ENTRIX

MEMORANDUM

TO: Tom Keegan

FROM: Shawn Chase **DATE:** February 18, 1994

SUBJECT: Results of Fish Sampling at 10, 5 and 1 cfs Sept thru Nov, 1993

INTRODUCTION

The TAC initiated this study to monitor the fish community in the Santa Ynez River at three streamflow releases, 10, 5 and 1 cfs. The specific objectives of the study were to:

- determine if juvenile steelhead were present in the Santa Ynez River below Bradbury Dam.
- evaluate the fish community in the river at streamflow releases of 10, 5 and 1 cfs
- evaluate aquatic habitat at the three streamflow releases

The study reach extended from the stilling basin below Bradbury Dam downstream to the Highway 154 bridge. The stream was divided into four segments, which were further divided into 23 discrete sampling units as directed by the TAC (Figure 1). The survey was conducted in this reach of the river because the TAC believed that it supported the best fish habitat (particularly for steelhead) in the lower river.

Segment 1 consisted of the entire length of river from the stilling basin through the Long Pond. Segment 1 was divided into four sampling sites, two riffles and two pools. All or part of the four sites were sampled by electrofishing, and both pools were surveyed by snorkel.

Segment 2 consisted of the first riffle and run habitats downstream of the Long Pond. Both sites were surveyed by electrofishing. No suitable snorkel sites were found in Segment 2.

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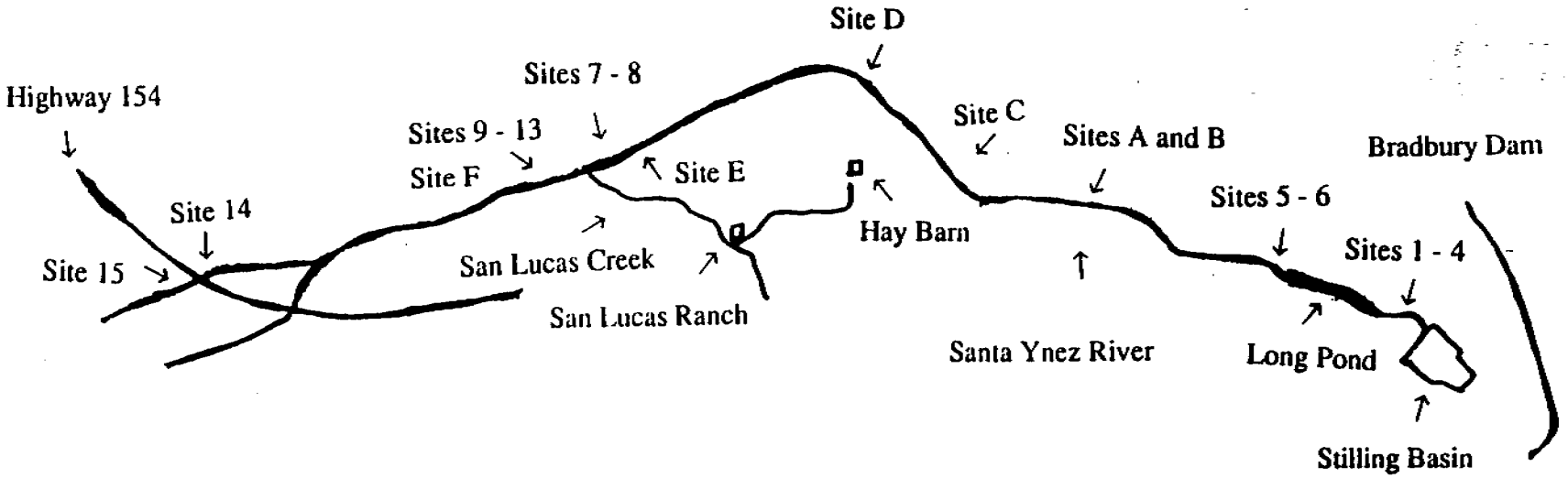

Figure 1. **Electrofishing and snorkel sites surveyed by the Santa Ynez River Technical Advisory Committee between September and November, 1993.**

Segment 3 spanned the river above and below San Lucas Creek. Seven habitat units were sampled by electrofishing in Segment 3, including three riffles, two runs and two pools. In addition, eight sites in Segment 3 were surveyed by snorkel (including Site 8 which was sampled by both snorkel and electrofishing).

