

Arroyo Grande Creek Watershed Management Plan Update



March 2009

Prepared for
The Department of Fish and Game
State of California

This management plan was funded by the California State Department of Fish and Game Fisheries Restoration Grant Program. The contents of this document do not necessarily reflect the views and policies of the CDFG, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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Executive Summary

The Arroyo Grande Creek Watershed Management Plan is a working documentation of history, information, and projects along the creek and its tributaries, and throughout the watershed. The plan describes the condition of the creek, identifies critical issues and limiting factors affecting steelhead in the watershed, and poses a set of recommendations to address the issues. The plan includes information on watershed history, steelhead data, habitat and channel typing, sediment and erosion conditions, and flow/dam releases. Information gathered from projects sponsored by partner organizations is included when available. Future updates of the plan will include additional information that becomes pertinent as projects are implemented and monitored.

Central Coast Salmon Enhancement (CCSE) produced the plan through grant funding by California Department of Fish and Game, Fisheries Restoration Grant Program. This grant follows grants that originally funded the establishment of the Arroyo Grande Watershed Forum (AGWF), a community wide watershed organization. During the original grant period a Steering Committee was established to share information among stakeholders. The Steering Committee self-selected members to form the Planning Subcommittee and the Assessment Subcommittee, each generating specific agreed-upon tasks in completing the management plan. In addition, a Technical Advisory Team was convened to provide technical input on the development of scopes of work for Habitat Typing and Hydrology/Geology studies, and to review reports emerging from those studies.

This plan identifies limiting factors affecting steelhead that will be used to view and assess the need for future projects. The plan also suggests priority projects related to critical issues put forth by the AGWF including habitat for steelhead, erosion/sedimentation, flood protection and water quality. Projects are ranked using criteria developed by the Steering Committee and the Technical Advisory Team.

The plan focuses on creek and watershed resources, community concerns and community educational opportunities. It is possible and desirable to link community concerns with restoration and enhancement activities for long-term community participation in defining future desired conditions for the creek and other watershed resources.

Summary of Findings

A preliminary assessment of the creek for steelhead habitat as well as assessment of the geomorphic and hydrologic conditions of the creek indicates that:

- There was agreement between the Arroyo Grande Creek Steering Committee and the Technical Advisory Committee that Arroyo Grande Creek should be recognized as an anadromous, natural production steelhead stream.
- In accordance with the accompanying Geomorphic and Hydrologic Assessment (Appendix B), the evolution of the creek corridor given human influences of increasing urbanization, Lopez Dam, and the flood control channel, along with the natural influences of underlying geology, is proceeding in such a way as to increase erosion along the banks of the creek, including head-cutting in the tributaries. Sediment is being deposited downstream, particularly in the Flood Control Channel.
- Water quality regarding nutrients is generally good. Sediment, as a water quality issue, needs to be addressed by stabilizing banks, increasing flood plain potential and continuing to work with landowners to install sediment reduction best management practices.
- Flood protection for the lower creek within the Flood Control Channel needs to be addressed through watershed-wide solutions coordinated among landowners, agencies and organizations.
- A comparison of historic versus present day available valley floor floodplain areas of Arroyo Grande Creek and its tributaries indicate that 15% of original floodplain area remains.

Limiting factors for steelhead in the Arroyo Grande Creek watershed include increasing sedimentation, decreasing spawning gravel quality and quantity, fish passage barriers, decreased water quantity, and increased water temperature due to a lack of canopy. The relatively good water quality in the watershed should be protected, as it is less expensive and more efficient to protect a water body's health than to remediate it once it has been impaired.

There is a considerable body of information regarding Arroyo Grande Creek. The culmination of several events are bringing to the forefront the need to address anew a coordinated management strategy for the watershed as the area continues to experience growth and land use changes.

Introduction and Background

Why do you care about the creek and watershed?

