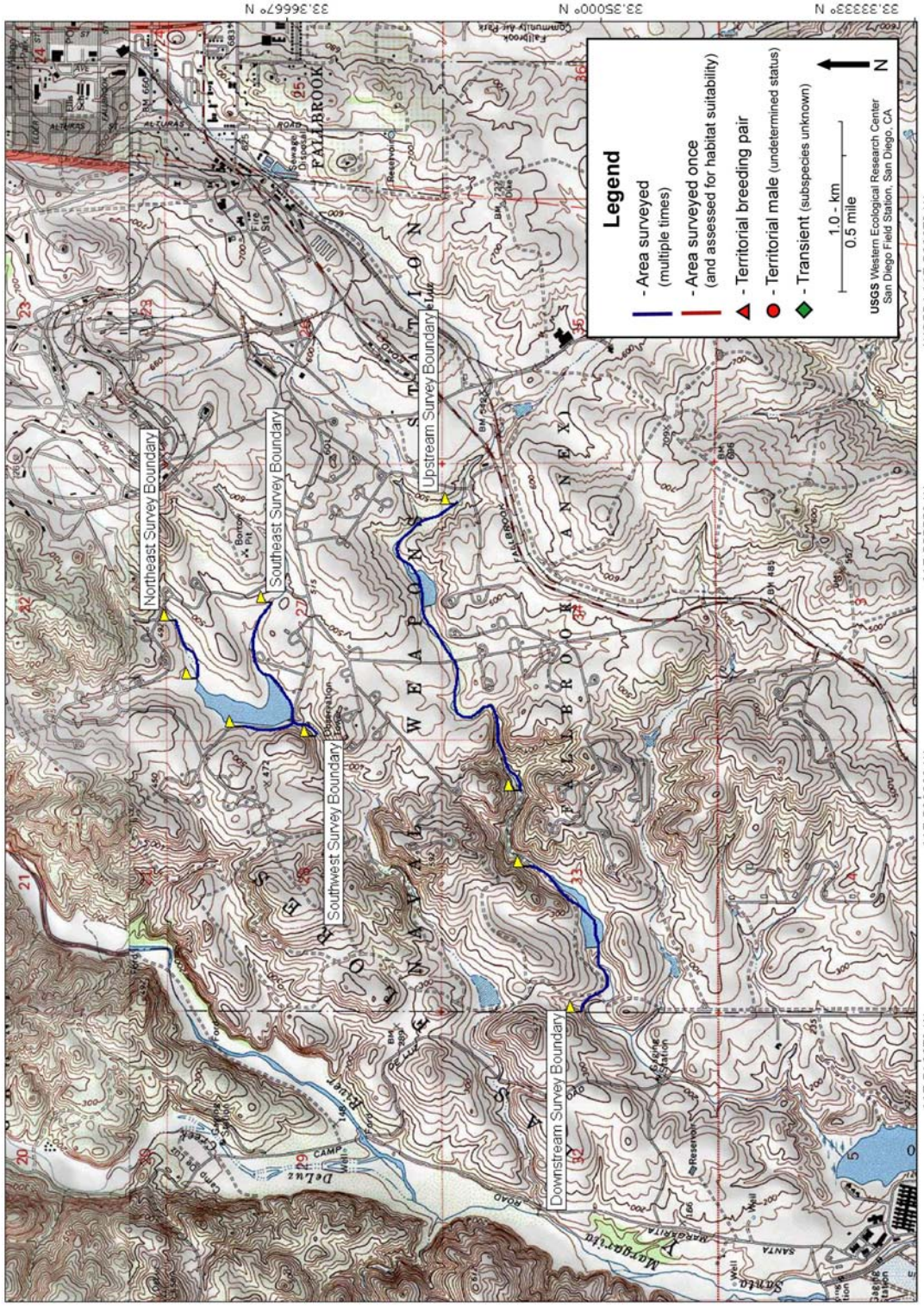

Figure 10. Survey limits and Southwestern Willow Flycatcher locations at Fallbrook Creek and Depot Lake, Fallbrook Naval Weapons Station, San Diego County.

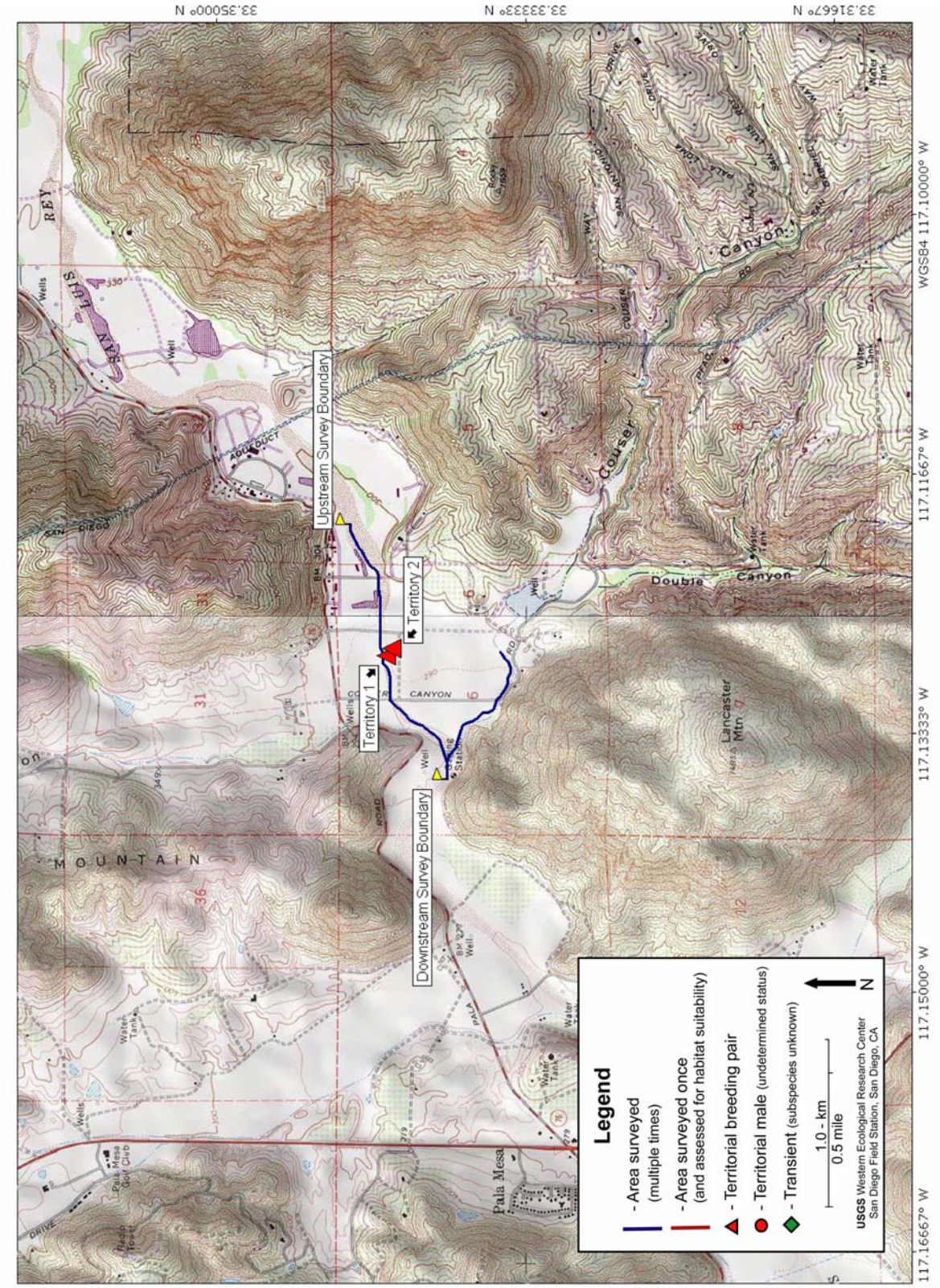

Figure 11. Survey limits and Southwestern Willow Flycatcher locations at the San Luis Rey River, Couser Canyon, San Diego County.

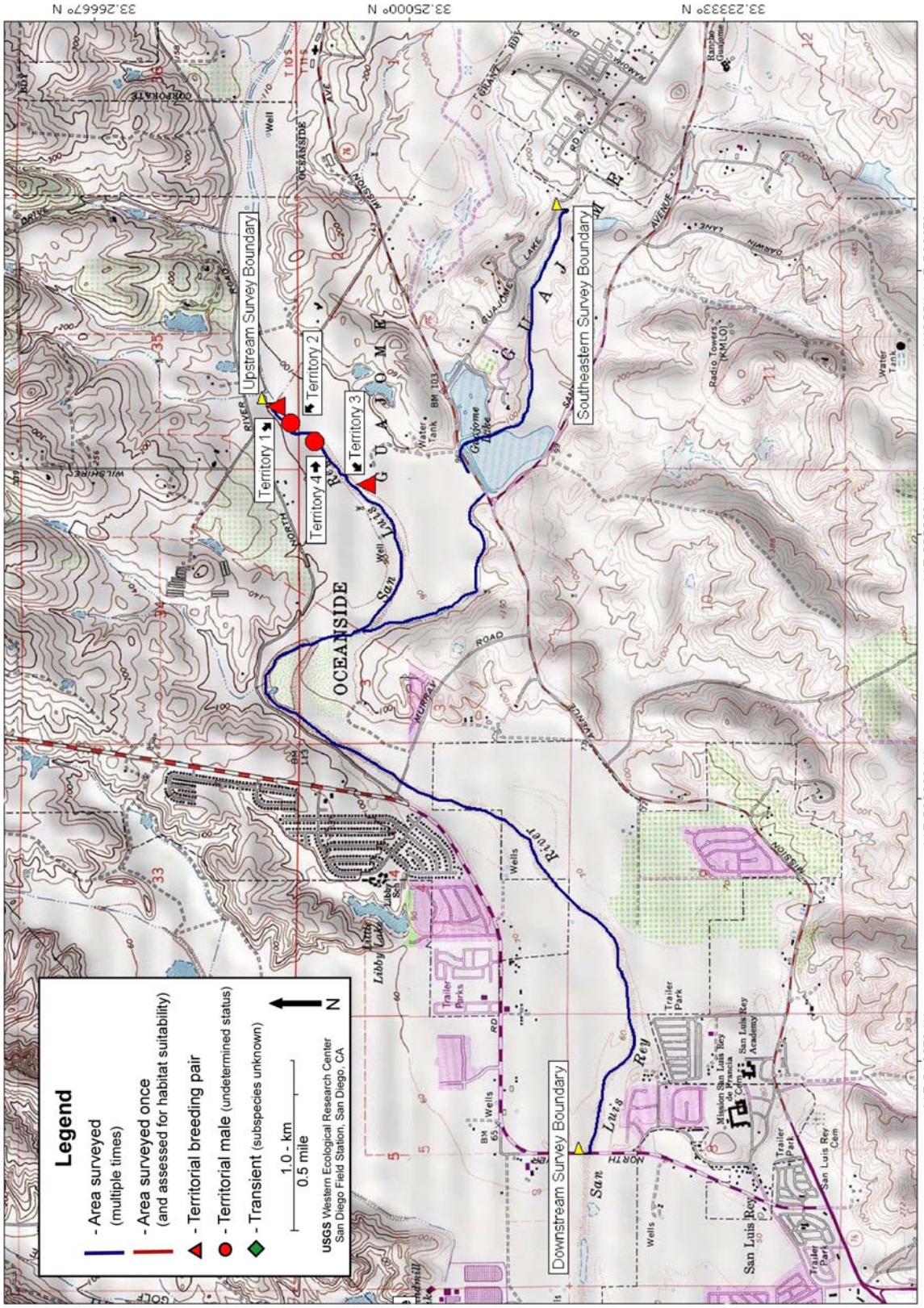

Figure 12. Survey limits and Southwestern Willow Flycatcher locations at the San Luis Rey River, Guajome Park, San Diego County.

