

Lower Arroyo Grande Creek and Lagoon
Fishery and Aquatic Resources
Summary 2007 Monitoring Report

Oceano Dunes State Vehicular Recreation Area

Pismo Dunes State Reserve

by
Douglas Rischbieter
Environmental Scientist
Central Valley District

January 2008

ABSTRACT

The lowest half-mile of Arroyo Grande Creek, including a periodically-closed euryhaline lagoon, is within or adjacent to Oceano Dunes State Vehicular Recreation Area (SVRA) and Pismo Dunes State Reserve (San Luis Obispo County, California). Qualitative sampling of the fishery in this area was conducted four times throughout 2007, and this report is intended to summarize the results of this activity. Purposes of sampling included gathering information about various species' use of the habitats within the State Park, evaluating whether any Park activities may be impacting the fishery and aquatic habitat, and documenting the impacts of habitat disturbance caused by upstream water management activities. We used a generally-consistent regime of electrofishing, seining, dipnetting, and direct observation during each survey episode, which followed methods and patterns established during similar activity in 2004, 2005, and 2006. A total of eight fish species were collected during the 2007 sampling, and several observations were noteworthy: extensive reproduction and population expansion of tidewater goby, a federally-listed Endangered species; no observation of steelhead, a federally-listed Threatened species, usually present in the study reach in low numbers and which had been relatively abundant in 2006; no observation of any non-native aquatic vertebrates; occurrence/colonization of staghorn sculpin above a persistent beaver dam, and later a complete disappearance of this previously-abundant species from the lagoon; relatively early and persistent interruption of freshwater inflow into the lagoon, which entirely desiccated the lotic reach and reduced the extent of the lagoon for several months during 2007. The latter condition appears responsible for the lowest fish numbers, and least aquatic biodiversity, observed here at any time since these surveys began in August, 2003.

INTRODUCTION

Arroyo Grande Creek arises from the mountains of San Luis Obispo County and flows to the Pacific Ocean. Within the watershed is one major reservoir, Lopez Lake storing up to 52,000 acre-feet, that is situated about 15 miles upstream from the ocean. Within the last few miles to the ocean, a low-gradient reach of stream flows through an alluvial agricultural valley and then forms a lagoon behind the beach. The lagoon is closed by a sandbar in some summers, but otherwise flows over the beach to the sea. The terminal half-mile of Arroyo Grande Creek, including the aforementioned lagoon, are part of Oceano Dunes SVRA and Pismo SB Dune Preserve. Adjacent to this reach of stream are a municipal airport and a wastewater treatment plant. Most of the lower reach of the creek is confined between levees, and some riparian vegetation is periodically removed for flood control purposes.

Study Area

Arroyo Grande Creek in and adjacent to Oceano Dunes SVRA and Pismo SB Dune Preserve typically consists of three distinct aquatic habitats: a few hundred feet of transitory low-complexity, relatively shallow channel that proceeds up from the surf line and is characterized by sand banks and substrate; a several-acre elongate lagoon behind the back-beach that is typically 2 to 6 feet deep and varies in extent depending on tides and high flow events (also recently affected by the condition of a relatively persistent mid-lagoon beaver dam), and is characterized

by varying patches of submerged and emergent aquatic vegetation and varying substrates of mud, silt, and gravel; and a lotic environment upstream of the lagoon characterized by a series of short low gradient riffles and shallow (maximum depth usually <3 feet) pools, runs, and glides. This upper reach is usually characterized by dense riparian vegetation on and overhanging the banks, and predominantly small-gravel substrate with sparse distribution of large woody debris fragments. The north end of the lagoon and both sides of the upstream reach are confined by levees.

Figure 1 shows the lower half-mile of Arroyo Grande Creek and the relative locations of the habitats described above. "Guiton Crossing" is the approximate upstream limit of State Park ownership, though electrofishing/sampling was conducted a few hundred feet upstream from this point on some occasions.

