

WILDLIFE MONITORING OF A RIPARIAN MITIGATION SITE¹

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Abstract: In December, 1986, nearly 4,000 riparian trees and shrubs were planted on 4 acres of floodplain land adjacent to Coyote Creek in Santa Clara County, California. To document changes in wildlife habitat characteristics of the revegetation area and surrounding habitats, an intensive wildlife monitoring program was established. Techniques employed included variable radius circular plot sampling for birds and mammals, live-trapping of small mammals, reptiles and amphibians, breeding bird censuses and mist netting of birds along established transect lines. This monitoring program is a joint effort involving a non-profit research organization, a private environmental consulting firm and the local project sponsor. This paper presents a description of these monitoring techniques and summarizes some findings to date.

Proposed flood control improvements along the lower reaches of Coyote Creek, Santa Clara County, will require the permanent loss of 5.6 acres of riparian vegetation and one major break in the riparian corridor (U.S. Army Corps of Engineers 1987). To determine the extent of mitigation required for this loss, the U.S. Fish and Wildlife Service conducted a Habitat Evaluation Procedure (HEP) analysis of the project. As a result of this analysis, the local project sponsor (Santa Clara Valley Water District) proposed to create and maintain mid- and upper terrace riparian habitat on 32.5 acres within the project area (Miller 1986).

Since most prior riparian planting projects were conducted in areas with different climatic conditions, plant species compositions and flow regimes, a pilot study was initiated by the local project sponsor to evaluate various plant materials, propagation methods and irrigation techniques. A more detailed description of planting methodology is presented by Stanley and others (1989). The U.S. Fish and Wildlife Service in its Fish and Wildlife Coordination Act Report (1986) also recommended that wildlife use of at least one riparian revegetation site be monitored for a minimum of 10 years after initial planting and then monitored at year 15 and every 10 years thereafter for the life of the project (100 years).

In December, 1986 Harvey and Stanley Associates, Inc. (acting as contractors for the Santa Clara Valley

Water District) cleared and planted the 4.4-acre pilot study site with over 4,000 riparian trees and shrubs.

Study Site

Located adjacent to and within the floodplain of Coyote Creek, the area being monitored includes the 4.4 Pilot Revegetation Study Site, the adjacent future overflow channel (approximately 7 acres) and a 2 acres portion of the existing riparian corridor (fig. 1). Operational headquarters for the Coyote Creek Riparian Station are located adjacent to the overflow channel and a future 7.9-acre riparian restoration site.

The Pilot Revegetation Site currently supports 14 species of planted trees and shrubs. Many native and introduced annual and perennial herbs and grasses occur within the study area. The northern half of the site is sprinkler irrigated while the southern portion is flood irrigated. A complete description of the revegetation project and plant monitoring protocol is provided by Stanley and others (1989).

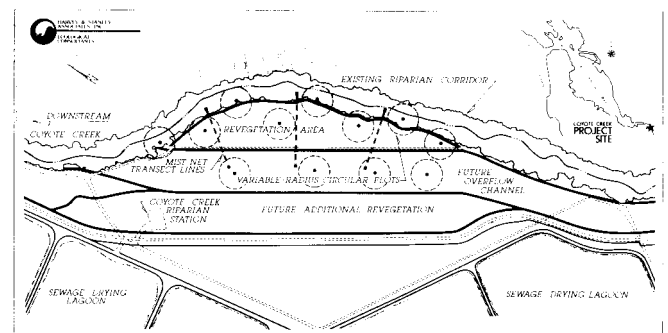


Figure 1— Coyote Creek riparian revegetation study site.

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The future overflow channel is comprised primarily of annual and perennial herbs, grasses and shrubs with remnant cultivated species such as pear (*Pyrus* sp.) and Beefwood (*Casuarina cunninghamiana*). Future flood control plans call for removal of all woody vegetation 3" DBH or greater and maintenance of the ruderal characteristics of the site.