The Central Coast is fortunate to have creeks which are largely natural. I want to see a cooperative effort to restore and preserve this resource. The effort must be a win-win for conservationists, landowners, farmers and the entire community.

-Watershed Organization Participant

The Arroyo Grande Creek Management Plan (plan) was developed by Central Coast Salmon Enhancement, in association with a coalition of private landowners, as well as local, state and federal agency representatives. The management plan was funded through the California Department of Fish and Game (CDFG), Fisheries Restoration Grant Program to identify long term steelhead habitat restoration on public and/or private lands in the watershed by carrying out comprehensive watershed-wide planning activities. The plan provides CDFG and landowners of the Arroyo Grande Creek Watershed below Lopez Reservoir with recommendations and implementation concepts that will address problems affecting steelhead habitat in the watershed. The recommended actions are intended to improve steelhead fish habitat by reducing soil erosion and sedimentation through bank stabilization, assessing and removing fish passage barriers, improving water quality and riparian habitat, while respecting private property rights and addressing landowner concerns regarding flood control and in-channel vegetation management.

Introduction to the 2009 Update

The primary purpose of this update to the Arroyo Grande Creek Watershed Management Plan is to present findings of the Arroyo Grande Creek Steelhead Distribution and Abundance Survey conducted in 2006. The Survey was funded by a grant from the California Department of Fish and Game Fisheries Restoration Grant Program. The purpose of the survey was to establish a baseline protocol to be used to compare subsequent surveys following completion of restoration activities.

The update also includes an expanded history of steelhead presence in the main stem Arroyo Grande Creek using historical documents made available since the release of the first edition. In addition, the update includes information on progress of barrier modification projects and recommendations made in the

original plan as well as confirmed steelhead fish-kills that have occurred. Finally, the update includes a new section on pending changes in the watershed and integrates the following errata from the first edition.

Purpose and Need for the Plan

The purpose of this plan is to identify the existing conditions of and stresses to, steelhead habitat, recommend enhancement or management measures, suggest alternative land use practices, with recommendations and implementation concepts that will address “keystone” problems affecting steelhead habitat in the watershed. The plan also includes opportunities and priority sites for project implementation, and recommends additional specific project planning that will improve fish and wildlife habitat. Lastly, the plan incorporates relevant management objectives and strategies previously developed for the Arroyo Grande Creek in light of other projects that are occurring on the creek and that may influence physical and ecological processes of the creek.

The Planning Subcommittee generated the following list of reasons for developing a watershed wide management plan. The list was then presented to and approved by the entire steering committee:

- Education for community.
- Permitting process, “streamlining”
- Common message/definition
- Identifying limiting factors such as:
 - Biological
 - Structure
 - Function
 - Habitat
- Preservation of Agriculture
- Flood protection – determine causes and solutions
- Urban Impacts - define
- Pollution – define sources
- Projects will be more attractive to funding organizations as part of a plan
- Recommendations for landowners
- Non-regulatory approach to improving watershed
- Develop consensus among stakeholders
- Outline land management practices-Best Management Practices
- Identify projects-restoration

- Prioritization of projects
- Define desired outcomes
- Erosion & sediment – identify and reduce
- Riparian rights – define and protect
- Increase sustainability of projects and plan

Watershed Overview

The area of study for the plan includes only the portion of the Arroyo Grande Creek Watershed that is below the Lopez Lake Dam. The total area of the watershed downstream of the Dam is eighty-six (86) square miles. This represents a disconnection with the remaining sixty-seven (67) square miles of potentially suitable habitat above the Dam.