Streamflow was cursorily estimated to be between about 0 and 5 cfs in the lotic areas during all survey periods. Water quality of lagoon inflow, when present, appeared good; water quality within the lagoon was relatively but persistently poor until December storms provided some flushing and restored inflow. High tides were observed washing seawater into the lagoon on several occasions. Periodic disturbances to these habitats during the survey period also included short-duration floods, beaver activity in and upstream from the lagoon, and past removal of some riparian vegetation for flood control maintenance purposes. The surface level of the lagoon appeared to vary, perhaps as much as 2 to 3 feet, depending on the dynamics of sandbar formation, inflow, outflow, tidal wash, and because of the location of the beaver dam in the middle of the lagoon.

Purpose and Scope

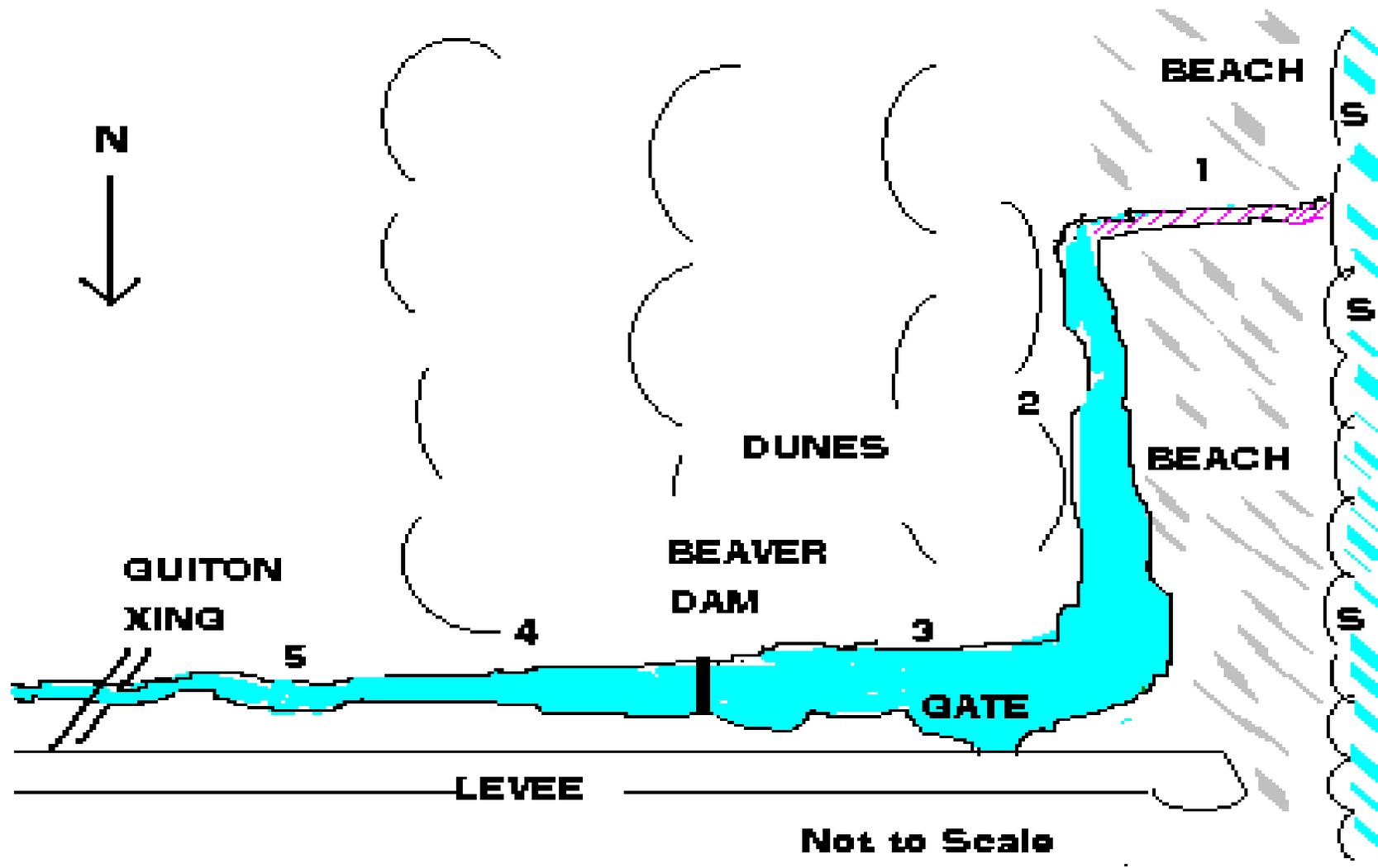
This study was conducted for two primary purposes: 1) to continue the evaluation, commenced in 2003 through 2006 (Rischbieter 2004, 2006, 2007) of the composition and significance of the fishery in Arroyo Grande Creek associated with State Park habitat; and 2) to gauge the impact (if any) of SVRA vehicle traffic on these aquatic resources, especially in the beach area where vehicles traverse the wetted stream. Towards these goals, aquatic sampling was generally limited to the Park reach of Arroyo Grande Creek. Most information sought was qualitative. Quantitative evaluation was limited to routine estimation of the relative abundance of species collected.