The existing riparian corridor is composed mainly of 30-70 year old Fremont cottonwoods (*Populus Fremonti*), California black walnut (*Juglans hindsii*), red and yellow willow (*Salix laevigata* and *S. lasiandra*), blue elderberry (*Sambucus mexicanus*) box elder (*Acer negundo*), live oak (*Quercus agrifolia*), tree tobacco (*Nicotiana glauca*) and weeping willow (*Salix babylonica*). An understory of giant reed (*Arundo donax*) and blackberry (*Rubus* sp.) is dominant in many areas.

Monitoring Methods

In 1982 a modest bird-banding program was begun by the Avian Biology Laboratory of San Jose State University. The banding program was more intensified in 1984 and incorporated into the newly formed San Francisco Bay Bird Observatory. The Coyote Creek Riparian Station (CCRS) was established in 1986 and the banding program was transferred to this non-profit research organization. It now operates on a near daily basis using 40-50 volunteers.

As plans progressed on the flood control project, it became apparent that wildlife monitoring of the Pilot Revegetation Site would be an integral part of the overall assessment of the success of the mitigations.

General Methodology

Riparian revegetation projects are relatively new and untested. As a consequence, a multi-faceted monitoring approach was deemed the most suitable. The monitoring program, instituted in the summer of 1987, became a joint effort between the sponsoring agency (The Santa Clara Valley Water District) the sponsoring agency's prime ecological consulting firm (Harvey and Stanley Associates) and the Coyote Creek Riparian Station.

In order to make use of the baseline information already derived from CCRS's program a banding component was incorporated into the monitoring methodology. In addition to the bird banding program, variable-radius circular plots were established in each of the three habitats (the revegetation plot, the overflow channel and the existing riparian corridor) to assess terrestrial vertebrate (primarily avian) use. During the breeding season

breeding bird censuses were conducted monthly. Regular mammal trapping (mark-release) sessions were also instituted on a quarterly basis. Censusing of herptile populations occurred in the spring and summer.

Mist-net Transects

Three transects were established perpendicular to Coyote Creek. Each transect extends from creekside through the revegetation study plot and into the future overflow channel. transects contained 8 or 9, 4-panel, 36 millimeter stretched mesh, black mist nets 12 meters long. When opened these nets extend from 0.15 meters above ground to a height of 2.15 meters. Individual net numbers identify the habitat in which each net is positioned.

Birds captured in each individually numbered net were marked with serially numbered bands issued by the U.S. Bird Banding Laboratory. During the banding process, mensural data were gathered. The age, sex, weight and reproductive or migratory status of each bird was also recorded. In addition, the numbered net in which the bird was captured was noted. On this project, nets were operated from dawn to about 11 a.m. on Wednesday of each week.

Variable-Radius Circular Plot Census

Thirteen permanent variable radius circular plots were established (four each in the revegetation study plot, the future overflow channel, and 5 in the existing riparian corridor) in Fall, 1987. Sampling protocol follows that suggested by Reynolds (1980) and DeSante (1986). During a 10-minute period, the observer records each bird or other vertebrate observed, its distance from the center point of the plot, its position in vegetation and its activity. Care is taken to avoid making repeated observations of a single individual. Birds flying over the plot are recorded if the overflight bears a relationship to the plot (e.g. aerial foraging).

Breeding Bird Census

In each of the months from March through July, breeding bird counts were conducted within hectare grids in each of the three study habitats. Censuses were conducted from dawn to approximately 11 a.m. During each census the number of territorial males (or breeding females if males were not observed) of each species were recorded. For species with three or more territories within a grid, the number of breeding pairs was calculated.

Mammal, Reptile and Amphibian Sampling

Beginning in the fall 1987, quarterly mammal trapping was instituted. Using Sherman live traps set in ten

meter grids established along existing vegetation monitoring transects, each of the three study habitats was sampled. Approximately 100 traps were run on 4 to 5 consecutive nights within each grid. All animals were ear-tagged, weighed, sexed, examined for reproductive condition, general health, and released.

Drift fences and funnel traps were used to sample amphibian and reptile presence and abundance within each of the three areas. Drift fences were 100 feet long and set in a crossed configuration (Campbell and Christman 1982) with pitfall traps located at the center and at each end. Six sets of funnel traps were used, two each in the three areas.