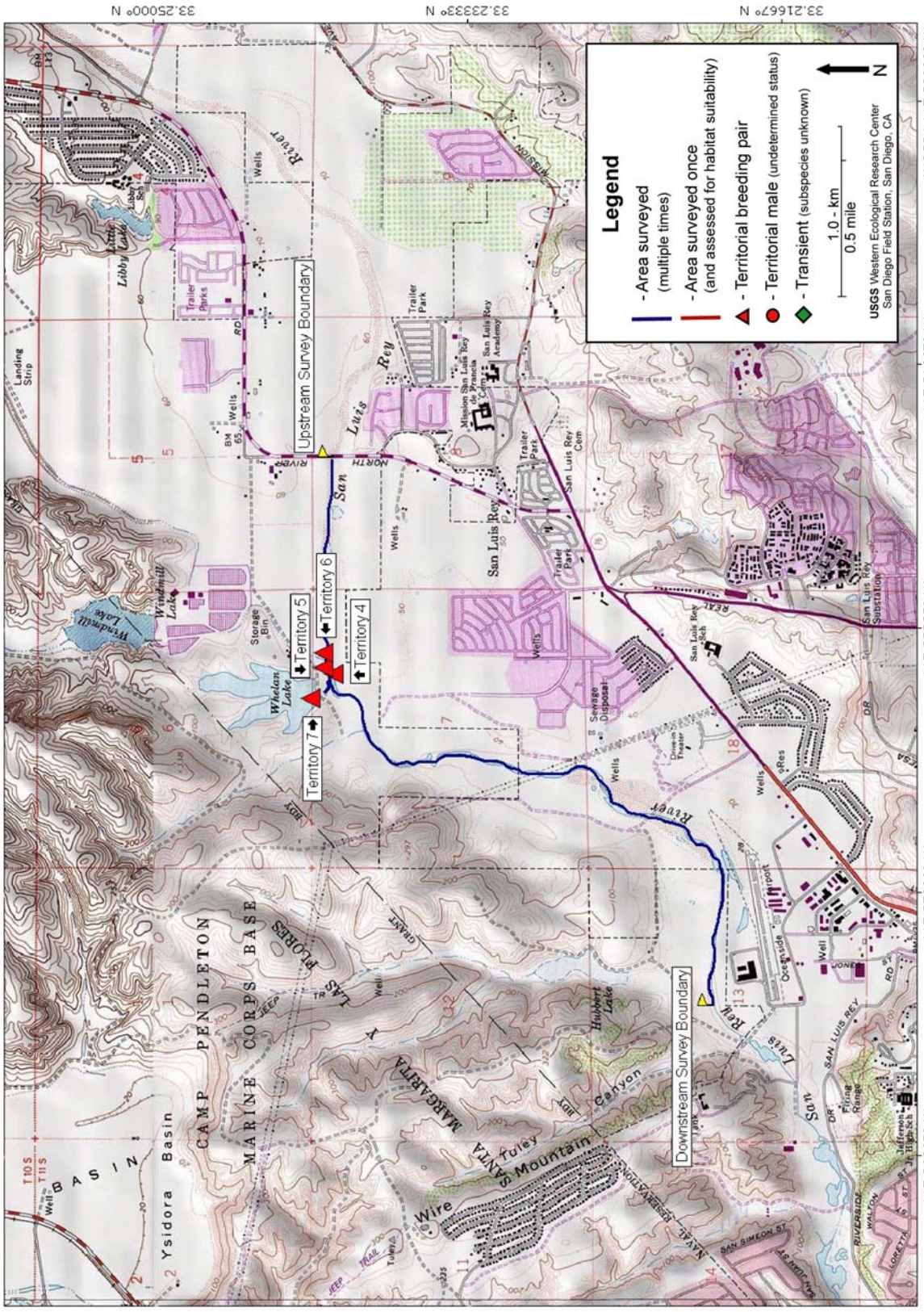

Figure 13. Survey limits and Southwestern Willow Flycatcher locations at the San Luis Rey River, Whelan Lake, San Diego County.

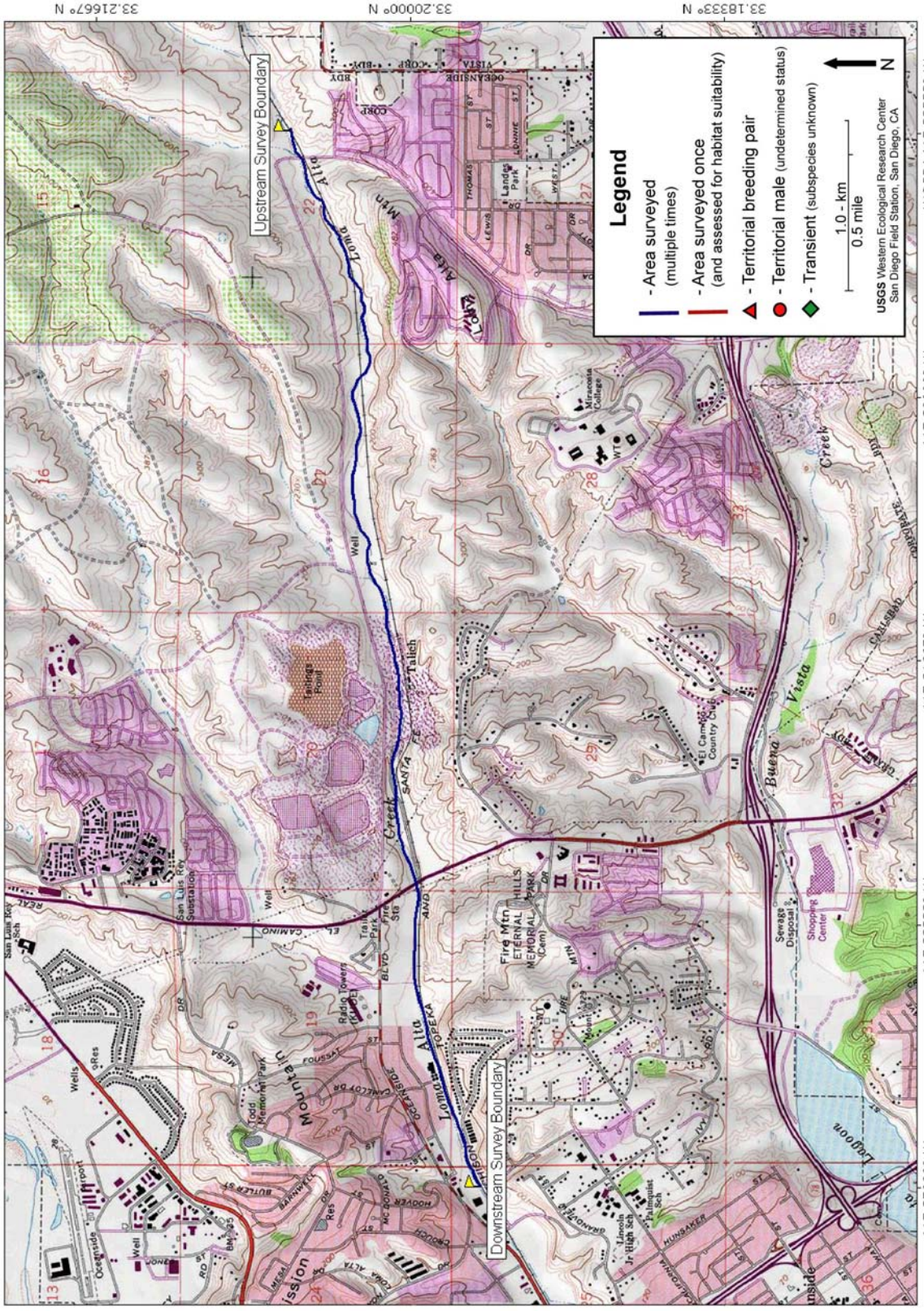

Figure 14. Survey limits and Southwestern Willow Flycatcher locations at Loma Alta Creek, San Diego County.

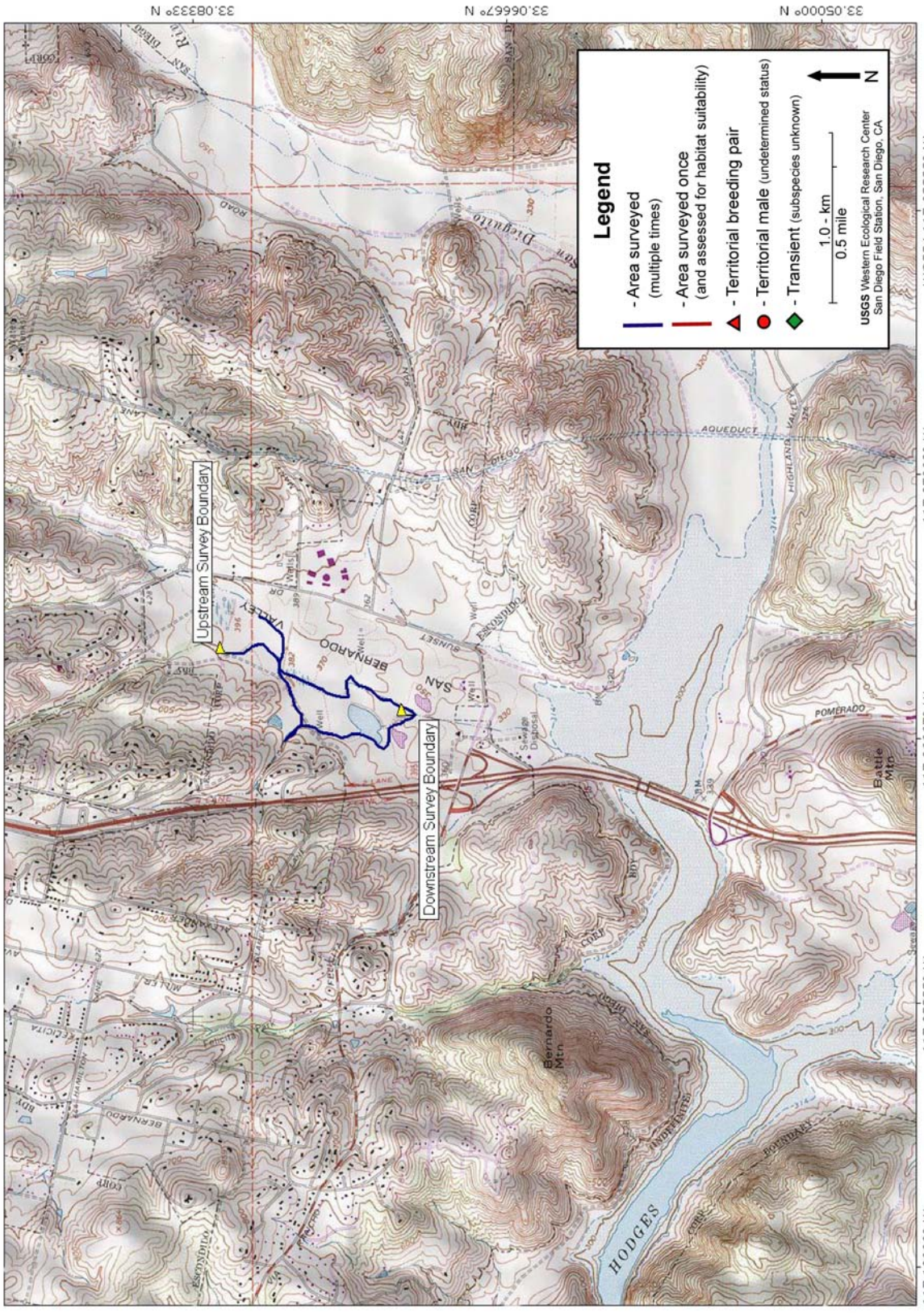

Figure 15. Survey limits and Southwestern Willow Flycatcher locations at Kit Carson Park, San Diego County.

Figure 16. Survey limits and Southwestern Willow Flycatcher locations at Los Penasquitos Creek, San Diego County.

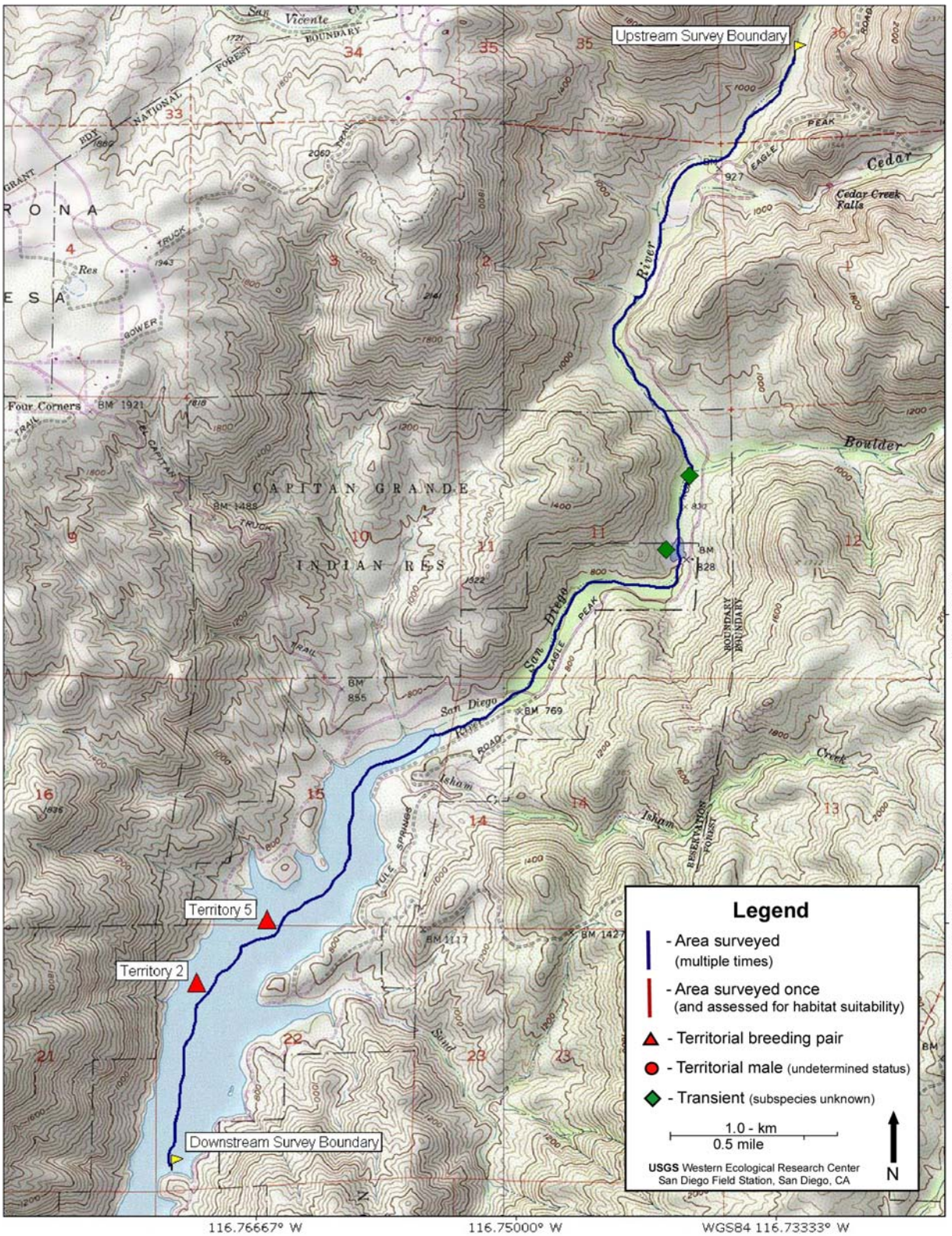

Figure 17. Survey limits and Southwestern Willow Flycatcher locations at the San Diego River, El Capitan North, San Diego County.