MONITORING PROCEDURES

We typically used dipnets, beach seine, direct observation, and electrofishing to observe, collect, and identify fish in each of the habitat zones described above. Each of these methods had some shortcomings in various areas from time to time, but generally a similar degree and type of effort was expended on each survey date. More detailed description of activities pursued during each of the seven surveys can be found within the summary reports prepared for each individual fish-sampling survey (Rischbieter, various dates). However, the following summary describes typical procedures conducted over the study period.

FIGURE 1. Relative locations of zones of Study Area, lower Arroyo Grande Creek and Lagoon, San Luis Obispo County, 2007.

1 - Surf-line Outlet Reach (intermittent); 2 - Back-beach Reach; 3 - Levee/Dune-constrained Reach; 4 - "Beaver Pond" Backwater; 5 - Lotic Reach;
BEAVER DAM - Persisted Through 2007; **GATE** - Under-Levee Discharge from Residential and Wetland Areas; **S**- Normal Surf Zone



The Back-beach Reach (Figure 1) was subject to 5-10 seine hauls using a beach seine (4' x 30' with 1/16" mesh, and/or 4' x 50' with 3/16" mesh). The hauls usually proceeded sequentially from south-to-north, occasionally including and ending at the Levee/Dune Reach and/or the Beaver Pond Backwater. The seine was typically swept in an arc, with a set pivot-point on shore, and closed and dragged ashore. After each haul the seine was checked for organisms and, if any were present, they were removed and identified and released.

Electrofishing was also conducted above the head of the lagoon. Effort was usually continuous from a relatively easy access point about 500-1,000 feet downstream of Guiton Crossing upstream to Guiton Crossing and occasionally 100-500 feet beyond. Distance covered was usually dictated by hydrologic conditions: the extent of the beaver pond backwater and the effectiveness of the electrofisher therein, and the existence of surface flow upstream from that pool. The author carrying the electrofisher was accompanied by two netters; immobilized fish were lifted with dipnets and, if noteworthy or representative specimens, were placed into a bucket for recovery, identification, and release. Roughly 1,000 seconds of electrofishing current was usually applied throughout this reach; settings were routinely 60 Hertz at 100-200 Volts DC.

RESULTS

Eight species of fish were collected over the four survey dates. Species collected, relative locations of collection for each species, general relative maturity of each species collected, and survey dates are summarized in Table 1. Virtually all fish collected were returned alive to the approximate location of capture, though one larval (19mm) tidewater goby succumbed to handling stress (June) and will be delivered to a UCLA fisheries geneticist for additional study, per Recovery Permit terms and conditions.

No reptiles or amphibians, and seemingly few aquatic invertebrates, were observed during the 2007 surveys, but the lagoon and creek support substantial numbers of migratory waterfowl. Wading shorebirds, both predators and scavengers, were frequently observed both resting and stalking in the lagoon, in and near the beaver pond, and in the surf zone outlet reach (latter zone present in April survey only, then again the day following December survey).

Beaver activity appeared to affect fish habitat. Though no beavers were seen, the dam in the middle of the lagoon (originally constructed in 2005) produced two different lagoon water levels simultaneously (the head of the lagoon was typically 2' to 3' higher than the lower half). This dam consequently backed-up water a significant distance upstream, and reduced the extent of the reach suitable for electrofishing.

No water quality measurements were taken, but lagoon water quality frequently appeared impaired when freshwater inflow was low or absent. Significant mats of algae in the back-beach reach made sampling difficult in April, but abated later; the head of the beaver pond was choked by algae in September, when in its lower reach it exhibited a fluorescent green tint similar to that associated with the toxic blue-green algae *Microcystis*. During June and September, hydrogen sulfide smell was pervasive as muddy substrates were disturbed (anaerobic benthic conditions).