Vegetation Sampling

In order to correlate changes in species composition, density and other wildlife population trends with changes in vegetation, the structure of the plant communities in the three study areas is being characterized. Data are being gathered on relative cover and species composition of herbaceous growth, canopy height, foliage height and diversity (MacArthur and MacArthur 1961) and horizontal patchiness (Anderson and others 1978) for each of the 13 variable-radius circular plots. At present, only one vegetation survey has been conducted and thus no comparative data are available.

Results

Because this is the first year of the wildlife monitoring program our findings can only be represented by general comparisons of data among the habitat types.

Net Transects

Numbers of birds captured per 100 net-hours (1 net-hour = 1-12 meter long net operated for 1 hour) remained relatively constant month to month in the existing riparian corridor (fig. 2). This contrasts sharply with the highly variable numbers of birds captured per 100 net-hours in the proposed overflow channel and in the revegetation area. House Finches (*Carpodacus mexicanus*) accounted for most of the captures in the revegetation area and the overflow channel, usually about 75 percent, when numbers were high. House Finches as well as Lesser Goldfinches (*Carduelis psaltria*) and American Goldfinches (*Carduelis tristis*) were apparently attracted by the abundant weed seeds available along the border between revegetation plot and the overflow channel.

Species variability among the different areas (expressed as cumulative numbers of bird species captured each month of transect operation) remained relatively

constant through the winter months (fig. 3). The higher values recorded in September and October likely reflect movement of migratory populations.

In terms of feeding guild representation, encounters with granivorous species (seed eating) were about twice as frequent as encounters with insectivorous species. A measure of this variability may be seen in fig. 4. Although we are only beginning to measure habitat variables such as foliage diversity and canopy stratification, it is apparent that the granivorous species were attracted by the prolific growth of herbaceous plants in the overflow channel and the revegetation plot. As the revegetation area matures and the existing riparian corridor achieves greater understory growth the ratio of insectivorous to granivorous species may well change.

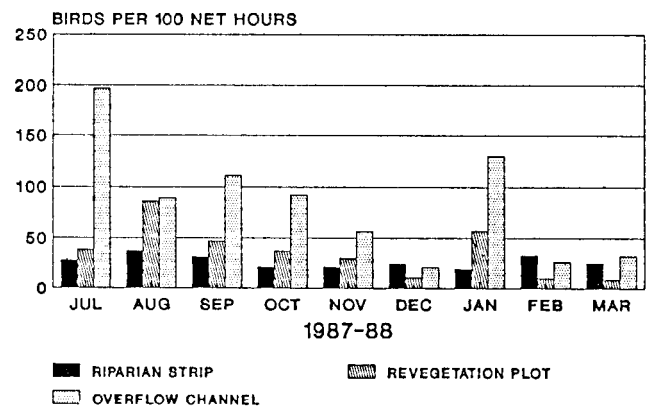


Figure 2— Birds captured per 100 net hours in three mist net transects.

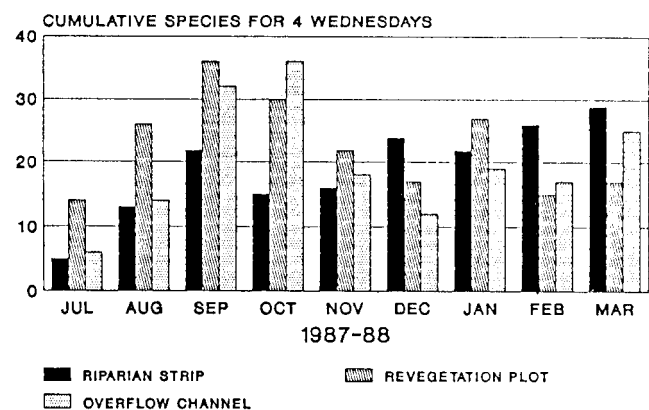


Figure 3— Cumulative numbers of bird species captured in mist net transects within each study area.