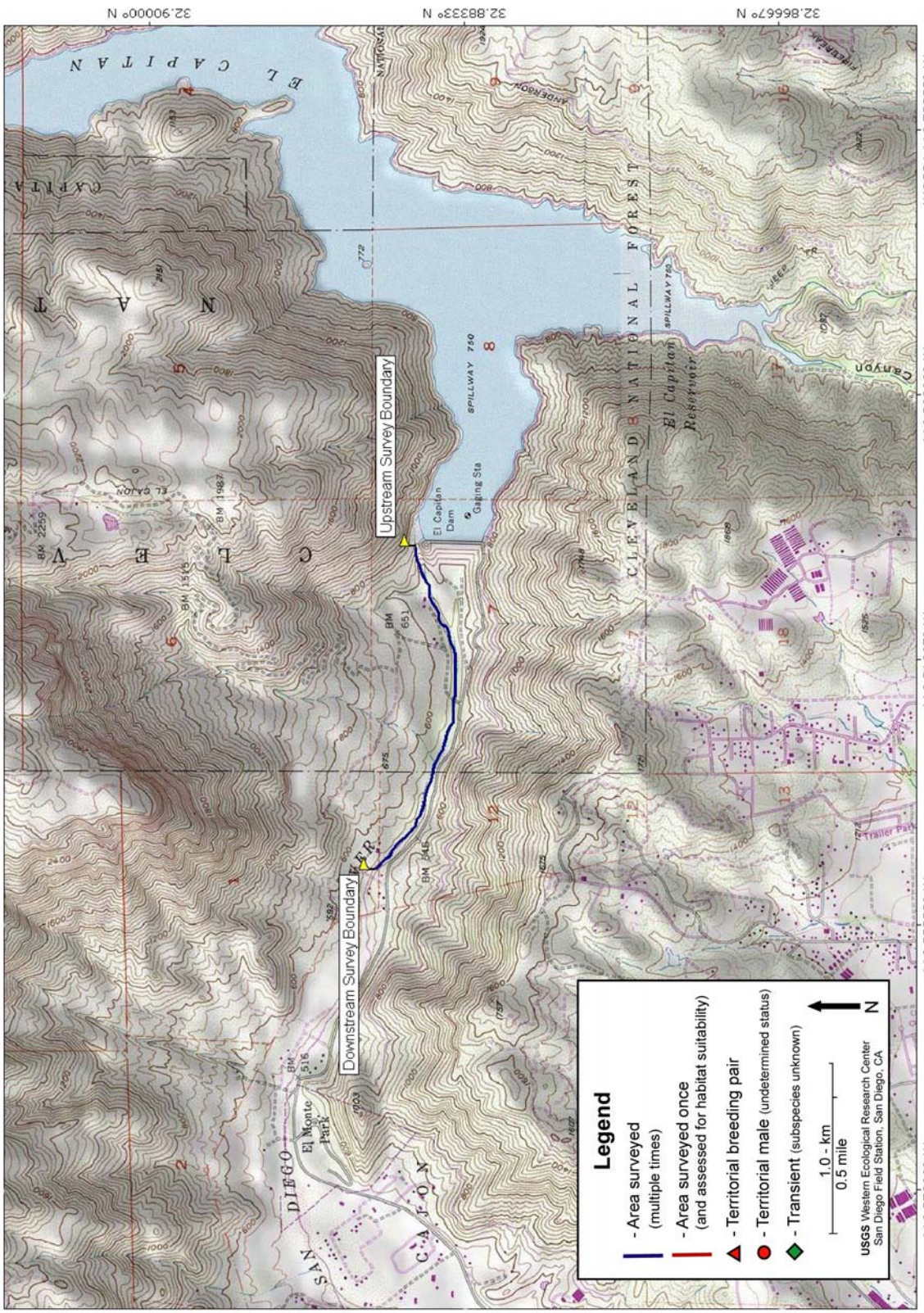

Figure 18. Survey limits and Southwestern Willow Flycatcher locations at the San Diego River, El Capitan West, San Diego County.

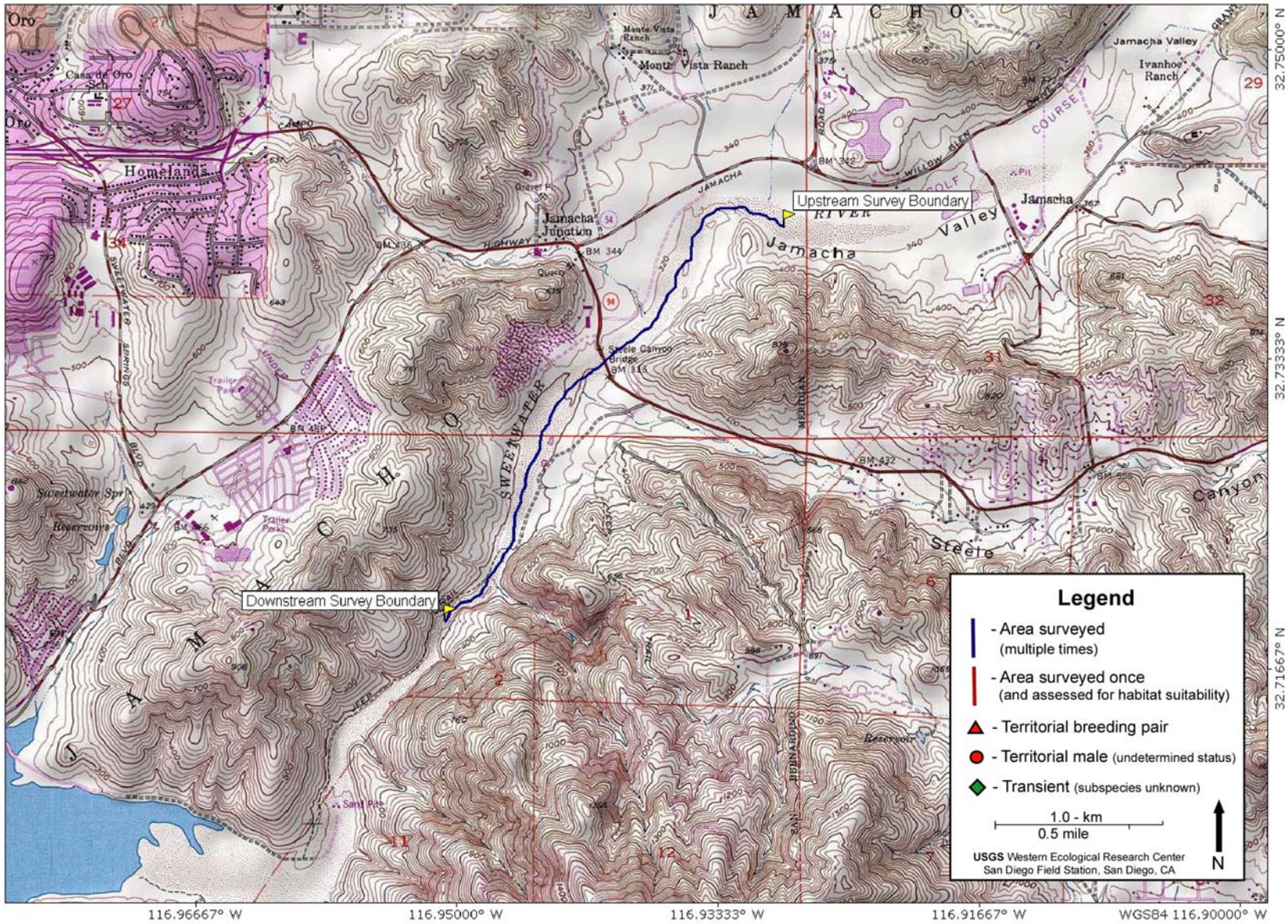

Figure 19. Survey limits and Southwestern Willow Flycatcher locations at Sweetwater River, San Diego County.

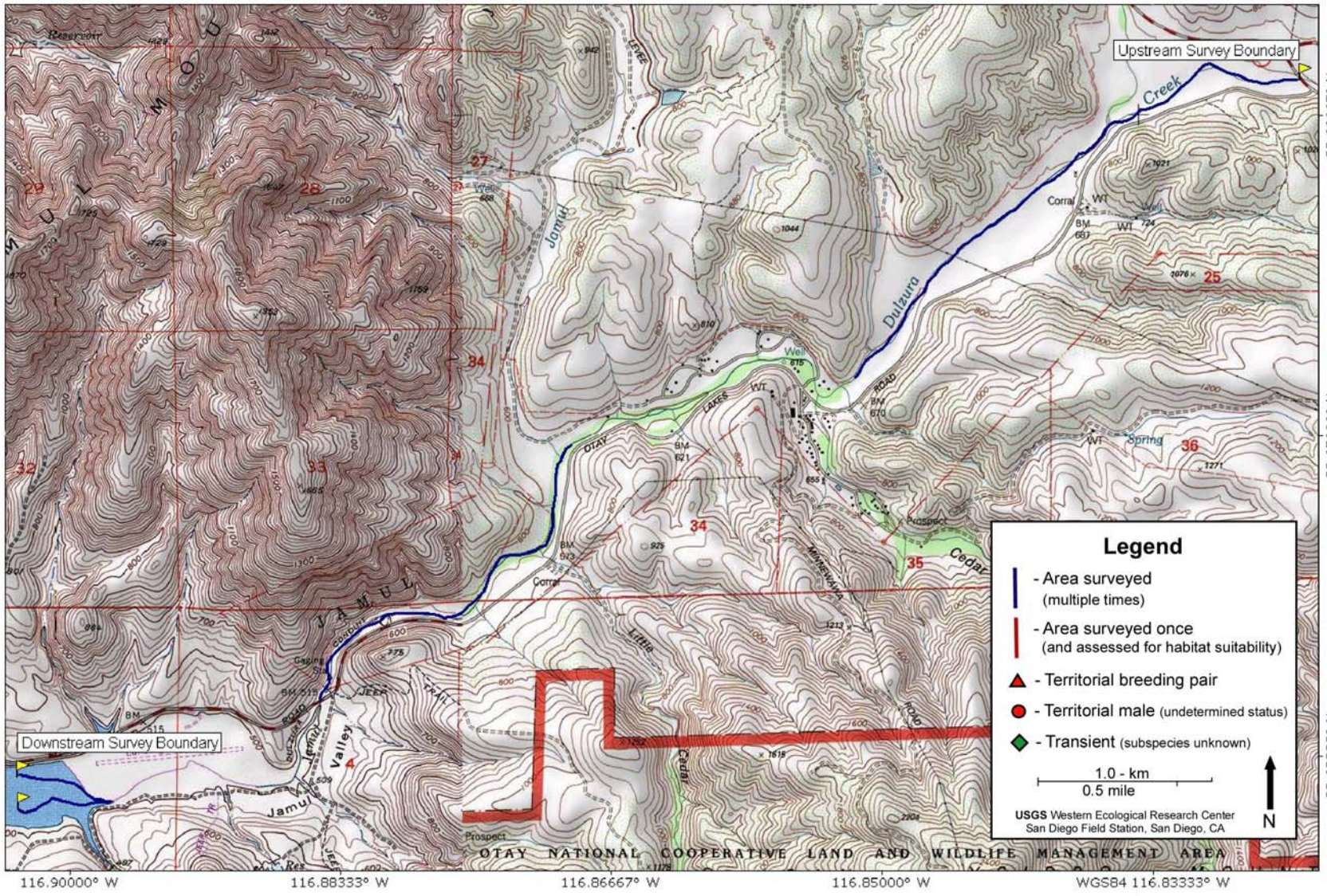

Figure 20. Survey limits and Southwestern Willow Flycatcher locations at Dulzura Creek, San Diego County.