Segment 4 consisted of the pool below the highway 154 bridge and the first riffle upstream of the bridge. The riffle and the first 10 meters of the pool were surveyed by electrofishing, and the entire pool was surveyed by snorkel.

Fish community was evaluated using a combination of electrofishing and snorkel techniques. These techniques allowed surveyors to obtain a relative index of species abundance and distribution within the study area. Because of the large number of sites sampled and the limited time frame allowed to access the sites, electrofishing was limited to a one pass survey through each site. Two electrofishing units were employed during the surveys. Surveyors entered the units at the lower end of each site and progressed upstream at a slow but steady pace. The goal was to capture a representative number of fish from each site to provide an index of fish distribution, diversity and relative abundance within each of the sample sites. The numbers presented do not represent population estimates. A representative sampled of each species captured was measured and weighed. The remaining fish were identified and counted.

General habitat data were also collected at each site. Total length and average width and depth were recorded for each site at the different streamflow releases to estimate the loss of habitat with declining flows. In addition, general habitat characteristics such as dominant and subdominant substrate types, presence or absence of cover, riparian vegetation and the presence or absence of potential salmonid spawning habitat were also recorded.

RESULTS

HABITAT

The decrease in streamflow from 10 to 1 cfs caused a corresponding reduction in the average width, depth, and in some cases, length (i.e., the streamflow became subsurface in some places) of individual sites. Riffles were affected to a much greater degree than were either pool or run habitats (Table 1). The average width of riffles decreased between 10 and 76 percent (average 52 percent) and the depth of riffles decreased 42 to 85 percent (average 64 percent). Average depth of riffles also declined substantially as flow decreased. Streamflow in five of the seven riffles became intermittent, and the site length decreased between 21 and 77 percent of their total length. The affect of flow reduction on

stream length was most pronounced on Site 3, which decreased from 80.8 m to 18.5 m between the 10 and 1 cfs surveys.

Run habitat was more variable in terms of changes in length and depth. The average width of Site 6 measured 7.4 and 4.5 meters at 10 cfs and 1 cfs surveys, respectively, a 39 percent decrease. At the same flows. the average width of Site 10 decreased 84 percent , from 21.2 to 3.4 meters. The decrease in depth with the decrease in streamflow was also noted in the run habitats. Average depth decreased 10 percent (3 cm) at site 6 between the 10 cfs and 1 cfs release, but at the same time decreased 87 percent (29 cm) at Site 11. The wetted length of the runs did not decrease as streamflow decreased.

The average width and depth of the pool habitats changed the least as streamflow was decreased. The only pool to show a dramatic change in length, width and depth was Site 2. The wetted length of site 2 decreased by 23 percent (10.7 meters), the average width decreased by 37 percent (3.7 meters), and the average depth decreased by 53 percent (26.7 cm).

Overall, reducing the streamflow from 10 to 1 cfs decreased the wetted length of Segments 1, 2 and 3. the length of Segment 1 decreased 41 percent (178.8 m to 105.8 m), Segment 2 by 16 percent (93.7m to 78.6m), and Segment 3 by 25 percent (192.1 m to 144.0 m. The wetted length of Segment 4 did not decrease with a reduction of streamflow, although streamflow did become entirely subsurface ten meters upstream .of Site 14.

The percentage of volume lost with a decrease in the streamflow release from 10 to 1 cfs increased with distance downstream, from 81 percent in Segment 1 to 54.2 percent in Segment 4. The decrease in volume was greatest in riffles

RESULTS OF FISH SURVEYS

Twelve species of fish were collected or observed during the study, including four native fish and eight exotic species (Table 2).