TABLE 1. Fish of lower Arroyo Grande Creek and Lagoon: species collected, status, collection dates, approximate collection locations, and general relative abundance of life history stages observed, 2007.

<u>SPECIES</u>	<u>STATUS</u>	<u>*APR 10,</u> <u>2007</u>	<u>JUN 27,</u> <u>2007</u>	<u>*SEP 17,</u> <u>2007</u>	<u>DEC 27,</u> <u>2007</u>	<u>COMMENTS</u>
California roach <i>Lavinia symmetricus</i>	n	O5	--	u5	u5	
speckled dace <i>Rhinichthys osculus</i>	N	U5	--	--	--	Only one individual, 53mm TL, collected in 2007; (April; collected slightly upstream of Park boundary).
Sacramento sucker <i>Catostomus occidentalis</i>	n	O5	u5	u5	--	
threespine stickleback <i>Gasterosteus aculeatus</i>	N	U2, O5	Aa2,a5	Aa2,4*; a5	o2, u5	
prickly sculpin <i>Cottus asper</i>	N	O5, o5	O5, o5	O5	--	The specimens collected in SEPT were in a desiccating, isolated pool (not expected to persist).
staghorn sculpin <i>Leptocottus armatus</i>	N	Aa2; O4*,5	o2	--	--	Most-upstream distribution ever observed here (April), including establishment above beaver dam.
tidewater goby <i>Eucyclogobius newberryi</i>	N	U2	Aa2	Aa2	A2	Abundant; observed only one mortality (larval, 19mm TL) due to handling stress (June).
starry flounder <i>Platvichthys stellatus</i>	N	u2,U3	--	--	u2	"Adult" flounder (April) largest ever collected here: 215 mm TL

KEY Status: **N** = Native to watershed; **n** = Native to California, but likely introduced to watershed

Zones Where Found (Figure 1): **1** - Surf-line Outlet Reach (only present during April date); **2** - Back-beach Reach; **3** - Levee/Dune-constrained Reach; **4** - "Beaver Pond" Backwater (only 2 survey dates*); **5** - Lotic Reach (intermittent in June and September).

* - Sampling in the "Beaver Pond" Backwater (see Figure 1, site "4") was limited to these dates.

Abundance (UPPER CASE = Adults; lower case = Young-of-Year): **A/a** - Abundant or Common; **O/o** - Occasionally Collected; **U/u** - Infrequently Collected

DISCUSSION

The 2007 surveys of Arroyo Grande Creek are noteworthy for several reasons. After a seemingly tenuous existence since site colonization was documented early in 2005, tidewater goby flourished. Conversely, for the first time since inception of monitoring, no juvenile steelhead were collected this year. The latter occurrence seems related to what persistently appeared to be the worst habitat conditions observed over our survey history: steelhead generally cannot endure poor water quality conditions, and they typically require temperatures consistently below 68 degrees Fahrenheit. In the absence of freshwater inflow, summer lagoon temperature probably exceeded this threshold frequently. It is not clear if these same conditions displaced staghorn sculpin, a euryhaline species that had successively become more abundant over 2005-2006, but which seemed to disappear (for the first time since 2004) over this summer. Additional information and discussion related to each of the four surveys can be found within the summary reports prepared for each individual fish sampling survey (Rischbieter, various dates). Table 2 presents a calendar year summary of species observed over the history of this program.

Several species observed in 2006 (Rischbieter 2007) were not collected in 2007. Non-native gamefish like bass and sunfish, potential predators upon native species, were not collected in 2007. Staghorn sculpin, relatively common and abundant last year, seemed to decline in the June catch and were absent thereafter. Well-adapted to marine conditions, staghorn sculpin seemed absent during surveys several years ago (Rischbieter 2004), but their seemingly complete disappearance while the lagoon was closed to the ocean this summer seems inexplicable. The June survey might suggest a clue, when we documented the first known occurrence of staghorn sculpin having migrated past a beaver dam. Considering this, the difficulty of sampling within the heart of the lagoon itself (and within the muddy-bottomed beaver pond) may have contributed to their absence from later surveys, and this difficulty overall probably results in an understatement of the diversity and abundance of species in lower Arroyo Grande Creek.