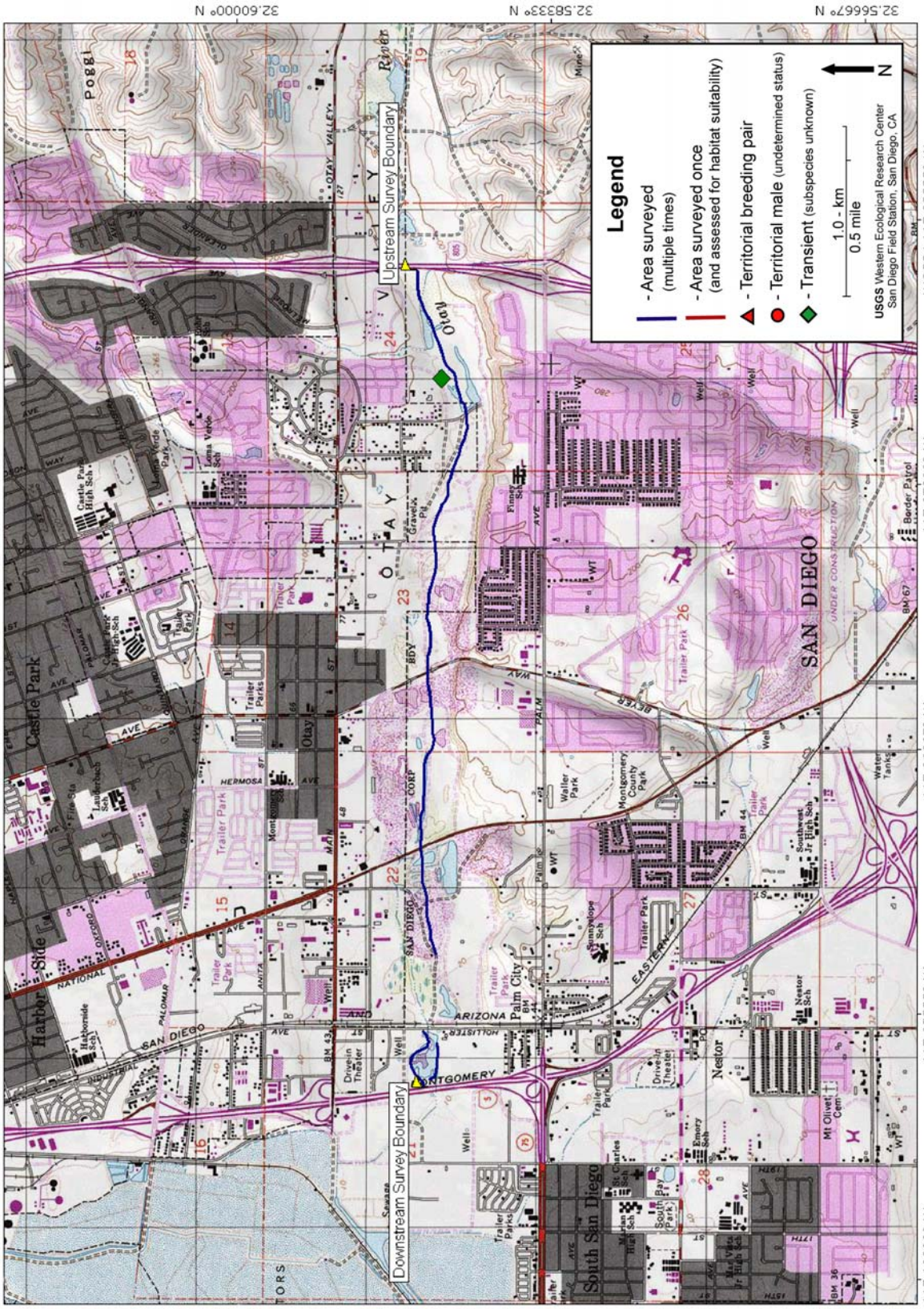

Figure 21. Survey limits and Southwestern Willow Flycatcher locations at Otay River, San Diego County.

Once caught, an adult was immediately removed from the net and uniquely color banded. A single plastic color band was placed on one leg and an anodized federal band was placed around the other leg. The plastic bands were sealed using acetone. We attempted to band nestlings when they were 7 to 10 days old. Nestlings were carefully removed from the nest, banded with a unique color combination as described above, and placed back into the nest. All mist netting and banding was conducted by Kimberly Ferree or Barbara Kus.

Habitat and Land-use Assessment

During the initial survey, habitat at each site was assessed and categorized based on the dominant plant species present as follows:

Willow: habitat dominated by a single species of willow - black willow (*Salix gooddingii*), sandbar willow (*S. hindsiana*), red willow (*S. laevigata*), or arroyo willow (*S. lasiolepis*).

Mixed willow riparian: habitat dominated by two or more of the willow species listed above.

Willow-Cottonwood: habitat consisting predominantly of one or more species of willow and Fremont cottonwood (*Populus fremontii*)

Willow-Sycamore: habitat dominated by one or more species of willow and western sycamore (*Platanus racemosa*)

Willow-Oak: habitat dominated by one or more species of willow and coast live oak (*Quercus agrifolia*).

Willow-Sycamore-Oak: habitat dominated by one or more species of willow, western sycamore, and coast live oak.

Riparian scrub: habitat consisting of lower growing vegetation lacking the heterogeneous, multi-layered structure typical of willow riparian woodlands. Typical species include: mule fat, coyote brush (*B. pilularis*), tamarisk (*Tamarix* spp.), and sandbar willow.

Following the breeding season, vegetation data were collected at 11 of the 20 sites to better characterize species composition and structure of the riparian habitat within the survey areas. The surrounding land use and any possible disturbance to the riparian system were documented. Transects were established perpendicular to the riparian corridor at 0.4 to 0.5 km intervals throughout the site. At each transect the following data were recorded: riparian corridor width, adjacent land use, the presence and nature of any disturbance to the riparian system, the presence of surface water and saturated soil both at the time of the assessment and earlier in the breeding season, the presence of grazing within the riparian corridor or adjacent land, and plant species composition and structure. Species composition and structure was sampled at fixed points along the transect approximately 30 m apart. At each point, overall plant cover was visually estimated within a 5-meter radius circle within three height intervals (0-3 m, 3-6 m, and >6 m above the ground). Overall foliage cover was estimated as the percentage of area within each height interval that was comprised of live foliage, lumping all plant species together. That cover estimate was then subdivided into the following four categories: Dominant species 1, Dominant species 2, Dominant species 3, and all other plant species, and the percent cover of each estimated. Finally, the total area occupied by exotic plant species within each 5-meter radius height interval was estimated. This method allowed us to quantify differences in species composition, cover and structure within the survey sites to better characterize available habitat at each site. For a more detailed description of the methods used, see Appendix 3.

RESULTS

Flycatcher Distribution and Abundance

Twenty sites, on 14 drainages, were surveyed for Southwestern Willow Flycatchers (Table 1). Two hundred and seventy-five hours were spent surveying a total of 94 linear kilometers of riparian habitat. Survey site length varied from 1.5 km to 16 km.

Willow flycatchers were detected at eight sites (Table 1, Figures 3-5, 11-13, 17 and 21). However, a single detection of a flycatcher on the Otay River, in mid-June, was most likely a migrating individual, as it was not found on the subsequent survey. Therefore, Southwestern Willow Flycatchers were confirmed as resident at seven sites (El Capitan North: San Diego River; Whelan Lake, Guajome Park and Couser Canyon: San Luis Rey River; Chalk Bluff, Highway 6 and Poleta Road: Owens River).

In total, thirty-six flycatcher territories were located on three drainages. Flycatchers were most abundant on the Owens and lower San Luis Rey Rivers, where 24 and 10 territories were located, respectively. An additional two Willow Flycatcher territories were located on the San Diego River above El Capitan Reservoir. Twenty-one of the 36 territories were documented to contain paired birds. However, it should be noted that the number of pairs located on the Owens River should be considered a minimum number present, as repeated visits to the site were not performed to determine the status of all birds. Eleven of the 14 drainages that were surveyed did not contain resident Southwestern Willow Flycatchers.

Willow Flycatcher Nesting Activity and Productivity

Breeding was confirmed at five of the seven sites with resident Southwestern Willow Flycatchers (Table 2). Eight nesting attempts were documented, of which three were known to

Table 1. Summary of survey results for Southwestern Willow Flycatcher at selected sites in southern California, 2001.

Site	Drainage	Habitat Type	Elev (m)	Survey Date	# WIFL	# Resident [1] WIFL	# Territories	# Pairs[2]	Breeding Confirmed?
Dulzura	Dulzura Creek	Willow/ Sycamore/ Oak	175	5/27/01 6/16/01 7/12/01	0 0 0	0	0	0	
Naval Weapons Station	Fallbrook Creek	Willow/ Sycamore/ Oak	139	6/22/01 7/16/02	0 0	0	0	0	
Hogback	Hogback Creek	Willow/ Cottonwood	1350	6/26/01 & 7/07/01	0	0	0	0	
Kit Carson Park	Kit Carson	Willow/ Sycamore/ Oak	110	6/21/01 7/11/01	0 0	0	0	0	
Loma Alta	Loma Alta Creek	Willow/ Cottonwood	26	6/08/01 6/27/01	0 0	0	0	0	
Los Penasquitos Park	Los Penasquitos Creek	Willow/ Sycamore/ Oak	75	6/21/01 7/11/01	0 0	0	0	0	
Otay Valley	Otay River	Riparian Scrub	21	5/28/01 6/15/01 7/07/01	0 1 0	0	0	0	
Chalk Bluff	Owens River	Mixed Willow/ Cottonwood	1340	6/27/01 7/08/01	18 14	32	21	11[3]	Yes
Highway 6	Owens River	Willow	1270	7/09/01	1	1	1	0	No
Poleta Road	Owens River	Willow/ Cottonwood	1255	7/09/01	2	2	2	0	No
El Capitan North	San Diego River	Mixed Willow	240	6/19/01 & 6/21/01 7/05/01 & 7/10/01 7/17/01	4 0 4	4	2	2	Yes
El Capitan West	San Diego River	Willow/ Cottonwood/ Sycamore	184	6/14/01 7/03/01	0 0	0	0	0	
Whelan Lake	San Luis Rey River	Mixed Willow	15	5/31/01 6/20/01 6/27/01 6/28/01 6/29/01 7/10/01	4 4 4 6 4 6	8	4	4	Yes
Guajome Park	San Luis Rey River	Mixed Willow/ Cottonwood	25	6/11/01 6/18/01 6/29/01 7/11/01	3 1 2 3	6	4	2	Yes
Couser Canyon	San Luis Rey River	Mixed Willow/ Cottonwood	84	7/12/01 7/18/01	4 4	4	2	2	Yes
Fallbrook - Town	Santa Margarita	Mixed Willow Riparian	89	6/19/01 7/11/01	0 0	0	0	0	
Naval Weapons Station – Depot	Small tributary to Santa Margarita River	Willow/ Oak	130	6/22/01 7/16/01	0 0	0	0	0	
San Timoteo	San Timoteo Creek	Mixed Willow	430	6/19/01 7/11/01	0 0	0	0	0	
Sweetwater	Sweetwater River	Willow/ Sycamore	30	6/14/01 & 6/17/01 6/30/01 & 7/02/01	0 0	0	0	0	
Aguanga Valley	Temecula Creek	Willow/ Cottonwood	555	6/08/01 7/06/01	0 0	0	0	0	
					Totals	57	36	21	

[1] Includes males and females
[2] Of territorial birds, number of known pairs
[3] Due to time constraints, we were not able to confirm the pairing status of all flycatchers at this site. Therefore, the numbers reported are a minimum number of flycatchers/pairs.

be successful. The remaining five nests were not monitored regularly and as a result their outcomes are unknown. Five nests were found during the incubation stage, two during the nestling stage, and one attempt was documented by observing adult flycatchers feed newly fledged young. A single parasitism event was documented on the Owens River at the Chalk Bluff site. Four nests were placed in black willow, while three others were built in sandbar willow.

Table 2. Host plant, contents, and outcome of Southwestern Willow Flycatcher nests located during surveys, 2001.

Site	Territory	Host Plant	# SWFL Eggs	#BHCO Eggs	#Nestlings	#Fledglings	Nest Outcome
El Capitan North	2	SGO[1]	2	0	2	---	Unknown[2]
El Capitan North	5	SGO	1+	---	---	---	Unknown[3]
Couser Canyon	1	Unknown	---	---	---	2+	Successful[4]
Couser Canyon	2	SHI[1]	---	---	2	---	Unknown[5]
Guajome Park	3	SHI	4	0	2	2	Successful
Whelan Lake	4	SGO	3	0	3	---	Unknown[5]
Whelan Lake	5	SGO	3	0	3	3	Successful
Chalk Bluff	1	SHI	1	2	---	---	Unknown[5]

[1] SGO = black willow; SHI = sandbar willow
[2] Unable to access site for follow-up visit.
[3] Nest found with 1 Willow Flycatcher egg. Nest was possibly from an earlier breeding attempt.
[4] Adults found feeding newly fledged young. Nest not located.
[5] Time/resource constraints prevented follow-up on nesting attempt.

Color-Banding

Five adult and seven hatching year (nestling) flycatchers were uniquely color-banded at three sites on two separate drainages (Table 3). Two unsuccessful attempts were made to mist-net and band flycatchers at Whelan Lake.

Table 3. Southwestern Willow Flycatchers banded in 2001.

Site	Territory	Date Banded	Federal Band Number	Color Band		Age	Sex
				Left Leg	Right Leg		
Couser Canyon	1	7/18/2001	2190-52564	DBWH	Mdg	AHY	F
Couser Canyon	2	7/23/2001	2200-10650	Mbr	WH	HY	U
Couser Canyon	2	7/23/2001	2200-10651	Mbr	BK	HY	U
Couser Canyon	2	7/23/2001	2200-10652	Mbr	PU	HY	U
El Capitan North	2	8/01/2001	2190-52566	PUWH	Mdg	AHY	F
El Capitan North	2	8/01/2001	2200-10656	Mbr	LP	HY	U
El Capitan North	2	8/01/2001	2200-10657	Mbr	LB	HY	U
Guajome Park	3	7/05/2001	2190-52558	LTBL	Mdg	AHY	M
Guajome Park	3	7/13/2001	2190-52563	PPWH	Mdg	AHY	F
Guajome Park	3	7/05/2001	2200-10640	LGLP	Mbr	HY	U
Guajome Park	3	7/05/2001	2200-10641	DGOR	Mbr	HY	U
Guajome Park	4	7/05/2001	2190-52559	ORYE	Mdg	AHY	U

Color band codes: DB = dark blue, DG = dark green, LG = light green, LP = light pink, LB = light blue, WH = white, BK = black, PU = purple, PP = pink, OR = orange, YE = yellow, Mdg = dark green anodized metal (federal) band, Mbr = brown anodized metal (federal) band **Age**: HY = hatching year, AHY = 1 year or older **Sex**: F = female, M = male, U = unknown

Habitat Assessment

Vegetation transects were sampled at 11 of the 20 sites to better characterize species composition and structure. The number of vegetation sampling points per site varied considerably depending on the site's length and stream channel width, and averaged 39.0 ± 23.0.