RESULTS OF ELECTROFISHING SURVEY

No juvenile steelhead trout were collected during the three electrofishing surveys. Sculpin were the most abundant fish collected overall, accounting for approximately 82 to 92 percent of the fish caught in all segments combined in each of the three surveys (Table 3). Sculpin were the dominant species collected in Segments 1, 2, and 4. Stickleback

Table 1. **Total length average width and average depth of electrofishing sites sampled in 1993.**

	Site Number	Total Length (m)		Average Width (m)			Average Depth (cm)			Habitat Type
		10 cfs	1 cfs	10 cfs	5 cfs	1 cfs	10 cfs	5 cfs	1 cfs	
Segment 1	1	37.5	37.5	8.1	6.0	2.8	20	16.5	5.9	Riffle
	2	46.0	35.3	10.0	11.0	6.3	50	66.2	23.3	Pool
	3	80.8	18.5	5.5	3.2	1.3	30	18.0	4.5	Riffle
	4	14.5	14.5	7.0	7.0	5.7	50	43.5	37.6	Pool
Total length shocked =		178.8	105.8							
Segment 2	5	73.6	58.5	6.0	6.4	2.6	20	13.3	7.3	Riffle
	6	20.1	20.1	7.4	5.2	4.5	30	23.7	27.0	Run
Total length shocked =		93.7	78.6							
Segment 3	7	70.0	42.5	5.8	4.6	4.7	24	9.8	10.5	Riffle
	8	18.6	18.6	11.1	10.6	10.0	51	47.4	32.7	Pool
	9	35.5	27.6	12.1	N/S	5.5	17	N/S	7.4	Riffle
	10	22.3	22.3	N/S	14.7	16.2	N/S	27.7	19.6	Run
	11	8.2	8.2	21.2	12.5	3.4	33	14.8	4.3	Run
	12	32.0	19.3	8.4	4.9	2.8	33	24.8	8.5	Riffle
	13	5.5	5.5	20.7	N/S	19.7	41	58.0	35.0	Pool
Total length shocked =		192.1	144.0							
Segment 4	14	104.0	104	9.7	7.5	7.4	20	16.7	11.6	Riffle
	15	10.0	10	15.4	10.2	11.2	60	51.7	40.6	Pool
Total length shocked =		114.0	114.0							

Table 2. **Common and scientific names and status (native (N) or introduced (I)) of fish collected and/or observed in the Santa Ynez River between Bradbury Dam and the Highway 154 Bridge.**

Common Name	Scientific Name	Status
Rainbow trout	*Oncorhynchus mykiss*	N[1]
Stickleback	*Gasterosteus aculeatus*	N
Prickly sculpin	*Cottus asper*	N
Pacific lamprey	*Lampetra tridentata*	N
Arroyo chub	*Gila orcutti*	I
Smallmouth bass	*Micropterus dolomieui*	I
Largemouth bass	*Micropterus salmoides*	I
Bluegill	*Lepomis macrochirus*	I
Green sunfish	*Lepomis cyanellus*	I
Redear sunfish	*Lepomis microlophus*	I
Catfish	*Ictalarus sp.*	I
Bullhead	*Ictalarus sp.*	I

[1]Although rainbow trout are native to the Santa Ynez River system, the trout observed may have been of hatchery origin.

Table 3. Results of electrofishing surveys conducted at 10, 5 and 1 cfs.

	Site Number	Sculpin			Arroyo chub			Stickleback			Smallmouth bass		
		10 cfs	5 cfs	1 cfs	10 cfs	5 cfs	1 cfs	10 cfs	5 cfs	1 cfs	10 cfs	5 cfs	1 cfs
Segment 1	1	409	297	608	0	0	0	0	0	0	0	0	0
	2	57	179	1,108	0	3	3	0	0	0	0	0	4
	3	476	190	423	0	0	0	0	4	0	0	1	1
	4	2	12	72	0	0	0	0	0	0	0	0	0
	Total	944	678	2,211	0	3	3	0	4	0	0	1	5
Segment 2	5	522	737	437	0	0	0	0	0	0	0	2	1
	6	40	264	286	0	0	0	0	0	0	1	0	4
	Total	562	1,001	723	0	0	0	0	0	0	1	2	5
Segment 3	7	44	13	12	61	0	0	4	43	93	0	0	0
	8	6	3	5	8	11	7	10	25	55	0	0	0
	9	4	N/S	2	0	N/S	1	10	N/S	41	0	N/S	0
	10	N/S	4	4	N/S	102	0	N/S	120	48	N/S	0	0
	11	2	1	0	1	0	0	2	5	16	0	0	0
	12	46	8	32	5	1	0	2	2	6	0	0	0
	13	6	18	13	0	0	0	0	3	3	0	0	0
	Total	108	47	68	75	114	8	28	198	262	0	0	0
Segment 4	14	153	194	121	41	9	9	12	12	85	0	0	0
	15	N/S	45	4	N/S	2	2	N/S	25	6	N/S	0	0
	Total	153	239	125	41	11	11	12	37	91	0	0	0