The Arroyo Grande Creek leaves Lopez Dam and flows through a narrowly sloped to gently sloped grade which empties into a flat valley that supports prime agricultural land and urban development; at the downstream end, it flows through the Arroyo Grande flood control channel into Oceano Dunes State Vehicle Recreation Area (ODSVRA) to the Pacific Ocean. The average slope is 4.2%. The Arroyo Grande Creek watershed, including its tributaries, drains approximately 150 square miles of land. The watershed includes the tributaries of Tally Ho, Tar Springs and Los Berros Creeks. Meadow Creek is a remnant marsh drainage system that enters Arroyo Grande Creek, just upstream of the confluence with the ocean. Floodgates were installed at the point where Meadow Creek meets the Arroyo Grande Creek Flood Control Channel levee to prevent storm surges from infiltrating the lowland marsh area and damaging homes in that area. Los Berros Creek is partially channelized and discharges into Arroyo Grande Creek's lower Flood Control Channel. The main stem Arroyo Grande Creek is 12.79 miles long, Los Berros Creek is 13.7 miles, Tar Springs 9.47 miles and Talley Ho is 4.25 miles in length, and Meadow Creek is 5.3 miles. Arroyo Grande Creek empties into an estuary adjacent to a lagoon, which is also the terminus of Meadow Creek.

Arroyo Grande Creek has been altered since the late 1950s for flood control, water supply and groundwater recharge purposes. The most substantial alterations include the flood control channel and Lopez Dam. The flood control channel was funded by PL 566 through the USDA Soil Conservation Service as a partnered project of the Arroyo Grande Soil Conservation Service and the Flood Control and Water Conservation District, and completed in 1958. Lopez Dam was completed in 1968 and filled by winter rains of 1968/69. The Dam collects and provides water to municipalities and releases for downstream users, while the flood control channel provides flood

protection to the productive farmlands of the Cienega Valley. The 100-year 24-hour rainfall event is 6.8 inches according to the “100-YR 24-HR Precipitation” map prepared by NOAA.

The Los Berros Creek Watershed includes the southeast section of the City of Arroyo Grande and portions of the unincorporated County area east of the City limits. The headwaters are located northeast of Temettate Ridge and south of Newsom Ridge. The watershed encompasses the canyon that contains Los Berros Road/Upper Los Berros Road from Valley Road to near the Suey Creek Road terminus. The Los Berros Creek Watershed is 28 square miles in size with a length of approximately 13.7 miles. The average slope of this drainage is 2.8 percent. The watershed consists of approximately 83 percent mountainous and foothill area and 17 percent valley area. Runoff from Temettate Creek and numerous other small tributaries accumulates prior to emptying into Los Berros Creek. The upstream 15 miles of Los Berros Creek’s drainage is gauged. A continuous record for years 1968-2000 is available. The base period runoff for the entire watershed was between 800 and 1100 acre feet each year (Water Resources of the Arroyo Grande-Nipomo Mesa Area, DWR, 2002).