Overall vegetative cover showed in inverse relationship with height at all sites (Figure 22). Cover was greatest in the 0-3 m height category and decreased with increasing height. Plant cover over all sampling points (N = 429) averaged 42.6 percent (SD = 9.9) within the 0-3 m height interval, 19.5 percent (SD = 7.6) for the 3-6 m interval, and 6.0 percent (SD = 4.1) for the >6 m height category. To facilitate graphical interpretation exotic and native herbaceous plant species were combined, and species of similar management concern (e.g. giant reed (*Arundo donax*)/tamarisk = woody exotic species) or with similar physiognomy (e.g. rush/cattail/sedge) were grouped. Also, species not considered dominant were removed from

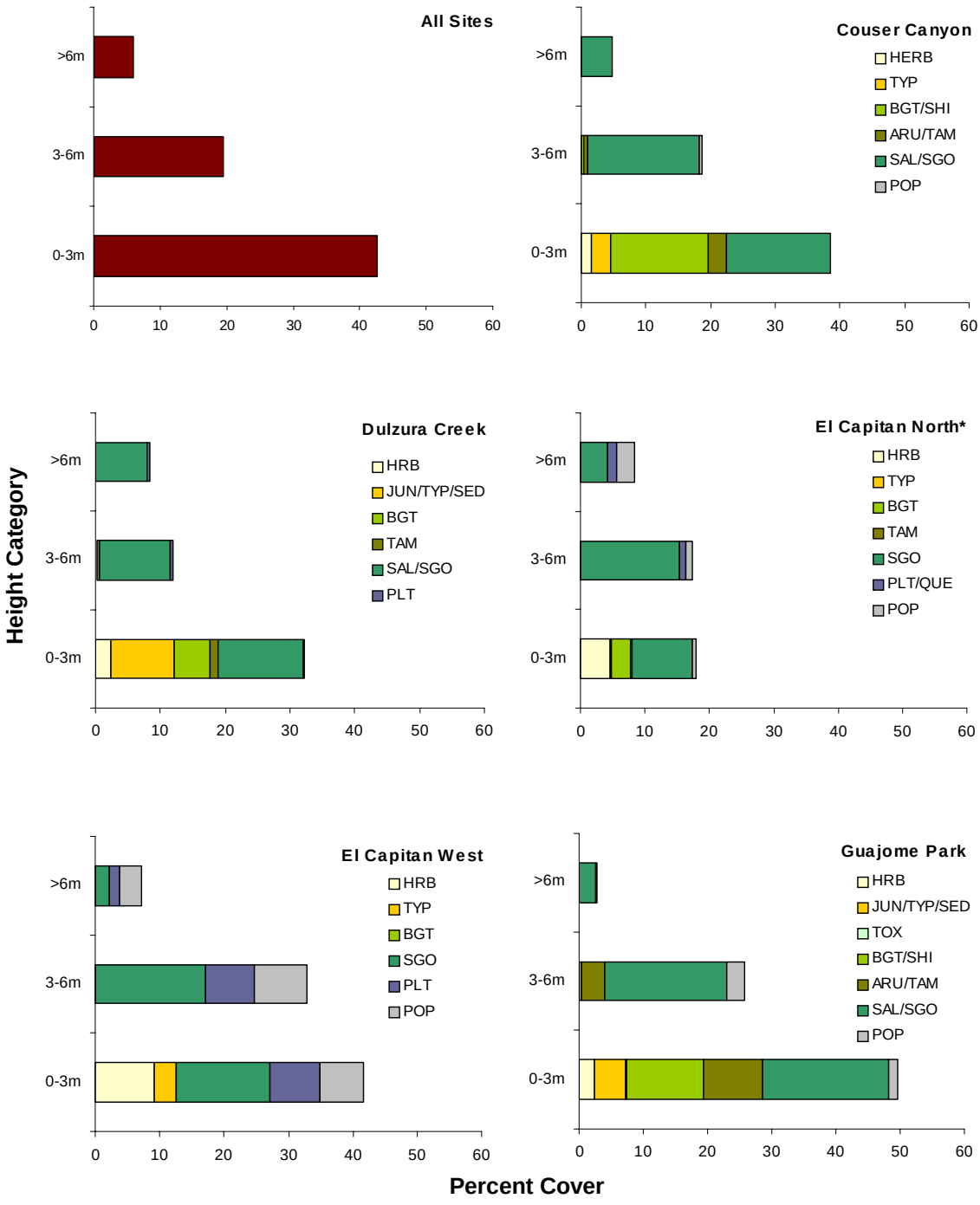

Figure 22. Average percent foliage cover of dominant plant species in three vertical height classes at 11 survey sites. Codes for plant species are as follows: ARU = giant reed, BGT = mule fat, BRA = black mustard (*Brassica nigra*), CON = poison hemlock (*Conium macultum*), ECU = Eucalyptus (*Eucalyptus* spp)., HRB = herbaceous cover, JUN = rush, PALM = Palm spp., PAM = pampas grass (*Cortaderia selloana*), PLT = western sycamore, POP = Fremont cottonwood, QUE = Oak (*Quercus* spp.), SAL = red or arroyo willow, SED = sedge, SGO = black willow, SHI = sandbar willow, TAM = tamarisk, TYP = cattail, TOX = poison oak (*Toxicodendron diversilobum*). *Area sampled was upstream of area occupied by Willow Flycatchers.

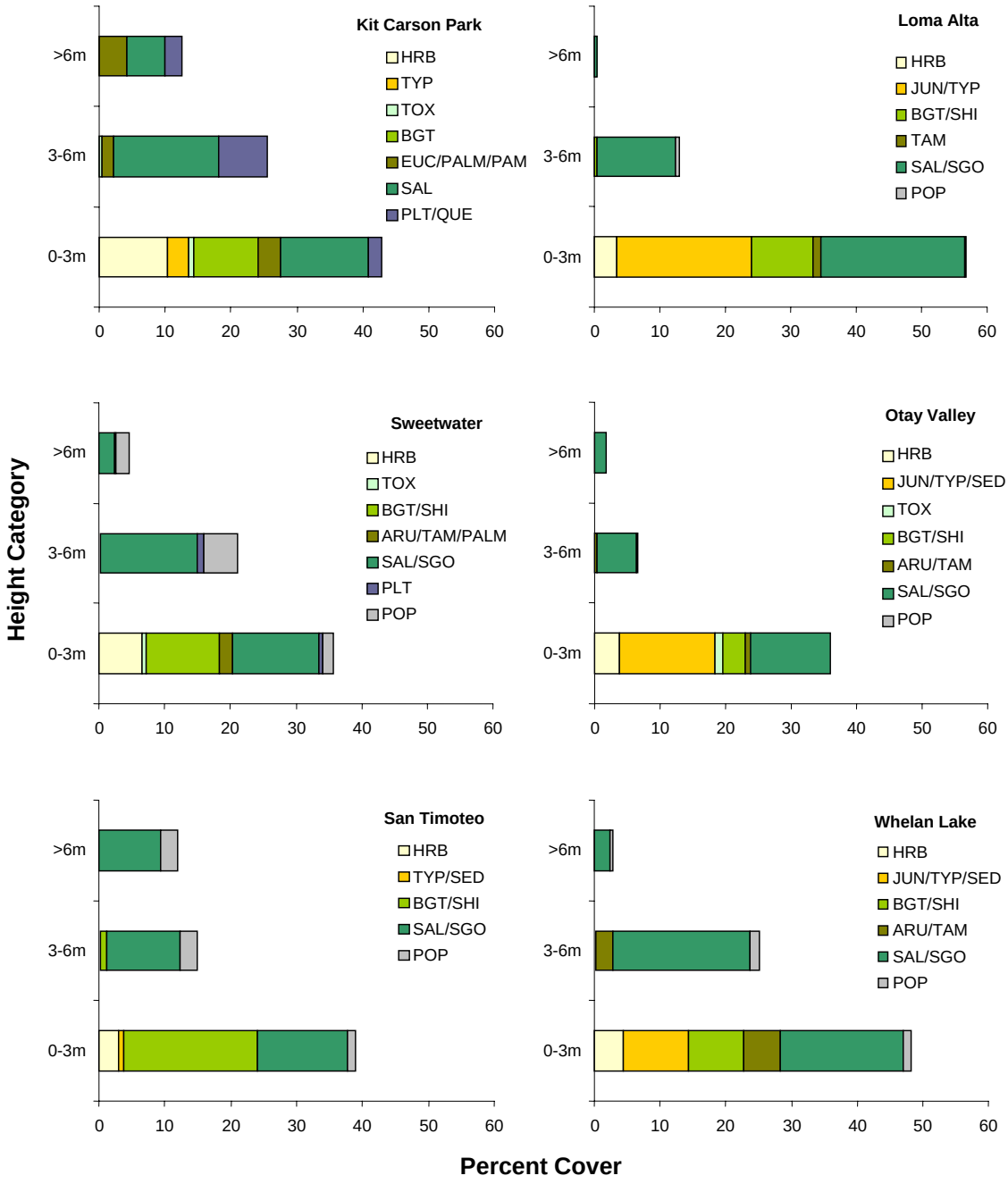

Figure 22 (continued). Average percent foliage cover of dominant plant species in three vertical height classes at 11 survey sites.

figures, and averaged approximately 3, 1, and .05 percent additional cover in the 0-3, 3-6, and >6 m height categories, respectively.

Mule fat, black willow and cattail were the most ubiquitous plant species, occurring at 11, 10, and 10 sites, respectively. Other widespread species were red/arroyo willow and Fremont cottonwood, which were documented at nine sites each. Similarly, red/arroyo willow, black willow, and mule fat possessed the highest cover values at the 0-3 m height, averaging 10.3, 6.7, and 6.9 percent cover, respectively (Table 4).

Table 4. Average percent foliage cover of dominant plant species comprising 1 percent cover or greater at sampling points. Foliage cover is presented for three height intervals: 0-3 m, 3-6 m, >6 m. n1= number of sites where the species was present, n2= number of points within sites where the species was present, SD= standard deviation. Percent cover was calculated as: (total cover occupied by a species/n2).

Plant Species (n1, n2)	Cover 0-3m (SD)	Cover 3-6m (SD)	Cover >6m (SD)
Red/arroyo willow (9, 379)	10.3 (15.3)	8.7 (14.0)	1.7 (6.0)
Black willow (10, 404)	6.7 (12.8)	7.9 (15.2)	2.2 (7.4)
Mulefat (11, 429)	6.9 (13.4)	0.04 (0.4)	
Cattail species (10, 371)	4.4 (13.4)	0.02 (0.2)	
Sedge (5, 257)	1.1 (6.5)		
Giant reed (5, 268)	4.1 (12.5)	1.7 (5.5)	0.3 (0.02)
Sandbar willow (7, 322)	2.9 (8.1)	0.2 (1.3)	
Eucalyptus (1, 25)	1.4 (4.1)	1.1 (2.6)	4.2 (12.4)
Fremont cottonwood (9, 372)	1.1 (5.0)	2.1 (6.1)	1.0 (4.1)
Western California sycamore (5, 121)	1.0 (3.9)	2.2 (6.1)	1.0 (4.9)
Poison hemlock (5, 280)	1.0 (5.8)		

Four of the 11 sites sampled contained breeding Southwestern Willow Flycatchers. However, at the El Capitan North site only the habitat upstream of the area occupied by the flycatchers was sampled. Therefore, this site was not considered when evaluating apparent flycatcher habitat preferences.

Although the small sample size prevented us from analyzing the habitat data statistically, flycatchers seemed to select sites with higher cover within the 0-3 and 3-6 m height categories

that were dominated by a few specific species (Figure 22). These species included red/arroyo and black willow, comprising 16-20 percent and 17-21 percent cover within the 0-3 and 3-6 m height categories, respectively. To a lesser extent seep and sandbar willow also dominated occupied sites within the 0-3 m height category, comprising 8-15 percent cover.

A second characteristic that seemed to separate occupied from unoccupied sites was the ratio of total vegetation cover at 0-3 to that at 3-6 m. Occupied sites tended to have twice as much cover at 0-3 m as at 3-6 m (Table 5). Sites with a ratio less than or greater than 2:1 did not contain resident flycatchers.

Table 5. Ratio of total under-story cover (0-3 m) to total mid- (3-6 m) and over-story (>6 m) cover at sites surveyed for Southwestern Willow Flycatchers in 2001.