Table 3. Results of electrofishing surveys conducted at 10, 5 and 1 cfs (continued).

	Site Number	Green sunfish			Bullhead			Lamprey		
		10 cfs	5 cfs	1 cfs	10 cfs	5 cfs	1 cfs	10 cfs	5 cfs	1 cfs
Segment 1	1	0	0	0	0	0	0	0	0	0
	2	0	0	1	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0
	Total			1	0	0	0	0	0	0
Segment 2	5	0	0	1	0	0	0	0	0	0
	6	0	0	1	0	0	1	0	0	0
	Total	0	0	2	0	0	1	0	0	0
Segment 3	7	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	42	0	0	0
	9	0	N/S	0	0	0	0	0	0	0
	10	N/S	0	0	0	0	0	0	0	0
	11	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	1
	Total	0	0	0	0	0	42	0	0	1
Segment 4	14	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0

dominated the catch in Segment 3 at the 5 and 1 cfs release surveys, although sculpin were the most abundant fish caught at the 10 cfs release survey.

The average number of sculpin caught in riffles was an order of magnitude greater in segments 1 and 2 compared to Segment 3 (sculpin in Segment 4 were intermediate in abundance). Conversely, stickleback and arroyo chub abundances were greater in segment 3 compared to the other segments. Although the electrofishing survey accurately represented the increase importance in arroyo chub and stickleback in the Segment 3 fish community, it underestimated their true abundance. Arroyo chub and stickleback were extremely abundant in the large pools in Segment 3 (snorkel observations). However, pool habitats are difficult to sample with the electrofishing technique. Therefore, the snorkel surveys provide a more realistic assessment of the true abundance of arroyo chub and stickleback.

SEGMENT 1

Sculpin accounted for all of the fish captured in Segment 1 during the 10 cfs survey and 99 percent of the fish in the 5 and 1 cfs release surveys. Arroyo chub, stickleback, black bass and green sunfish were also collected in Segment 1.

Riffles: Sculpin populations decreased at the two riffle sites (1 and 3) between the 10 and 5 cfs release surveys, and then increased during the 1 cfs release survey. The increase in the number of sculpin captured in the riffles at the 1 cfs release probably resulted from the remaining fish being crowded into a decreased habitat as the flow declined. The decreased habitat increased the efficiency of the electrofishing technique, and may have resulted in an increased percentage of the remaining fish being collected.

The riffles in Segment 1 were substantially affected by the reduction in streamflow, particularly Site 3 (Table 3). At the low flow release, sculpin were found in the remaining pockets of water in the riffles, and from the electrofishing and snorkel surveys, a large proportion apparently moved into the pools, particularly Site 2.

Pools: The number of sculpin collected in the two pool sites (2 and 4) increased as the streamflow decreased. The surface area and average depth decreased with a reduction in streamflow (particularly in Site 2), which resulted in an increase in sampling efficiency (i.e., there was less habitat to sample). However, the increase in the sculpin abundance in two pool sites was probably real. First the number of sculpin collected in Site 2 increased from 57 at the 10 cfs survey to 1,108 at the 1 cfs survey. Second, no fish were observed in Site 2 during the snorkel survey at 5 cfs compared to the 1 cfs survey when the bottom of the pool was "swarming" with sculpin. Although the number of sculpin collected in Site 4 (the Long Pond) increased from 12 to 72 between the 10 and the 1 cfs surveys, only

a small portion of this habitat unit could be surveyed by electrofishing, and sculpin moving into this habitat could have moved out of the area surveyed by electrofishing.