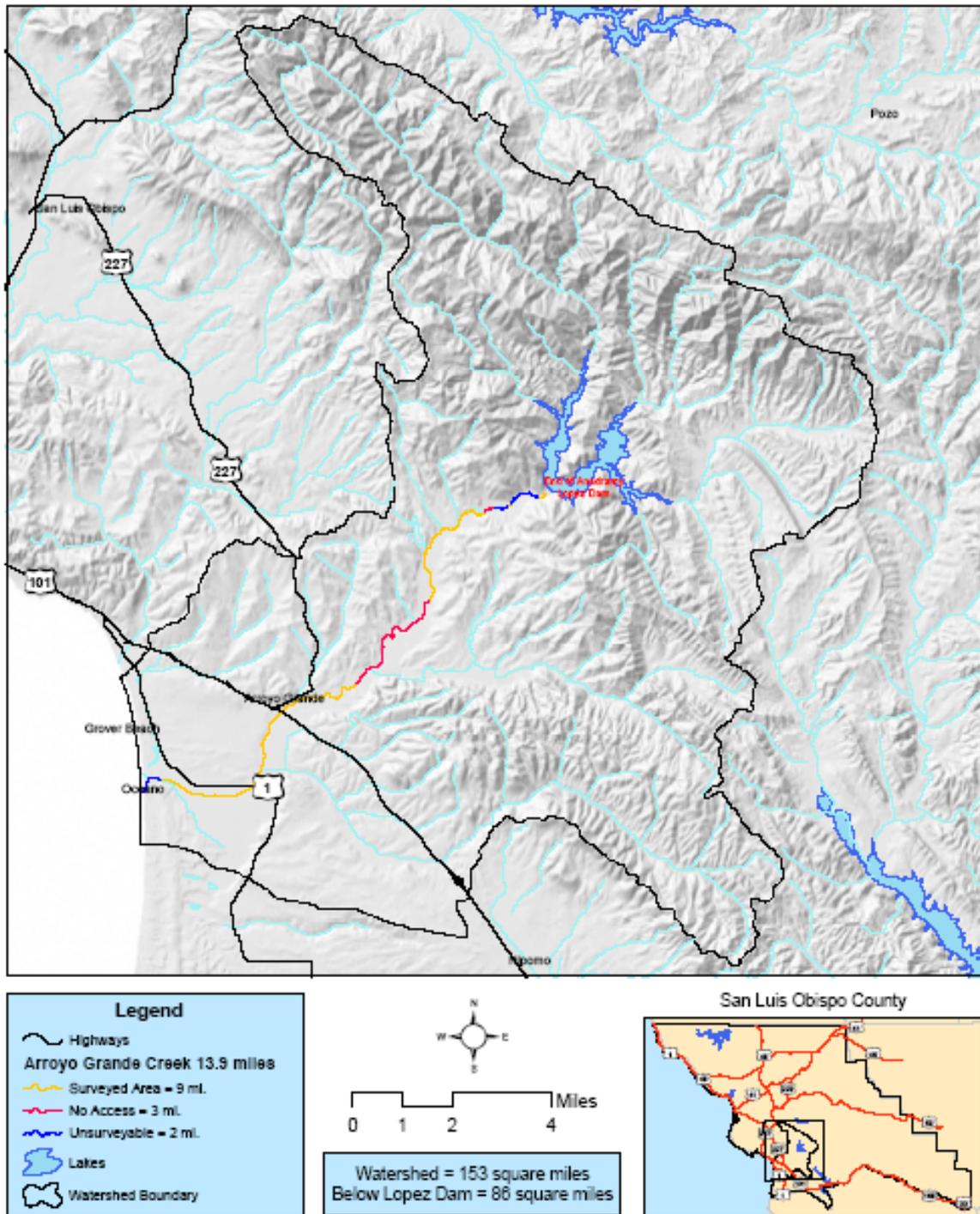
Tar Springs Creek flows in a westerly direction from its headwaters north of Newsom Ridge and south of Tar Spring Ridge to its confluence with Arroyo Grande Creek. Its watershed attains a maximum elevation of about 1700 feet upstream mean sea level and occupies almost 19 square miles. It consists of approximately 73 percent mountainous and foothill area and 27 percent valley area. Tar Springs Creek, currently an un-gauged drainage and many small tributaries contribute 1200 to 1400 acre-feet of runoff annually (Water Resources of the Arroyo Grande-Nipomo Mesa Area, DWR, 2002).

Talley Ho (Corbett Canyon Watershed area) Creek conveys water from the Corbett Canyon area to the Arroyo Grande Creek. The Corbett Canyon Watershed contains the middle northern section of the City of Arroyo Grande and portions of the unincorporated County area north of the City limits. This area encompasses the canyons that contain Corbett Canyon Road from East Branch Street to Verde Road and Carpenter Creek Road (Highway 227) from East Branch Street to Verde Road. The Corbett Canyon Watershed Area is 3,000 acres in size with a length of approximately four miles. The maximum elevation is 686 feet and the low point is 140 feet. The average slope of this drainage area is 2.6 percent. The 100-year 24-hour event is 6.2 inches (Wallace and Associates, 1999).