	Cover Ratios	
Site	**Under/Mid-story**	**Under/Over-story**
El Capitan North	1.03	2.14
El Capitan West	1.26	5.88
Kit Carson Park	1.68	3.41
Sweetwater	1.69	7.91
Whelan Lake*	1.92	16.85
Guajome Park*	1.93	17.61
Couser Canyon*	2.07	8.09
San Timoteo	2.60	3.24
Dulzura Creek	2.69	3.82
Loma Alta	4.39	155.29
Otay Valley	5.54	20.23

* Site containing resident Southwestern Willow Flycatchers

Exotic plant species were detected at 91 percent (n = 11) of the sites sampled. However, species varied greatly in their prevalence and distribution both across and within sites. For example, tamarisk and black mustard were the most widespread species (found at eight and seven sites, respectively, Table 6), but giant reed and tamarisk were encountered most frequently

Table 6. Exotic plant species located at survey sites in San Diego County, 2001. "X's" indicate at which site species were found. Codes for the exotic species listed are as follows: ARU = giant reed, BRA = black mustard, CON = poison hemlock, EUC = eucalyptus, PALM = palm, PEP = pepper tree (*Schinus* spp.), PAM = pampas grass, RIC = castor bean (*Ricinus communis*), TAM = tamarisk.

	Exotic Plant Species								
Sites	**ARU**	**BRA**	**CON**	**EUC**	**PALM**	**PEP**	**PAM**	**RIC**	**TAM**
Couser Canyon	X	X							X
Dulzura Creek								X	X
El Capitan North									X
El Capitan West									
Guajome Park	X	X	X						X
Kit Carson Park		X	X	X	X	X	X		
Loma Alta		X							X
Otay Valley	X		X	X					X
San Timoteo	X	X	X						
Sweetwater	X	X	X		X				X
Whelan Lake	X	X	X						X

at sampling points (n= 429) across all sites, present at 18 and 17 percent of all points, respectively (Figure 23). All other exotic species were found at 5 percent or fewer of points sampled.

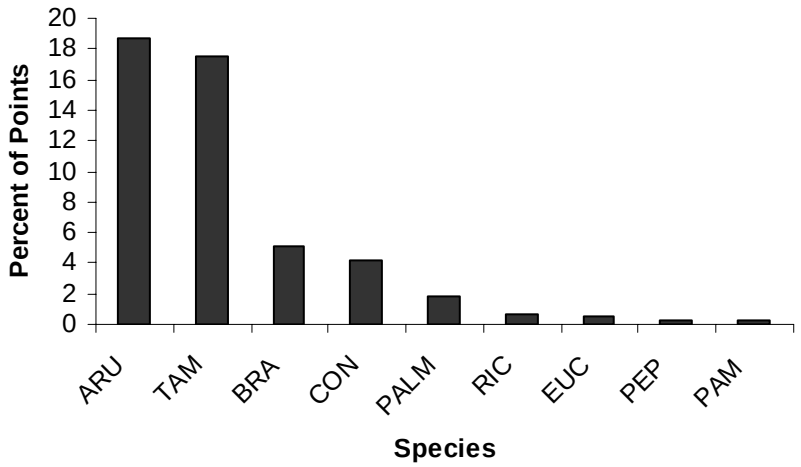

Figure 23. Percent of vegetation sampling points with exotic vegetation, by plant species (n= 429). Codes for the exotic species listed are as follows: ARU = giant reed, TAM = tamarisk, BRA = black mustard, CON = poison hemlock, PALM = palm, RIC = castor bean, EUC = eucalyptus, PEP = pepper tree, PAM = pampas grass.

The total percent cover of exotic vegetation also differed greatly between sites, comprising 0 to 15 percent cover within the 0-3 m height category. The distribution of these cover statistics showed two distinct groupings of exotic cover, with exotics making up less than 4 percent cover at seven sites, and between 11.5 to 15 percent cover at the four remaining sites (Figure 24). The single site where no exotic plants were detected was El Capitan West.

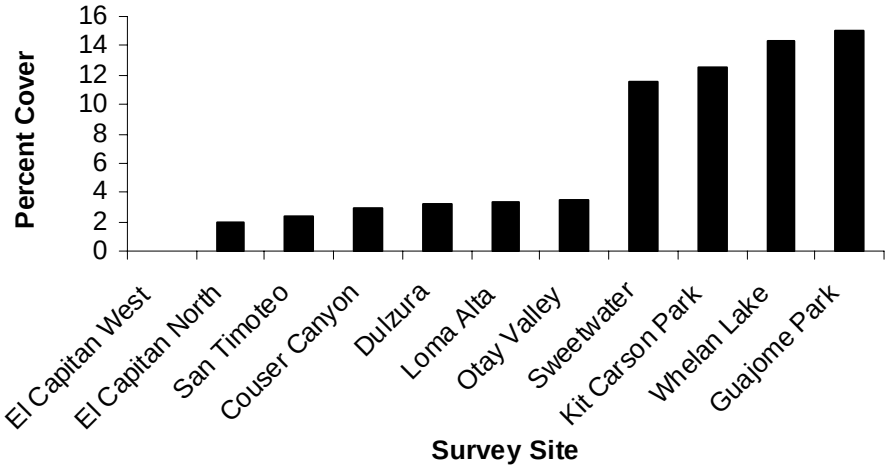

Figure 24. Percent cover of exotic vegetation within the 0-3 m height category at 11 survey sites in southern California.

The variability in spatial distribution of exotic plants between sites is further evident when examining the percent of transects and points at which exotic plants were detected. While on average 56 percent (n = 103, SD = 35.0) of all transects and 34 percent (n = 429, SD = 23.7) of all sampling points contained exotic vegetation, the actual number of transects and points possessing exotics within sites varied from 0 to 100 percent (Figure 25) and 0 to 74 percent (Figure 26) for transects and points, respectively. Exotic vegetation was encountered most frequently at Kit Carson Park and Whelan Lake, where it was considered a dominant component of the habitat in 100 percent of all transects and approximately 55 percent of all sampling points.

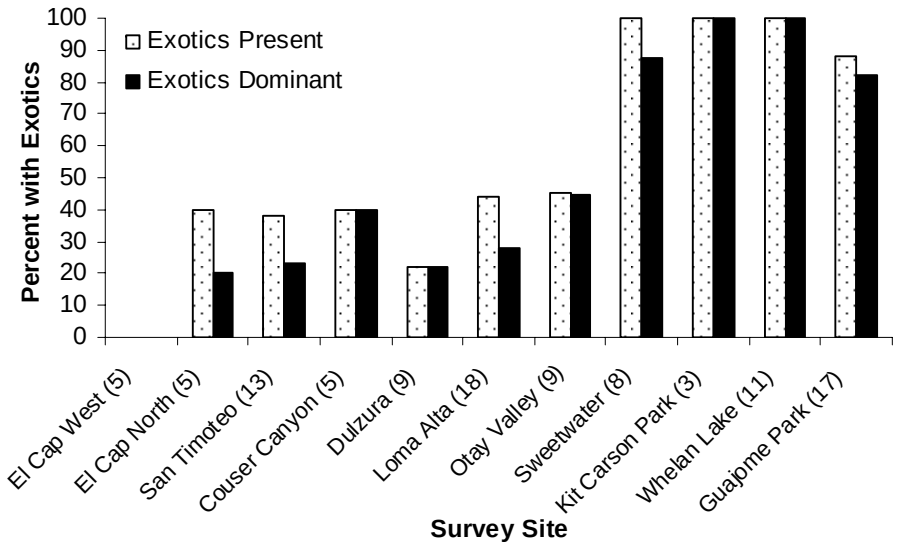

Figure 25. Percent of transects with exotic vegetation present, and as a dominant species, by site. Numbers inside parentheses are the number of transects at each site.

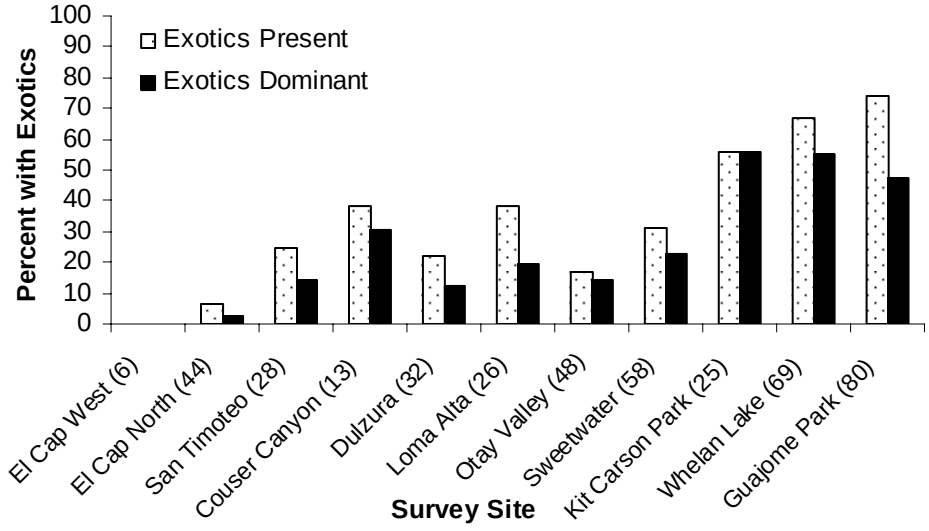

Figure 26. Percent of sampling points with exotic vegetation present, and as a dominant species, by site. Numbers inside parentheses are the number of sampling points at each site.

In most cases, exotic plants comprised between 1-10 percent of vegetation cover per transect (Figure 27). However, in some cases, notably at two sites where Willow Flycatchers were resident (Guajome Park and Whelan Lake), exotic plants comprised a greater percentage of the overall cover. At these sites, exotic vegetation was documented comprising cover within the 20 to 40 percent range for numerous transects.

The three sites with resident flycatchers, at which vegetation was sampled (Couser Canyon, Guajome Park, and Whelan Lake) also varied greatly in the amount and distribution of exotic vegetation present (Figures 23-26). Exotic vegetation was considered a dominant species in 40- 100 percent of transects and 31-55 percent of sampling points. Couser Canyon contained the smallest percentage of transects (40 percent) and sampling points (31 percent) with exotics, followed by Guajome Park (82 percent of transects and 48 percent of sampling points), and Whelan Lake (100 percent of transects and 55 percent of exotics). Exotic vegetation at occupied sites was dominated by giant reed and tamarisk, followed by poison hemlock and black mustard.

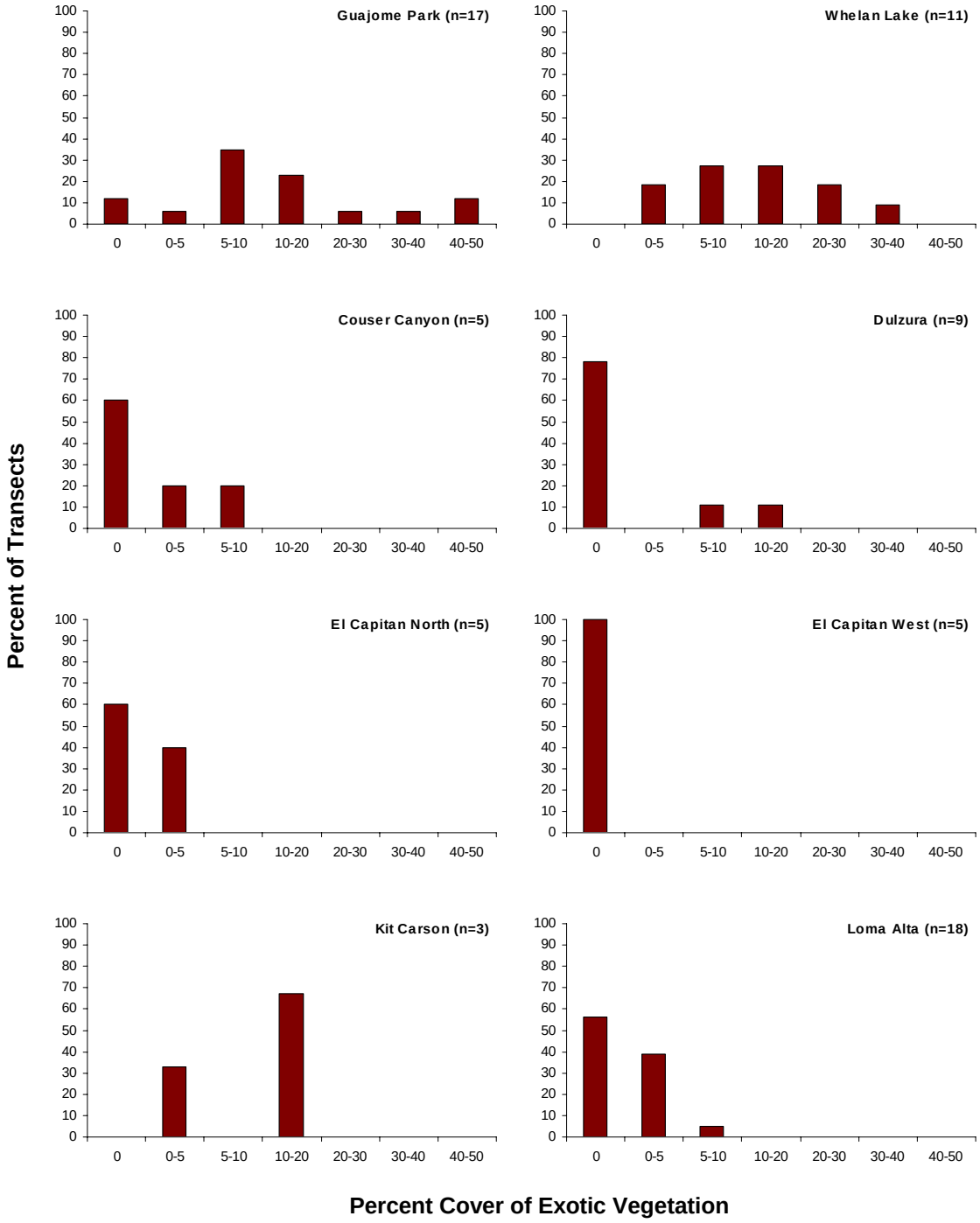

Figure 27. Percent of vegetation transects falling into seven exotic plant species cover classes at sites surveyed for Southwestern Willow Flycatchers in 2001.