SEGMENT 2

The fish community in Segment 2 was similar to that observed upstream of the Long Pond. Sculpin accounted for 99.5 percent of the fish collected during all three surveys combined (Table 3). Black bass, green sunfish and one bullhead were also captured during the three surveys.

Riffle: The number of sculpin decrease slightly in the riffle (Site 5) between the 10 and 1 cfs surveys. Although the average width and depth of Site 5 decreased substantially with the reduction of flow, overall, the habitat appeared to remain suitable for sculpin (in comparison to the Segment 1 riffles).

Run: The number of sculpin increased from 40 to 264 between the 10 and the 5 cfs surveys, and then to 286 at the 1 cfs survey. Site 6 reacted in a similar manner as Site 5, habitat overall decreased, but habitat apparently remain suitable for sculpin.

SEGMENT 3

The fish community in the vicinity of San Lucas Creek (Segment 3) consisted of a higher proportion of arroyo chubs and sticklebacks and comparatively fewer sculpin compared to Segments 1 and 2. An explanation for the reduced sculpin numbers is that the substrate was composed primarily of smaller size particles compared to segments 1, 2 and 4. In addition, the riparian vegetation and the amount of woody debris in the stream is considerably reduced compared to the other segments.

Riffles: Overall, the number of sculpin declined in the three riffle sites from 94 to 46 between the 10 and 1 cfs surveys. During the same period, abundance of arroyo chub declined from 67 to 1, while the abundance of stickleback increased from 16 to 140.

Segment 3 riffle habitat reacted in a manner similar to those in Segment 1, decreasing substantially in length, average width and depth, thus reducing available habitat for sculpin. Arroyo chub and stickleback may have benefited from the flow reduction in the riffles. Both of these species prefer low velocity habitat, and the reduction of flow through the riffles may have provided greater access to the riffles.

Pools: Fish abundance in the two pool sites (8 and 13) remained relatively low and fairly constant for sculpin and arroyo chub. However, at Site 8, stickleback increased from 10 to 55 between the 10 and 1 cfs surveys, and 42 bullheads were collected at the 1 cfs. In

addition, one adult Pacific lamprey (510 mm total length) was collected in Site 13. As stated above, both the arroyo chub and threespine stickleback abundance were underestimated in the pool habitats with electrofishing, and both species were exceptionally abundant in the pools (snorkel observations).

Runs: Few sculpin were collected in the two run sites (10 and 11) (Table 3). Arroyo chub abundance declined from 102 to 0 between the 5 and 1 cfs at Site 10, while only 1 arroyo chub was collected at Site 11 during the three surveys. Stickleback, the only other species collected in the two run habitats, increased slightly between the 10 and 1 cfs surveys, from 2 to 16 at Site 10, and from 2 to 6 at Site 11.

SEGMENT 4

The fish community in Segment 4 was intermediate to Segments 1 and 2, and Segment 3. Sculpin were the most abundant species, but stickleback and arroyo chub accounted for 30 percent of the catch overall.

Riffle: Sculpin abundance declined from 194 at 5 cfs to 121 at 1 cfs (153 sculpin were collected during the 10 cfs survey, however, due to time constraints, only three crew members were available to survey this Segment, and therefore, only one electrofisher was utilized). Arroyo chub abundance declined from 62 at the 5 to 9 at the 1 cfs surveys. In contrast, stickleback numbers increased from 12 and 14 at both the 10 and 5 cfs surveys to 85 at the 1 cfs survey. Overall, the habitat in Site 14 showed the least change with the reduction in streamflow.

Pool: Fish abundance in Site 15 was generally low, and declined between the 5 and 1 cfs surveys (the habitat unit was to deep to efficiently survey with one electrofisher, therefore no data was collected from this site at the 10 cfs survey). Sculpin abundance declined from 45 to 4, and stickleback ranged from 2 to 6 between the 5 and 1 cfs surveys. Arroyo chub accounted for 12 and 2 at the 5 and 1 cfs surveys, respectively.