The Meadow Creek Watershed contains the northwest section of the City of Arroyo Grande and portions of the unincorporated area north of the City limits. The Meadow Creek Watershed covers 2,900 acres with a length of 2.8 miles and the lower section is remnant marshland. The headwaters come from Canyon No. 1, and Canyon No. 2 according to the Arroyo Grande NE Quad USGS map. This is located directly west of Carpenter Canyon, which feeds

Tally Ho Creek and encompasses the canyons that contain Oak Park Blvd., and Noyes Road from Highway 101 to Highway 227. The creek then flows through the southeast part of Pismo Beach towards Oceano. Its terminus is the Arroyo Grande Creek estuary in the flood control channel.

Figure 1. Arroyo Grande Creek Watershed



History of Arroyo Grande Creek

To describe the history of the creek, one might understand the history of the people who lived in the watershed and how their actions within their daily lives affected the creek, and how the creek, in turn, affected their lives.

The earliest inhabitants of the Arroyo Grande Valley were the northern Obispeno Chumash Indians. Village sites within the Valley and creek area date back 2,000 years or more (Brown, 2002). As the mission era unfolded, European settlers homesteaded the area and began developing agricultural pursuits.

Though it is difficult to definitively describe what Arroyo Grande Creek may have looked like in the past, historical accounts from early settlers, presented below, along with excerpts from a chronology of events written by the steering committee (Appendix A), provides a glimpse into the past. Quotes are from a book by Robert Brown, a local historian, entitled, “Story of the Arroyo Grande Creek,” published in 2002.

“..When Francisco and Manuela Branch came here in 1837 to establish their home, the valley was described as a ‘thicket of swamp and willow and cottonwood, a monte, as it was called by the Spanish...”

“...The great adobe, built by Branch, was midway up the valley on a hill just below the present day Branch School. From that point on to the ocean the creek had no channel; it just spread out in the monte, creating bogs and ponds as it made its way to the sea.”

“W. H. Findley, who came here in 1875 said in a speech delivered in 1911: ‘A large part of this beautiful valley was still covered with primeval forests through which the flood waters of the Arroyo Grande had been spreading for untold ages...we helped make the channel and reclaim the land. We felled the forests and built our homes...”

“As far as the creek is concerned, the early settler, Branch, did some clearing of the monte when he first arrived, but it wasn’t until 1863-64 that nature extended a hand and lent assistance by sending the Central Coast a devastating drought. A lot of wetlands dried up and it was easier to channel the creek.”

These accounts indicate that the historic channel likely had a much wider active floodplain, as compared to the incised condition it is in today. The entire valley bottom most likely consisted of a series of active channels, flood

channels, and abandoned channels with backwater wetlands that all occurred at, or near, the elevation of the current valley floor. The active channel likely shifted from one location to another based on sediment deposition, debris jams, or other obstructions. In some areas the channel was likely braided, where the floodplain was wide and a single thread channel where constrictions such as bedrock outcrops narrowed the floodplain.

Since then, much of the existing channel has been straightened, confined, constricted, and deepened. Floodplain areas have been converted to agricultural fields and the associated riparian forests have been removed. Many of these changes occurred in the late 1800's and early 1900's as evidenced in the historic accounts from Brown (2002):

“...The Arroyo Grande Creek became used as a boundary line and it kept shifting, it made good business sense to get a fixed line somewhere. The way the creek shifted around and tore up the land when it flooded, it was necessary to create a definite channel on the south side of the valley.”

“One of the interesting things about the Arroyo Grande Creek is that in the early days it flowed along the south side of the valley, but now it flows along the north side...”

“...The farmers all up and down the creek were working to straighten the creek and prevent further damage....”

“While the amount of damage done is great, including the loss of practically all bridges and the washing out of roads, it has some compensation. The channel of the Arroyo Grande Creek was never in better condition to carry future floods than it is now. The channel has been widened, many bad corners cut off and the creek bed is four to six feet deeper than it was...”