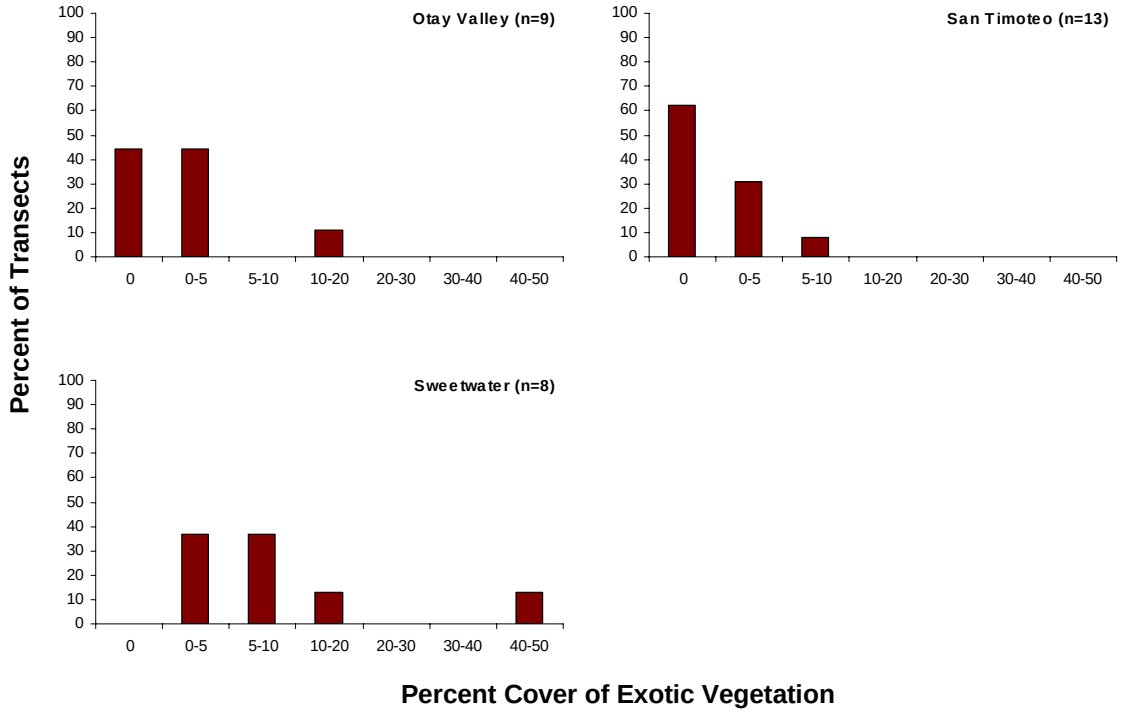

Figure 27 (continued). Percent of vegetation transects falling into seven exotic plant species cover classes at sites surveyed for Southwestern Willow Flycatchers in 2001.

DISCUSSION

Abundance and Distribution

In southern California, Southwestern Willow Flycatcher abundance remains low. Our surveys located 21 breeding pairs; combining this with the results of all other surveys conducted in California in 2001 suggests that approximately 146 Southwestern Willow Flycatcher pairs currently breed in California (USGS California Southwestern Willow Flycatcher Database). This represents an apparent doubling of the breeding population since the 1993 estimate of approximately 70 pairs (USFWS 1993). This increase has been extremely slow, indicating that recovery efforts, such as brown-headed cowbird (*Molothrus ater*) removal, have not been as

effective in mitigating stresses on flycatcher populations as they have for other species such as the least Bell's vireo (*Vireo bellii pusillus*) (Kus et al. 2003 and Whitfield et al. 1999).

In San Diego County, flycatcher abundance has shown a marked increase in the past four years, doubling from approximately 40 pairs in 1997 (Kus and Beck 1998) to 86 pairs in 2001. This could be considered a positive sign for flycatcher recovery within the county, possibly indicating a general improvement in riparian habitat quality countywide; however, the majority of this increase can be attributed to the two largest sites in the county, the Upper San Luis Rey River and Camp Pendleton. Over the past four years, the documented population on the Upper San Luis Rey has grown from 20 to approximately 41 pairs (W. Haas pers. comm.), while the flycatcher population on Camp Pendleton has increased from 10 to 18 pairs (Kus and Ferree 2002). Therefore, the growth in these two populations alone accounts for approximately two thirds of the entire countywide population increase (29 out of 46 pairs) since 1997. Moreover, the increase at the San Luis Rey River reflects, in part, an increase in survey effort and not necessarily actual flycatcher numbers.

The other notable site surveyed in San Diego County was El Capitan North. This was the only site at which flycatchers were documented where they had been absent previously (Table 7). This site is characterized by a mix of older, more mature riparian vegetation at the north end of the site, transitioning into patches of young emergent willow at closer proximity to the inflow of the San Diego River at El Capitan Reservoir. It was at this southerly portion that one of the pairs of flycatchers was documented and which we believe shows the most promise for supporting a larger flycatcher population. However, heavy cattle grazing was documented within riparian habitat in this area, which could possibly threaten the development of suitable Willow Flycatcher habitat.

Table 7. Willow Flycatcher abundance over multiple years for sites surveyed in this study[1].

Site	County	Year Surveyed	# Territories	# Pairs
Agaunga Valley	Riverside	1997	1	1
		2001	0	0
Chalk Bluff	Inyo	1993	5	0
		1998	3	2
		1999	15	5
		2001	21	11
Couser Canyon	San Diego	1998	2	2
		1999	2	2
		2000	1	1
		2001	2	2
El Capitan North	San Diego	1997	0	0
		2001	2	2
El Capitan West	San Diego	1997	0	0
		2001	0	0
Fallbrook	San Diego	1998	0	0
		1999	0	0
		2001	0	0
Guajome Park	San Diego	1996	2	2
		1999	1	0
		2000	1	1
		2001	4	2
Highway 6	Inyo	1993[2]	0	0
		1999	5	0
		2001[3]	1	0
Loma Alta	San Diego	1997	0	0
		2000[2]	0	0
		2001	0	0
Otay Valley	San Diego	1997	0	0
		2001	0	0
Poleta	Inyo	1993	5	0
		1999	7	6
		2001[4]	2	0
San Timoteo	Riverside	1997	0	0
		1998[5]	2	2
		1999[2]	3	0
		2000	2	0
		2001	0	0
Sweetwater	San Diego	1997	0	0
		1998	0	0
		1999	0	0
		2000	0	0
		2001	0	0
Whelan Lake	San Diego	2000	3	2
		2001	4	4

[1] Sources: Crook 1999, Famolaro 1999, Famolaro and Tikkanen 2000, Kus and Beck 1998, Laymon and Williams 2000, Wells and Turnbull 2000, and USGS Southwestern Willow Flycatcher California Database.
[2] Area surveyed was smaller than and was contained within the area surveyed in 2001
[3] Smaller area surveyed in 2001 than in previous years. In 1999 an additional 2 km section to the south was surveyed that contained two territorial flycatchers, and a 3 km section north of the 2001 boundary was also surveyed.
[4] Smaller area surveyed in 2001 than in previous years. In 1993 and 1999 an additional 3.3 km section to the north was survey. This section contained two and five additional flycatcher territories in 1993 and 1999, respectively.
[5] Exact survey boundaries unknown or not reported.

Outside of San Diego County, significant increases in flycatcher abundance have come from the Chalk Bluff population on the Owens River (Table 7). This population has increased from three to approximately 21 territories in the last three years, and is currently the second largest population in California. It is worth noting that the population estimate reported here for Chalk Bluff is a minimum number of flycatchers, as repeated protocol surveys were not performed and only a single visit was made to the site. The remaining two sites along the Owens River, Highway 6 and Poleta, appear to have lost flycatchers in recent years. However, this may be misleading as the amount of habitat surveyed and the survey effort was greater in 1999 than in 2001. In 1999, an additional 8 km of river, containing seven flycatcher territories, were surveyed that were not covered in 2001. Therefore, definitive statements concerning the population status for these two sites would be unwarranted at this time.

Habitat

Willow Flycatchers have been documented selecting for habitat possessing a relatively high foliage cover in the under- and mid-story from 0-5 m in height (Allison et al. 2003). This habitat characteristic describes the majority of the sites surveyed in this project, even though most did not contain resident birds. It is therefore likely that Willow Flycatchers are using a combination of habitat characteristics when selecting sites. For example, Allison et al. (2003) found that the presence or absence of particular plant species, such as tamarisk, black willow, and velvet mesquite (*Prosopis velutina*), were primary attributes separating nest sites from unoccupied habitat in Arizona. Similarly, Willow Flycatchers at our survey sites appear to be selecting for habitat with relatively high overall foliage cover from 0-6 m that is dominated by black, red, and/or arroyo willow.

An additional characteristic that flycatchers may be selecting for is the appropriate ratio of under-story cover (the vegetative cover between 0-3 m) to mid-story cover (the vegetative cover between 3-6 m). Although our sample size is small (n=3), the three sites containing flycatchers all possessed an under- to mid-story cover ratio very close to two, indicating that there was twice as much cover in the under-story as the mid-story. This differs from the eight unoccupied sites whose cover ratios ranged from 1.0 to 5.5.

These two characteristics, combined with minimal foliage cover from 3-6 m (2.8 – 4.8 percent at occupied sites), provide a good image of the kind of habitat Willow Flycatchers may be selecting for in southern California. The high percentage of willow cover from 0-6 m, an understory that is twice as dense as the mid-story, and the relatively low canopy cover reflect the presence of "younger" riparian habitat and is indicative of the mesic conditions that seem favorable to the formation of suitable flycatcher habitat.

A change in any one of these characteristics may therefore make a site less suitable for flycatchers. For example, a change in plant species composition away from an under- and mid-story dominated by red, arroyo, and black willows is indicative of more xeric or hydric conditions that may be less favorable to the formation of suitable flycatcher habitat. This appears to be the case at Kit Carson Park, El Capitan West, and the northern section of El Capitan North which all contain western sycamore and/or coast live oak, species that tend to be found at drier sites. The more xeric conditions at these sites are also reflected in their lower under-to-mid-story cover ratios (1.0 to 1.7), indicating greater vegetation cover in the mid-story compared to the understory. Conversely, Loma Alta and Otay Valley possess relatively high riparian cover from 0-6 m, but much of that cover is made up of plant species that prefer more hydric conditions such as cattail, sedge, and rush. These species tend to grow in denser patches

than are preferred by Willow Flycatchers, and this is reflected in their under-to-mid-story cover ratios of 4.4 and 5.5, respectively.

The prevalence and distribution of exotic vegetation varied considerably between survey sites. In general, exotic vegetation was widespread as it was found at over one third of the points sampled, and at 10 of 11 sites at which vegetation measurements were taken. However, the distribution and prevalence of particular exotic plant species varied according to the spatial scale under consideration. For example, at the site level, the most widespread species were tamarisk and black mustard, while the most frequently encountered species at sampling points were giant reed and tamarisk. What is undeniable is that numerous species of exotic plants have become established in southern Californian riparian areas, and can presently be found within limited reaches of most drainages, if not throughout their entirety.

The prevalence of exotic species in riparian systems has generated much debate in the context of exotic species removal and habitat restoration as a management tool for fostering Willow Flycatcher recovery (USFWS 2002). However, when this discussion is framed around the short-term needs of Southwestern Willow Flycatchers, it is not always clear which direction should be taken. This becomes apparent when considering that exotic plants were encountered most frequently, and at their highest cover values, at two of the sites containing resident Willow Flycatchers. At these sites, the dominant exotic species were giant reed, tamarisk and poison hemlock. This is not surprising as these plant species have been documented as components of flycatcher habitat elsewhere (Allison et al. 2003 , Kus and Ferree 2002, Kus and Kenwood 2003, Sogge et al. 2003, Stoleson and Finch 2003). What is unclear is how, or if, these species affect flycatcher nest success and productivity. It is therefore essential that flycatcher nest success and

productivity are investigated in the presence of exotic species prior to conducting widespread removal of exotics in potential Willow Flycatcher habitat.

Population Structure

If the Southwestern Willow Flycatcher is to be recovered, it is imperative that we understand the structure of its existing populations. Currently, the distribution of flycatchers in southern California is characterized by a small number of "large" sites and numerous small populations. This can be seen from the 2001 survey data where 52 percent of all breeding pairs were found at four sites: the Upper San Luis Rey (41 pairs, W. Haas pers.comm.), Camp Pendleton (18 pairs, Kus and Ferree 2002), the Kern River Preserve (11 pairs, Whitfield 2002), and Chalk Bluff (11 pairs). Of the remaining forty-two sites supporting resident Willow Flycatchers, only two possessed more than four territories (Mojave River (six territories) and Prado Basin (seven territories)) (mean population size excluding the four largest sites = 2.2 territories, SD = 1.5, n= 42, USGS California Southwestern Willow Flycatcher Database). This pattern is repeated at a smaller scale in San Diego County, with Camp Pendleton and the Upper San Luis Rey River acting as larger sites, and nine other smaller "satellite" sites (mean number territories/site = 2.1, SD = 1.2, n= 9) scattered throughout the county.