SNORKEL SURVEY

INTRODUCTION

All or part of several pool habitats in the study section were too deep to sample with backpack electrofishing techniques. Therefore, a snorkel survey was conducted in twelve pools to describe the fish community in these habitats.

Two surveyors entered from the downstream end of each pool and slowly worked upstream through the habitat unit. Fish observed were counted and notes were made on the estimated size range of the larger species.

General observations were made on the physical features of the pool sites snorkeled. Most pool habitats surveyed were visually estimated to be between 100 and 150 meters in length, although Site 2 and Site A were less than 50 meters in length and the stilling basin and Site 4 were considerably longer than 150 meters in length.. Maximum depth and available cover varied between sites. Most pool sites showed a small to moderate change in surface area and maximum depth between the 5 and 1 cfs release (visual estimate). however, Site 2 and Site E were exceptions. The surface area of Sites 2 and E were greatly reduced at the lower release.

Segment 1

Stilling Basin: The stilling basin fish community was comprised primarily of non-native species (large and small- mouth bass and sunfish; all fish observed were in the relatively shallow "tailout" section of the stilling basin). The bass observed ranged from approximately 200 to 375 mm in length. Two large (approximately 600 mm in length) catfish were also observed in the stilling basin during the October survey. Although trout were not observed during the snorkel surveys during either survey, one trout was observed in the tailout from shore on two occasions in October. In addition, five trout were caught in the main body of the stilling basin during rod and reel sampling conducted in November. Water clarity during the November survey was poor (approximately five feet) and a reliable estimate of species diversity and abundance could not be made. The stilling basin was by far the largest and deepest unit surveyed. Cover in the stilling basin was provided by submergent and emergent vegetation, and was relatively abundant.

Site 2: Site 2 was surveyed by both electrofishing and snorkel techniques. Only prickly sculpin were observed during snorkel surveys. Although only five sculpin were observed during the October survey, an estimated 2,000 sculpin were observed during the November survey. Site 2 was a relatively small pool at the 5 cfs release (October survey), and was reduced in size (length, width and depth - Table 4) during the 1 cfs (November) survey. Maximum depth in Site 2 decreased from an estimate 1.25 meters at the 5 cfs release to approximately 0.75 meters at the 1 cfs release. Cover in the pool was provided by a single large root mass and was relatively sparse.

Site 4. The Long Pond was surveyed by snorkel and electrofishing on three occasions, at the 10, 5 and 1 cfs releases. The fish community was comprised of trout and black bass. At the 10 cfs release approximately 75 percent of the surface of the habitat unit was covered with a thick algae mat which prevented much of the pool from being surveyed. In

Table 4. Snorkel survey observations (visual estimates in study reach pools, Santa Ynez River, 14 October and 10 November, 1993.

Site	Rainbow trout		Black bass		Sunfish		Sculpin		Arroyo chub		Stickleback		Catfish	
	Oct	Nov	Oct	Nov	Oct	Nov	Oct	Nov	Oct	Nov	Oct	Nov	Oct	Nov
Stilling Basin	0	0	30	4	10	0	0	0	0	0	0	0	2	0
Site 2	0	0	0	0	0	0	5	2,000	0	0	0	0	0	0
Site 4	4	4	12	0	0	0	0	0	0	0	0	0	0	0
Site A	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Site B	0	0	0	8	0	0	0	15	5	0	5	0	0	0
Site C	3	0	40	35	50	50	0	25	20	0	20	50	0	0
Site D	0	0	9	10	0	15	5	0	10	0	10	0	31	0
Site E	0	0	0	4	0	1	0	0	200	50	30	500	0	100
Site 8	0	0	0	3	0	0	0	5	500	3,000	100	3,000	0	0
Site F	0	0	0	0	0	0	0	10	1	75	50	200	0	0
Site 9	0	0	0	0	0	0	0	0	500	0	150	1,000	0	0
Site 14	1	N/S	20	N/S	50	N/S	100	N/S	50	N/S	100	N/S	0	N/S