“...In the winter of 1969, before the dam, it became furious and frothy to the belly of the Harris Bridge, 30 feet above the gorge that Mr. Harris and some engineers had dynamited in the early part of the century, for the creek had a lethal history.”

The late 1800's, early 1900's was also a time when significant modifications were occurring elsewhere in the watershed, affecting tributary channels and the supply of sediment to the main stem. Alluvial valleys in the lower portions of some of the tributaries were being modified in similar ways to the Arroyo Grande main stem to channelize and straighten the natural stream channel. Conversion of the upland areas in the watershed was also occurring in the early 1900's. Hill slopes dominated by chaparral or oak woodland were being

converted to grassland for grazing or to orchards. With these conversions, it appears that much of the sediment that was eroded from these hill slopes was being stored in these tributary channels and/or increased the risk of flooding downstream within the Arroyo Grande main stem.

Beginning in the mid-1900s and accelerating in the late 1900's, urban development became an important agent of change in the Arroyo Grande Creek watershed. The communities comprising the Five Cities area began to grow and expand into agricultural lands within the Arroyo Grande valley and surrounding hills. Conversions of agricultural lands to urban uses meant increasing the total runoff from impervious surfaces within the community such as roads and homes. Flood protection became more of an issue.

The two single largest influences on the current configuration of the creek include the Flood Control Channel comprising the lower portion of the main stem Arroyo Grande Creek, as well as a portion of Los Berros Creek, and Lopez Dam and Reservoir. The Flood Control Channel, completed in 1961, is comprised of a set of levees and a constructed channel approximately three miles in length extending inland from the ocean. It was designed to convey water and sediment through the system and to protect the adjacent low-lying farmland from flooding that had been seen in the past. To maintain the flood control channel's capacity, over 60,000 cubic yards of sediment have been removed from the channel between 1983 and today.

Lopez Dam and Reservoir were completed in 1968. The Dam serves municipal and agricultural users. Water for municipal use is diverted directly from the dam to a small treatment reservoir located on a tributary to the lower main stem of Arroyo Grande Creek, and then delivered through a series of pumps and pipes to the end user. To deliver water to agricultural users, water is released directly into Arroyo Grande Creek and passively recharged into local ground water basins. Agricultural users then pump from wells for irrigation.

In her column in the Five Cities Times-Press Recorder, (October 10, 1990), Jean Hubbard, speaking of the early days of the Arroyo Grande Creek flowing through the village, reports "...the steelhead would fill the creek as they propelled their great silvery bodies inland, fueled by the biological urge to propagate."

While human activities were transforming the watershed, the habitat of Arroyo Grande Creek was undergoing modification as well, impacting fish and wildlife populations. As farm fields were created, active floodplain areas were reduced. Native vegetation was replaced with cultivars. Records of steelhead in the creek date to the late 1800's with more reliable reporting beginning in the 1940's. The population size prior to the installation of Lopez Dam and the flood control channel ranged from 500-5,000 in various reports. By the late 1950's, estimates of steelhead declined to 100-300 fish.

In 1994, a water rights complaint was filed against the County of San Luis Obispo by the California Sport Fishing Alliance (CalSPA). In 1997, South Central California Steelhead Trout were listed as threatened on the Endangered Species list. Prior to the work conducted for this plan, the last steelhead and habitat assessment was completed 1996. In 1998, two adult Steelhead trout were found stranded in a dry portion of Arroyo Grande Creek. In 2000, the County began studies to be used to develop a Habitat Conservation Plan (HCP) for the Protection of Steelhead and Red-legged Frogs. The draft HCP was released in February, 2004. The County then released an Interim Downstream Release Schedule (IDRS) for Lopez Reservoir in 2006 to allow the Lopez Project to continue to meet its contractual responsibilities, and requested that participating communities purchasing water from the project support the implementation of the IDRS with a resolution stating so from their respective governing boards. In-stream improvements were identified in the IRDS which included eight fish passage barriers that had been included in the original 2005 version of this plan. According to the County Public Works Department, the County and the National Marine Fisheries Service (NMFS), the agency responsible for protecting Steelhead trout on the federal level, continue to work toward an agreed upon in-stream flow program to protect Steelhead trout in the Arroyo Grande Creek watershed.