Whether these sites function as a meta-population or are dominated by source-sink dynamics is unclear, but has management implications. For example, if the regional population functions under source-sink dynamics, where larger populations produce a surplus of individuals that subsequently colonize sink habitats which don't contribute to population growth, then management efforts would be most effective by focusing limited resources on the few large remaining populations. However, under a meta-population model, individuals in small

populations can successfully produce young that colonize additional suitable habitat. Under this scenario, all breeding sites become important to the regional persistence of the species and management actions could differ greatly.

To determine which population model best describes Willow Flycatcher distribution, greater banding and nest monitoring is required than is presently in place. It is essential that intensive banding and nest monitoring studies be conducted throughout the continuum of flycatcher population sizes, over a large geographic area. Currently, most monitoring and banding studies occur within the largest flycatcher populations. This is useful, but by itself inadequate, as it is only through the collection of demographic data on dispersal and site-specific productivity at sites across the continuum of population sizes that we will be able to answer this important management question.

RECOMMENDATIONS

The findings of this study, and our interpretation of them in light of our previous research, lead us to the following recommendations:

1. Statewide surveys for Southwestern Willow Flycatchers should be conducted every five years to obtain a regular estimate of the species' distribution and population size throughout California.

2. Long-term nest monitoring and banding studies should be continued and expanded to generate basic demographic data for populations of varying sizes in southern California.

3. Research on the productivity, turnover, and persistence capabilities of small populations should be conducted to identify the processes involved in regional population maintenance and range expansion. Research should focus on the relative contributions of dispersal and recruitment to the establishment of new populations.

4. Research to determine how, or if, the presence of exotic vegetation in riparian systems affects flycatcher nest success and productivity should be conducted prior to the implementation of widespread removal projects within potential Willow Flycatcher habitat.

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PERSONAL COMMUNICATIONS

Haas, W. Varanus Biological Services, 7920 Silverton Ave. Suite D, San Diego, CA 92126.

Appendix 1. Willow Flycatcher Survey Form (page 1)

Site Name_____Total Site No _____
Was site surveyed in previous year? Yes No Drainage _____
If yes, what site name was used? _____

County _____ State_____ USGS Quad Name _____

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? Yes No
Site Coordinates: Start: N_____ E_____ UTM
Stop: N_____ E_____ UTM Datum/Zone ___
Elevation _____ feet / meters (circle one)

***** Fill in additional site information on back of this page *****

Survey # Observer(s)	Date (m/d/y) Survey time	Number of WIFLs Found	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N	Cowbirds Detected? Y or N	Presence of Livestock, Recent sign Y or N	Comments about this survey (e.g., evidence of pairs or breeding, number of nests, nest contents or number of fledges seen; potential threats)
_____ _____	Date start stop total hrs _____							
_____ _____	Date Start Stop total hrs _____							
_____ _____	Date Start Stop total hrs _____							
_____ _____	Date start stop total hrs _____							

Overall Site Summary (Total only resident WIFLs) Total survey hrs_____	Adults	Pairs	Territories	Nests	Were any WIFLs color-banded? Yes No If yes, report color combination(s) in the comments section on back of form

Name of Reporting Individual _____ Date Report Completed _____

Submit the original of this form. Retain a copy for your records.

Appendix 1. Willow Flycatcher Survey Form (page 2)

Fill in the following information completely. Submit original form. Retain copy for your records.

Name of Reporting Individual _____Phone # _____

Affiliation _____ Email _____

Site Name_____
Did you verify that this site name is consistent with that used in previous years? Yes No ? (circle one)

Management Authority for Survey Area (circle one): Federal Municipal/County State Tribal Private

Name of Management Entity or Owner (e.g., Tonto National Forest) _____

Length of area surveyed: _____ (specify units, e.g., miles = mi, kilometers = km, meters = m)

Did you survey the same general area during each visit to this site this year? Yes / No If no, summarize in comments below.

If site was surveyed last year, did you survey the same general area this year? Yes / No If no, summarize in comments below.

Vegetation Characteristics: Overall, are the species in tree/shrub layer at this site comprised predominantly of (check one):

___ Native broadleaf plants (entirely or almost entirely, includes high-elevation willow)

___ Mixed native and exotic plants (mostly native)

___ Mixed native and exotic plants (mostly exotic)

___ Exotic/introduced plants (entirely or almost entirely)

Identify the 2-3 predominant tree/shrub species: _____

Average height of canopy: _____ (specify units)

Was surface water or saturated soil present at or adjacent to site? Yes No (circle one)
Distance from the site to surface water or saturated soil: _____ (specify units)

Did hydrological conditions change significantly among visits (did the site flood or dry out)? Yes No (circle one)
If yes, describe in comments section below.

Remember to attach a xerox copy of a USGS quad/topographical map (REQUIRED) of the survey area, noting the survey site and location of WIFL detections. You may also include a sketch or aerial photograph showing details of site location, patch shape, survey route in relation to patch, and location of any Willow Flycatchers or Willow Flycatcher nests detected. Such sketches or photographs are welcomed, but DO NOT substitute for the required USGS quad map.

Comments (attach additional sheets if necessary): _____

Appendix 2. Willow Flycatcher Detection Form

Drainage:	**Section:**		Page _____ of _____
Date:		**Start Time:**	**End Time:**
Observer(s):	**GPS Coordinates:**	**Temp.**	**Temp.**
	Start	**Cloud cover (%)**	**Cloud cover (%)**
	End	**Wind**	**Wind**

Comments:

ID/Map Code	Time	Habitat Type	Dominant Species	Exotic Species Composition	Dominant Exotic Species	Habitat Quality	Dist. To H_2O (m)	Status	Sex	Age	Banded?	GPS Coordinates

Comments:

ID/Map Code	Time	Habitat Type	Dominant Species	Exotic Species Composition	Dominant Exotic Species	Habitat Quality	Dist. To H_2O (m)	Status	Sex	Age	Banded?	GPS Coordinates

Comments:

ID/Map Code	Time	Habitat Type	Dominant Species	Exotic Species Composition	Dominant Exotic Species	Habitat Quality	Dist. To H_2O (m)	Status	Sex	Age	Banded?	GPS Coordinates

Comments:

Exotic Species Composition

1 = <5% 3 = 50-95%

2 = 5-50% 4 = >95%

Habitat Quality

P = Poor N/A = Not Applicable

M = Moderate UNK = Unknown

G = Good R = Restored

**Attach a topographic map of area surveyed with the survey area delineated.

Appendix 3. Willow Flycatcher Vegetation Characterization Form and Instructions (Transect)

Page _____ of _____

Willow Flycatcher Vegetation Characterization Form (Transect)

Observer:_____ Date:_____ Drainage:_____ Segment:_____

Time:_____ Temp:_____ Cloud Cover:_____ Wind:____ Transect #:_____

GPS start: N_____, W_____. GPS stop: N_____, W_____.

Riparian width (m):	< 10		10 – 50		50 - 250		> 250		
Adjacent habitat N or W:	RES	COM	IND	REC	AG	GRAS	CSS	CHP	OW
Adjacent habitat S or E:	RES	COM	IND	REC	AG	GRAS	CSS	CHP	OW
Upland Grazed?: Yes No Unknown					Riparian Grazed?: Yes No Unknown				
H2O (FLowing, STanding, SAturated soil, DRy):					Current Conditions- ____,		Early breeding season- _____.		

List any type of disturbance within the segment of habitat leading up to this transect: _____

_____

Cover Categories: 0 = 0, 1 = 1-10%, 2 = 11-25%, 3 = 26-50%, 4 = 51-75%, 5 = 76-90%, 6 >90%

Vegetation composition and cover

0-3 m Height Interval		3-6 m Height Interval		> 6 m Height Interval	
	% Cover		% Cover		% Cover
Overall Foliage Cover:		Overall Foliage Cover:		Overall Foliage Cover:	
Species 1:		Species 1:		Species 1:	
Species 2:		Species 2:		Species 2:	
Species 3:		Species 3:		Species 3:	
All Other:		All Other:		All Other:	
Exotics:		Exotics:		Exotics:	
GPS Coordinates: N			W		

0-3 m Height Interval		3-6 m Height Interval		> 6 m Height Interval	
	% Cover		% Cover		% Cover
Overall Foliage Cover:		Overall Foliage Cover:		Overall Foliage Cover:	
Species 1:		Species 1:		Species 1:	
Species 2:		Species 2:		Species 2:	
Species 3:		Species 3:		Species 3:	
All Other:		All Other:		All Other:	
Exotics:		Exotics:		Exotics:	
GPS Coordinates: N			W		

Instructions and Data Dictionary for Data Collection using the WIFL Veg Characterization Form

Observer: Name of individual collecting the data.

Date: Date vegetation survey was performed.

Drainage: River on which transect was located.

Segment: Reach of river encompassing transect.

Time: Time transect was started.

Temp: Temperature at the start of data collection.

Cloud cover: Percent cloud cover at start of data collection.

Wind: Wind speed at start of data collection as judged using the Beaufort scale.

Transect #: You will be characterizing vegetation along transects perpendicular to the river channel. The first transect along a river should be labeled "1", all subsequent transects should be labeled sequentially (2, 3, 4, etc.). Transects should be shaped 0.5 km apart.

Sampling points: Sampling points should be spaced 30 m apart along each transect.

GPS Start: GPS coordinates of the start point for an individual transect.

GPS Stop: GPS coordinates of the end point for an individual transect.

Riparian Width (m): The cross-sectional width in m of the river at the transect. Circle the appropriate width provided (e.g. <10, 10-50, 50-250, >250).

Adjacent Habitat N or W: Circle the appropriate land use of the adjacent habitat North or West of the river at each transect (RES = residential, COM = commercial, IND = industrial, REC = recreational [i.e. golf course, etc.], AG = agricultural, GRAS = grassland, CSS = coastal sage scrub, CHP = chaparral, OW = oak woodland).

Adjacent Habitat S or E: Circle the appropriate land use of the adjacent habitat South or East of the river at each transect. For a key to the land uses, see above definition for Adjacent Habitat N or W.

Upland Grazed?: If the uplands adjacent to the riparian area are grazed by livestock, circle "Yes", if the area is free of grazing circle "No", if you are unsure circle "Unknown".

Riparian Grazed?: If the riparian habitat that the transect bisects is grazed by livestock circle "Yes", if the area is free of grazing circle "No", if you are unsure circle "Unknown".

H2O (FLowing, STanding, SAturated soil, DRy): In this field indicate the hydrologic conditions of the channel where it crosses the transect, both currently and previously (i.e. at the start of the breeding season). Use the codes provided (FL = flowing water, ST = standing water, SA = saturated soil, DR = dry).

List any type of disturbance within the segment of habitat leading up to this transect: This field provides opportunity for you to list disturbances within or adjacent to the riparian area that would otherwise go unrecorded. As you are walking from one transect to another, evaluate the habitat and record any disturbances in the space provided. Examples of disturbances are a sand and gravel mining operation in the stream bed or the construction of a housing development adjacent to the riparian area.

Vegetation composition and cover: For each of the three height intervals (0-3 m, 3-6 m, and > 6 m) visually estimate vegetative cover within a 5-meter radius of each sampling point.

Overall Foliage Cover: The percent of area within each of the height intervals that is comprised of live foliage, lumping all plant species together. Within each height interval, visually estimate how much of the area is occupied by live foliage. Select the appropriate cover category (i.e. 0-6) and record it under "% Cover".

Species 1: The plant species whose foliage comprises most of the occupied area within a specific height interval. Record the species name in the space provided and an estimate of what percent of the total foliage it comprises.

Species 2: The second most abundant plant species within a specific height interval. Record the species name in the space provided and an estimate of what percent of the total foliage it comprises.

Species 3: The third most abundant plant species within a specific height interval. Record the species name in the space provided and an estimate of what percent of the total foliage it comprises.

All other: The percentage of the Overall Foliage Cover estimate within each height interval that is comprised of live foliage from plants other than those identified in Species 1-3.

Exotics: List all exotic plants present in each height interval. Record each species present and estimate their collective percent cover.

Determining Species 1–3 and Estimating % Cover: In the spaces next to Species 1, Species 2, and Species 3, under "% Cover", record an estimate of how much of the Overall Foliage Cover each species comprises. For example, if you have estimated that 50% of the area between the 0-3 m height interval is comprised of foliage, your next step would be to determine the three dominant plants species within that interval. If you determine that willow, mulefat, and giant reed are the three dominant plants you would record these to the right of "Species 1", "Species 2" and "Species 3", respectively. The next step would be to determine what percentage of the overall 50% cover estimate each of those species comprises. If you judged the existing foliage to be comprised of 70% willow (cover class 4), 20% mulefat (cover class 2) and 5% giant reed (cover class 1) you would record each of those values under "% Cover" for the respective species. The remaining 5% (cover class 1) of foliage would then be accounted for under the "All Other" category.

The final step in completing the vegetation composition and cover estimation for an individual point, at a specific height interval, is to determine the percentage of exotic foliage within a height interval. In the space provided, list all exotic plants and estimate their total percent cover for each height interval.

This estimation procedure should be followed for all three height categories at each sampling point.