the area that was free of surface algae, approximately 10 to 12 bass, averaging approximately 175 mm in length and 7 adult trout, ranging from 300 to 350 mm in length were observed in the pool. During the 5 cfs survey, four trout 450 mm in length were observed. Approximately 12 bass (predominantly largemouth) estimated to be between 175 and 300 mm in length were also observed in the pool (Table 4). Water clarity during the November survey was poor (approximately five feet) through most of the habitat due to algae,. Four trout were observed near the upper end of the pool where the visibility was approximately eight feet, and were similar in size to those observed during the October survey. Excluding the stilling basin, Site 4 was by far the largest habitat unit surveyed. Maximum depth in Site 4 was approximately 1.5 meters, and abundant cover was provided by submergent and emergent vegetation.

Site A (Pool just downstream of the uppermost weir): The fish community observed consisted of a few sculpin during the October survey, and a single bass (approximately 100 mm in length) during the November survey. Alga mats covered the surface of approximately 50 and 67 percent of the this habitat unit during the October and November surveys, respectively. Site A was relatively small, shallow unit (maximum depth approximately 60 cm). Cover was provided by algae and boulder substrate.

Site B (Pool immediately downstream of Site A). The fish community in Site B was comprised of sculpin, stickleback, and bass. Fish numbers estimated during the two surveys were very low, particularly based on the size of the habitat. A few sculpin and sticklebacks were observed during the October survey, and 15 sculpin and eight small bass (<150 mm) were observed during the November survey. Site B was a relatively large, shallow (maximum depth approximately 70 cm) unit with relatively little cover.

Site C (Above the first weir upstream of the San Lucas Ranch hay barn): The fish community in Site C was comprised primarily of bass (both small- and large- mouth) and sunfish (redear and bluegill) during both surveys. Approximately 40 bass (up to an estimated 400 mm in length) and approximately 50 sunfish were observed in both surveys. In addition, two (possibly three) trout were observed during the October survey. Relatively small schools of arroyo chub, stickleback, and sculpin were also observed in the pool. Site C was relatively large and deep (maximum depth estimated to be 2 two meters). Cover provided by woody debris and submergent vegetation was moderately abundant.

Site D (Across from hay barn on the San Lucas Ranch): The fish community consisted of predominantly bass, sunfish and catfish. Approximately ten bass (to 300 mm in length) were observed during both surveys. During the October survey, a school of catfish to 125 mm in length, one large catfish (visually estimated to be 600 mm in length), and small numbers of sculpin, arroyo chub and sticklebacks were observed. However, during the November survey, algae in the pool was exceptionally dense compared to the earlier

survey, and observations were imitated to a couple of small pockets of open water. In addition to the bass, only a school of 15 sunfish were observed during November. Site D was also relatively large and deep (maximum depth approximately 2.5 meters). Abundant cover was provided by algae and submergent vegetation.

Site E (Pool directly above electrofishing Site 7): The fish community observed in Site E consisted arroyo chub and stickleback. Arroyo chub numbers decreased between the two surveys, although stickleback numbers increased (this unit had a relatively large area of shallow water which could not be effectively surveyed by snorkel, and probably accounted for the differences in the number observed). During the November survey, in addition to chub and stickleback, approximately 100 small catfish (<125 mm in length), four small bass and one sunfish were observed in the site. Site E was a large pool at the 5 cfs release, however, at the 1 cfs release the surface area was reduced and became separated into three pools. Maximum depth was approximately 1 meter at the 5 cfs release and approximately 60 cm at the 1 cfs release. Cover provided by woody debris was relatively abundant.

Site 8: (lower section of pool downstream of area shocked): The fish community in Site 8 consisted primarily of arroyo chub and stickleback, both of which were exceptionally abundant (an estimated 3,000 chubs and sticklebacks were observed during the November survey). In addition, low numbers of sculpin and small bass (<125 mm in length) were also observed in the unit. Maximum depth in Site 8 was approximately 1 meter). The bottom half of Site 8 was covered with algae mats during each survey.