History of Arroyo Grande Watershed Forum

Recognizing a need for better communication and coordination among landowners and agencies, Central Coast Salmon Enhancement (CCSE) held a watershed-wide community meeting in 2000 where stakeholders discussed pertinent issues in the watershed. From this meeting, interested stakeholders (with the assistance of CCSE) initiated the Arroyo Grande Watershed Forum (AGWF). Based on the initial meeting, the public was invited to serve on a steering committee that would address the issues in the watershed concerning the community. At the time of its inception, the steering committee had an average of 20 active members representing all sectors of stakeholders. Agencies, farmers, ranchers, landowners, and interested individuals have attended regular meetings to establish prioritized watershed issues, conduct community outreach, and help with on the ground restoration projects. A diverse group of individuals allows a much larger group to be kept informed of what CCSE and other agencies hope to accomplish for all the stakeholders needs and the rehabilitation of the watershed.

Following the release of the original version of this plan, a watershed-wide MOU was drafted by the City of Arroyo Grande and circulated among potentially interested parties. The MOU identifies roles and responsibilities of potentially interested parties in the coordinated managing the watershed's resources. The MOU is included in Appendix L.

In addition, the City of Arroyo Grande convened the Arroyo Grande Creek Work Group comprised of CCSE, NRCS and the Coastal San Luis RCD, representatives of City lead staff from the Community Development Department, Parks and Recreation Department, Public Works Department, and the City Manager,. This group meets monthly to coordinate and cooperate on creek related projects. The City contributes up to \$75,000 annually to creek projects made available through a voter-approved sales tax increase.

Several documents were produced by the original steering committee and its subcommittees.

- A chronological history of events in the watershed was developed by the Assessment Subcommittee and is included in Appendix A.
- A series of questions posed to Forum participants and their answers is provided in Appendix H. Concerns voiced were then expanded upon in developing this plan.
- A Master Plan in outline form was produced that illustrates the breadth of agreement established during the course of the steering committee’s history and is provided in Appendix J.

Public Outreach Plan/Process

A public outreach plan was developed by the steering committee, and is being implemented by the committee and staff. The outreach plan details recommended strategies and actions that will serve to keep the community involved in watershed activities which will, in turn, allow for a more complete implementation of recommended projects. As part of the outreach plan, a “user-friendly” version of the plan will be produced and the plan will be posted on our web site. In addition, recommended projects, such as storm drain stenciling, that are appropriate for students, will be integrated into CCSE Watershed Education Programs.

Goals & Objectives

The following purpose statements were developed through consensus by the steering committee of the Arroyo Watershed Forum (AGWF) in March 2001.

- Develop a workable management plan for the Arroyo Grande watershed that protects its resources and uses.
- Promote access to, and stewardship of the watershed based on an understanding of how a healthy watershed functions.

- Enhance and restore both the natural habitat and the functional capacity of the creeks.
- Create an open dialogue through multi-faceted outreach to involve the community in the Arroyo Grande Watershed.
- Develop, foster and provide incentives for public and private landowners to incorporate conservation practices in to their various land uses, while protecting both property and water rights.
- Secure sustainable funding for projects consistent with the management plan.

Sponsors

Central Coast Salmon Enhancement
Coastal San Luis Resource Conservation District
California Department of Fish and Game, Fisheries Restoration Grant
Program

Existing Conditions

Why do you care about the creek and watershed?