One original purpose of this monitoring was to gain insight as to whether high traffic volume in the SVRA (including vehicles fording the seasonal lagoon outlet) might be affecting fish or their habitat. Complete and unambiguous closure of all of the back-beach reach to vehicle entry seemed to avoid any impacts to the lagoon in 2007. Vigilant maintenance of posted closure signs seemed effective at almost eliminating public encroachment into sensitive closed lagoon areas, based on observation on these survey dates of few if any straying tire tracks. Any possibility of impact was further reduced by the early and persistent closure of the lagoon's sandbar this year, though fish typically do not use the intermittent and transitory surf-line outlet reach (where vehicles most frequently, efficiently, and legally ford the stream).

TABLE 2. Fish species collected in lower Arroyo Grande Creek and Lagoon, by DPR staff, by calendar year 2003-2007 (# of surveys): **X** = collected, -- = not observed.

<u>SPECIES</u>	<u>STATUS</u>	<u>2003</u> (2)	<u>2004</u> (5)	<u>2005</u> (4)	<u>2006</u> (4)	<u>2007</u> (4)	<u>COMMENTS</u>
California roach <i>Lavinia symmetricus</i>	n	X	X	X	X	X	Largest was 132mm total length (TL; June, 2006).
speckled dace <i>Rhinichthys osculus</i>	N	X	X	--	X	X	Very uncommon in study area catch.
Sacramento sucker <i>Catostomus occidentalis</i>	n	X	X	X	X	X	Range extension of spawning population.
steelhead <i>Oncorhynchus mykiss</i>	N	X	X	X	X	--	Two adults found stranded on beach (2003-04); all others juveniles.
mosquitofish <i>Gambusia affinis</i>	I	--	X	X	X		
topsmelt <i>Antherinops affinis</i>	N	--	X	X	--		
threespine stickleback <i>Gasterosteus aculeatus</i>	N	X	X	X	X	X	
black crappie <i>Pomoxis nigromaculatus</i>	I	X	--	--	--		Very uncommon in study area catch
green sunfish <i>Lepomis cyanellus</i>	I	--	X	--	--		Very uncommon in study area catch
bluegill <i>Lepomis cyanellus</i>	I	--	X	X	--		Very uncommon in study area catch
largemouth bass <i>Micropterus salmoides</i>	I	X	X	X	X		
black bullhead <i>Ameiurus melas</i>	I	--	--	--	X		Carcass found only – no live specimens.
prickly sculpin <i>Cottus asper</i>	N	X	X	X	X	X	Largest was 181mm TL (June, 2006).
staghorn sculpin <i>Leptocottus armatus</i>	N	--	X	X	X	X	
striped mullet <i>Mugil cephalus</i>	N	--	X	--	--		Only young-of-year observed, once: abundant in November, 2004.
starry flounder <i>Platichthys stellatus</i>	N	X	X	X	X	X	Largest collected was 215mm TL (April, 2007).
tidewater goby <i>Eucyclogobius newberryi</i>	N	--	--	X	X	X	First known observation and occurrence in this watershed, 2005.

KEY Status: N = Native to watershed; n = Native to California, but likely introduced to watershed; I = Introduced to California

Recommendations

Continued fishery monitoring in this area will provide additional useful information for resource managers, and is scheduled to be conducted three or four times in 2008. This sampling will continue to document this dynamic fishery and the periodic presence of the aforementioned species in the future. The effect of freshets, late-summer drought, and other cyclic hydrologic conditions may be deduced in the future through continued monitoring. Timing of 2008 surveys should generally be scheduled considering occurrence of significant hydrologic events such as following periods of flood, lagoon closing/opening, and any extended periods of low or no flow.