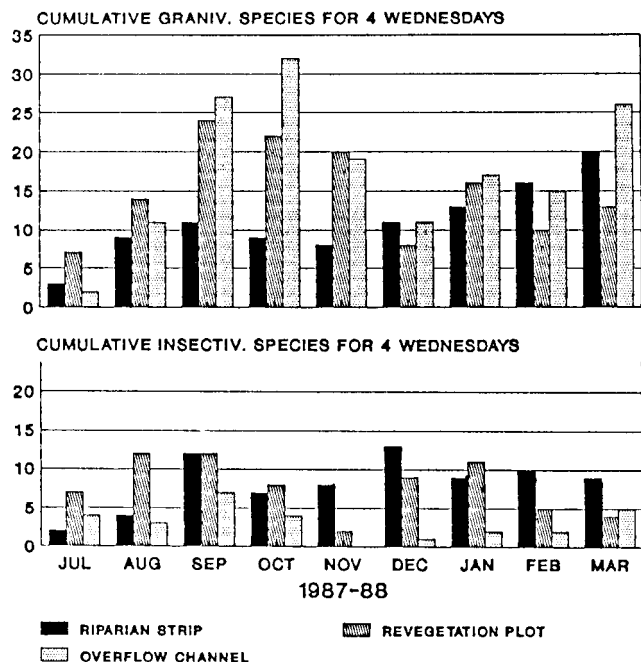


Figure 4— Cumulative numbers of granivorous and insectivorous bird species captured during mist net transect operation.

Variable-Radius Circular Plots

Numbers of birds observed per census increased sharply in the riparian corridor in January and February and in the revegetation area in January (fig. 5). These increases were due to large flocks of House Finches using the large cottonwoods for roosting cover between feeding forays into the revegetation and overflow channel areas. For 6 of the 7 months censuses were conducted, numbers of birds were smallest in the revegetation area.

Census plots within the riparian corridor contained the highest species diversity in all months (fig. 6). In part, the higher species variability in this area is due to the presence of water birds (e.g. Belted Kingfisher (*Ceryle alcyon*), American Coot (*Fulica americana*), Pied-billed Grebe (*Podilymbus podiceps*), etc.). These species are not usually expected in the other two habitats.

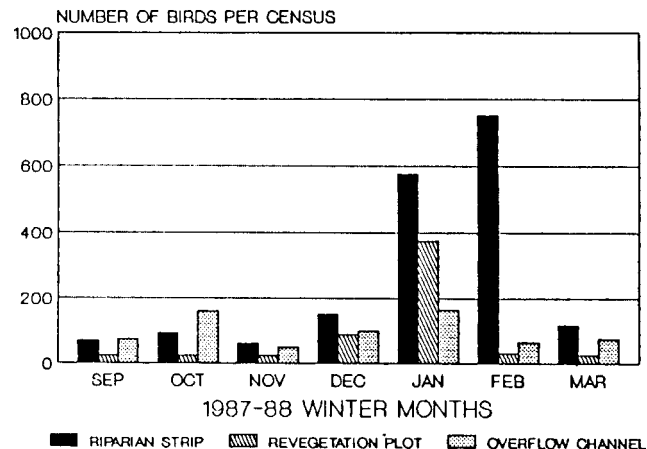


Figure 5— Numbers of birds encountered during variable-radius circular plot censuses.

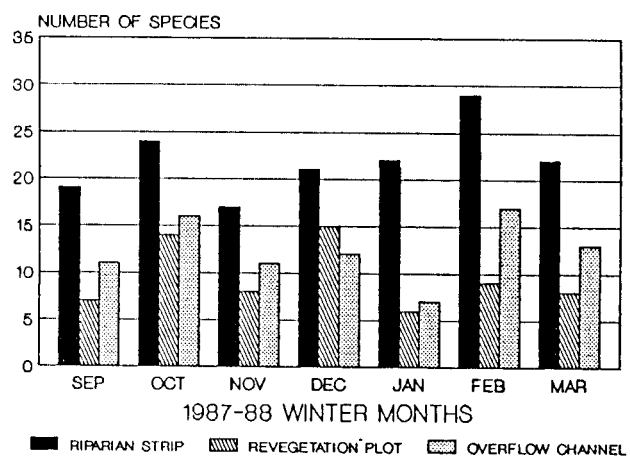


Figure 6— Numbers of bird species encountered on variable-radius circular plot censuses.