Site F (Pool above site 9): The fish community in Site F consisted of stickleback, arroyo chub, and sculpin. Although this pool was similar in size and habitat characteristics as sites 8 and 9, relatively few fish were observed in this habitat unit during the two surveys.

Site 9: (lower section of pool downstream of area shocked): Same as site 8 with similar numbers of chubs and sticklebacks. Schools of arroyo chubs were also observed under the floating algae mats in the lower section of the pool, thus the number presented here may well be a gross underestimate of the true numbers of arroyo chub and stickleback in this pool. Many of the male sticklebacks were in spawning colors.

Site 14: The fish community in Site 14 consisted primarily of black bass and sunfish. An estimated 20 bass and sunfish were observed as well as one large goldfish and one rainbow trout that appeared to be in poor condition. The trout was estimated at 300 mm in length with a low K factor (condition), and the caudal fin was badly eroded. Sculpin, arroyo chub and stickleback became more numerous near the highway 154 bridge (electrofishing site). Site 14 was not surveyed at the 1 cfs release due to darkness. An attempt was made to obtain permission to survey the site at a later date. However, access to survey the pool was denied by the land owner due to potential conflicts with the operations of the ranch.

FISH STRANDING

The reduction in the streamflow from 10 to 5 cfs had a minimal affect overall on habitat, and the potential for fish to become stranded was observed at site 2 only. This site braided into 5 channels at the 10 cfs release, but was reduced to 3 channels at the 5 cfs release. One channel that was dewatered still maintained a small section of flowing water in its lower 5 meters due to ground water up welling. Several young-of-the-year sculpin were collected from the upper end of this channel in small pools which may have been isolated from the rest of the stream. It is possible that sculpin were stranded as the two side channels became dewatered, although no fish were actually found to be stranded.

However, at the 1 cfs release, a substantial amount of the river bed was dewatered in Segments 1 and 3. Only sculpin appeared to be affected (only one non-sculpin, as stickleback, was found during the stranding survey). Sculpin were typically found under rubble size substrate (approximately ten inches in diameter). Since sculpin are bottom dwellers, it is likely that by the time that the interstitial areas inhabited by sculpin were dewatered, it was too late for the fish to move into deeper water.

The potential for stranding was assessed by turning over rocks in areas that were recently dewatered, and counting the number of fish found. Several of the sculpin found were still alive, indicating that the areas had been dewatered quite shortly (possibly within 24 hours) of the survey.

Site 1 Six rocks (rocks typically ranged from six to ten inches in diameter) in areas which had been recently dewatered were turned over to assess stranding. The number of sculpin found under the rock and in the adjacent interstitial areas ranged from zero to 60 (average 15).

Site 2 A total of 55 sculpin were found under five rocks upstream of the waterline at 1 cfs. The substrate in the upper (dewatered) section of Site 2 was similar to that in Segment 1; predominantly rubble size substrate with large interstitial spaces. Conversely, the interstitial areas around the substrate in the tailout of site 2 were filled in with silt, providing few areas for sculpin to become stranded. Several rocks in the dewatered tailout section of Site 2 were examined, and only 1 sculpin was found.

Site 3 Based on the decayed state of the sculpin found in Site 3, this habitat became dewatered at a higher flow than Site 1. At 10 cfs, Site 3 braided into 5 channels of various sizes, decreased to three channels at 5 cfs, and 1 intermittent channel at 1 cfs. Sculpin were found stranded in the plunge pool at the upstream end of the site (a total of 31 under four rocks), and 55 sculpin were found under four rocks in the right hand channel. Conversely, few sculpin were found at five different locations in the main channel downstream of the plunge pool (33 sculpin found under a total of 25 rocks).

Sites 7 and 8 The stranding survey in these two sites was qualitative. Several rocks were turned over in areas which were dewatered between the 5 and 1 cfs surveys, and only 1 sculpin and 1 stickleback were found stranded. Next, small pools of standing water which were endangered of being isolated from the rest of flowing stream were surveyed for fish (under the assumption that fish in these areas would be alive, but endangered of being stranded if the water continued to decline). No fish were found.