Additional local hydrologic information may help explain occurrence of certain species and the dynamics of habitat quality and connectivity. Flow estimates recorded during each sampling episode, usually cursorily estimated by eye, is probably sufficient for fishery monitoring purposes. (Because Arroyo Grande Creek appears seasonally dewatered by human activities, there may be future interest in more precisely measuring flow for legal or regulatory reasons.) However, it would be a relatively simple matter to also collect and include lagoon stage information during future surveys. To do so would require identification or establishment of a known elevation reference point, and a corresponding pin or line should be physically established on Milepost #1. From this reference point, changes in the water elevation(s) of the lagoon could be documented and considered in the context of the various habitat changes that are generally observed to wax and wane. Water level could periodically be measured by transit, or a staff gage could be installed at the "gate" (Figure 1) or on the eastern shore of the lagoon's back-beach reach. Since the lagoon is relatively shallow, and varying but limited in areal extent, depth changes of a few inches (sometimes feet) can give insight to habitat volume, quality, dynamics, and future trends and tendencies.

The current closure zone protects the aquatic resources well, but should periodically be reviewed to ensure its effectiveness given the seasonally-changing configuration of the stream and lagoon. It should generally be aligned so as to include as much length and area of active streambed as reasonably possible, to the degree practicable and consistent with necessary Park operations.

The one goby mortality (juvenile) collected in June remains in possession, preserved, because it became moribund after handling and release. Consistent with federal Recovery Permit conditions, it will be delivered to Dr. Dave Jacobs at UCLA as part of an ongoing genetic study. The recovery permit secured for this work further allows collection of up to 48 additional goby specimens from Arroyo Grande Creek to be contributed to that genetic study. If goby are as abundant in 2008 as they were in 2007, it seems a reasonable time to harvest the additional requested specimens. Coordination and permission for retention of any healthy specimens will be secured through the U.S. Fish and Wildlife Service.

Park staff can provide useful information by remaining observant and recording unusual biological sightings and changes in hydrologic conditions. In 2007, Oceano District resource management staff initiated a dedicated and specific log that included the dates of significant floods, lagoon closing and breach, and cessation and restoration of stream surface flow. This activity should continue into the future and a longer-term repository for these data should be established. Future observations of unusual, large, or abundant fish observed (such as fish

occasionally found dead) should be photographed, and representative specimens preserved by freezing¹; any other natural or man-made disturbances to water quality or aquatic habitat should also be cursorily documented (fuel or sewage spills, flood channel maintenance or vegetation removal, etc.). These activities will also be useful to aid the proposed future water quality and soil monitoring study currently being planned, and overall they can help ensure the continued effective management and protection of the aquatic resources of Arroyo Grande Creek and Oceano Dunes SVRA.

ACKNOWLEDGEMENTS

The California Department of Parks and Recreation is grateful for the assistance provided by several staff and volunteers during data collection on the four survey dates. Staff of California State Parks' Off-Highway Motor Vehicle Division and Oceano Dunes District who assisted during one or more survey efforts include: Karen Feldheim, Sarah Cumber, Rick LeFlore, Joanna Iwanicha, Maggie Przybylski, and Greg Wilvert. On behalf of California State Parks, the author also appreciated the volunteer help of Steph Wald and Shellie Hamilton (Arroyo Grande Watershed Forum and Central Coast Salmon Enhancement), Dan Robinette (Point Reyes Bird Observatory), and students Anna LeFlore and Monica LeFlore. Most of these individuals also took the time to review and comment on draft survey summary reports.

LITERATURE CITED

- Rischbieter, D. 2004. Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary Monitoring Report. Oceano Dunes State Vehicular Recreation Area Pismo Dunes State Reserve. California Department of Parks and Recreation, Central Valley District, Columbia, CA.
- Rischbieter, D. 2006. Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary 2005 Monitoring Report. Oceano Dunes State Vehicular Recreation Area Pismo Dunes State Reserve. California Department of Parks and Recreation, Central Valley District, Columbia, CA.
- Rischbieter, D. 2007. Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary 2006 Monitoring Report. Oceano Dunes State Vehicular Recreation Area Pismo Dunes State Reserve. California Department of Parks and Recreation, Central Valley District, Columbia, CA.
- Rischbieter, D. Various dates, 2007. Aquatic Survey Arroyo Grande Creek and Lagoon Oceano Dunes SVRA, Pismo SB Dune Preserve (four reports, dated between April and December, 2007). California Department of Parks and Recreation, Central Valley District, Columbia, CA.

¹ Handling and storage of listed species, such as steelhead, legally requires coordination with NOAA Fisheries and/or the California Department of Fish and Game.