Mammal Surveys

One hundred Sherman "live traps" were run 5 nights in each of the three areas in November-December, 1987 and late February-early March, 1988. Numbers of mammals captured and species composition, considered by area, differed substantially between the two trapping sessions (table 1). Most notable were the differences between the two sessions in captures within the revegetation area of house mice (*Mus musculus*). A similar decline (90%) in capture rates was evident for the Western Harvest Mouse (*Reithrodontomys megalotis*). These dramatic differences may be the result natural seasonal succession augmented by irrigation procedures and weed control in the revegetation area.

Breeding Bird Census

The first breeding bird census was conducted in the latter part of March. Census procedures follow those suggested by Van Velzen (1972). In this first year, species found nesting in the three test plots included: Song Sparrow (*Melospiza melodia*) and Common Bushtit (*Psaltirparus minimus*), Tree Swallow (*Tachycineta bicolor*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Yellowthroat (*Geothlypis trichasi* and Brown-headed Cowbird (*Molothrus ater*). Although there were singing or displaying males of other species (e.g., Ring-necked Pheasant and House Finch), there was no confirmation of nesting in the study areas.

Table 1 – Mammals captured and recaptured in Sherman traps Nov-Dec 1987 and Feb-Mar 1988.

Group	Riparian strip		Revegetation plot		Overflow channel	
	No-De	Fe-Ma	No-De	Fe-Ma	No-De	Fe-Ma
Nights of trapping	5	5	5	5	5	5
Trap nights	500	500	500	500	500	500
<i>House Mouse</i>						
Number tagged	3	0	30	4	28	43
Recaptures	0	0	25	3	28	49
<i>Harvest Mouse</i>						
Number tagged	9	3	18	2	11	12
Recaptures	11	1	15	2	8	6
<i>California Vole</i>						
Number tagged	0	1	5	3	0	10
Recaptures	0	0	0	0	0	10
<i>Deer Mouse</i>						
Number tagged	2	0	1	0	0	0
Recaptures	8	0	1	0	0	0
<i>Norway Rat</i>						
Number tagged	2	0	0	0	0	0
Recaptures	0	0	0	0	0	0

Information available for March on paired, singing or displaying males and the number hectares (out of 16 for the three habitat study areas) occupied is summarized below:

Species	Singing males (pairs)	Hectares occupied
Song Sparrow	39	14 of 16
Red-winged Blackbird	31	8 of 16
Common Yellowthroat	6	6 of 16
Ring-necked Pheasant	6	5 of 16
Common Bushtit	3	3 of 16
House Finch	5	3 of 16
Black-shouldered Kite	2	2 of 16
Northern Harrier	1	1 of 16

Reptile and Amphibian Surveys

To date, one reptile and amphibian trapping session has been conducted which was largely unsuccessful. Another trapping attempt is scheduled to be conducted in September, 1988 with a modified trapping array and additional pitfall traps. Anecdotal and incidental observations have provided us with sightings of 2 species of lizards and 3 species of snakes, 3 species of amphibians and 2 species of turtles (including the first Santa Clara County record for the spiny softshell (*Apalone spiniferus*)).

Discussion

A first year of wildlife monitoring activities has provided us with baseline information on relative species abundance and diversity. Future work, in the years to come will provide comparative data on wildlife population trends as habitats change.

We have also found that an important role in long-term monitoring programs can be played by volunteer organizations such as the Coyote Creek Riparian Station. The large amount of time which is necessary to provide a comprehensive monitoring program may be prohibitive on many revegetation projects if all field work is conducted by paid staff. Coordination and quality control is essential and best handled by paid professional biologists.

In choosing to include a bird-banding component in our monitoring program, we understood the labor intensity of such techniques. We felt, however, that the information gained on an individual organism's use of the different study areas would be important enough to warrant such expenditures of time. The inclusion of the volunteer organization made it economically feasible.

Future analyses will focus on quantitative relationships between vegetational characteristics in the three study areas and species abundance and diversity. We hope thorough examination of bird capture and recapture data will yield a detailed picture of the use pattern of mature and developing riparian habitats.

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