I live near it, walk along it, and am concerned about the changes over the last decades. Wildlife is dwindling, litter is multiplying and I want to participate in positive changes.

-Watershed Organization Participant

Prior to development of a watershed organization for Arroyo Grande Creek, there lacked a method of bringing people together for discussion and prioritization of projects to restore and enhance the stream corridor. Long-standing issues related to reduction of native fisheries, flood protection and bank stability had been addressed through regulatory agencies and permitting processes on a development project by project basis.

Decision-making therefore occurred within the private and government sectors with little input from the general public other than that required through public hearings related to project development. The watershed organization serves as a venue to actively solicit public input on creek management and provides community educational opportunities related to creek functions, and enhancement and restoration of lost or degraded creek resources. This has led to regular gathering of community members for voluntary activities related to the creek.

While private landowners oversee the majority of daily watershed management activities, the County of San Luis Obispo plays a large role regarding the operation of Lopez Dam and for maintenance of the flood control channel (approximately the last three miles of the creek to the ocean). The way in which both facilities are operated and managed is an important component in determining methods of managing the watershed, particularly as regards hydrology, sediment movement and threatened and endangered species. These two projects had apparently, historically, been operated and managed separately. In 2005, a 218 vote was been passed allowing the County of San Luis Obispo to fund maintenance activities in perpetuity through the Zones 1 and 1A benefit districts. In addition, a recommendation to implement a Memorandum of Understanding among stakeholder agencies and

organizations that was made in the 2005 edition of the AGCWMP is moving toward execution, including the County as a signatory. Finally, the County of San Luis Obispo Flood Control and Water Conservation District and Zone 1/1A are developing the Arroyo Grande Creek Waterways Management Program to identify and strategically plan activities and projects for the long-term maintenance and restoration of the Flood Control Channel. These combined developments pave the way for a more cohesive creek management framework for the watershed.

Physical Features and Processes

Topography

Terrain in the watershed varies from hilly to level, ranging in elevation from 522 feet at Lopez Dam to sea level where the creek enters the ocean within the Oceano Dunes State Vehicle Riding Area (ODSVRA). The creek forms a habitat connectivity corridor between the Guadalupe-Nipomo Dunes Complex (GND) and the OSDVRA for the movement of wildlife, plant seed stock recruitment and expansion for exotic plant species. GND is a relatively intact coastal dune and dune scrub ecosystem varying in width from two to five miles. It extends from Pismo Beach to Point Sal, and roughly from Highway 1 west to the Pacific Ocean in Santa Barbara and San Luis Obispo Counties (Annual Report Habitat Monitoring Oceano Dunes SVRA, CA Department of Parks and Recreation, 2002).

Climate

The climate of the coastal sections of the watershed is moderate and relatively uniform due to the marine influence of the Pacific Ocean. This influence contributes to a typical Mediterranean climate with cool, moist winters and warm, dry summers.

There are differences as one goes from the areas adjacent to the ocean to areas in the foothills and mountains of the Santa Lucia Range and to the few inland valleys. One such valley is the Huasna area, within the Arroyo Grande Creek watershed, where plant communities begin to show signs of having less of a coastal influence and more of a continental inland climatic influence.

During summer months, warmer inland temperatures create a sharp pressure and temperature gradient between coastal and inland areas, which causes a strong offshore flow of cool marine air to replace the rising warm air. The result is often fog or low overcast directly adjacent to the coast in the early morning or late afternoon. This serves to lower mean summer temperatures, reduce annual amount of evapotranspiration, and increase total moisture available for plant growth.

Rains occur mainly between November and April and totals approximately 14-16 inches along the coast and higher along the ridge tops. Stored available soil moisture is typically depleted by June. Mean annual temperatures range from 54-60 degrees Fahrenheit with cooler temperatures along the coast (Soil Survey, U.S. Department of Agriculture, Soil Conservation Service, 1977).

Description of Current Conditions

Geologic Setting

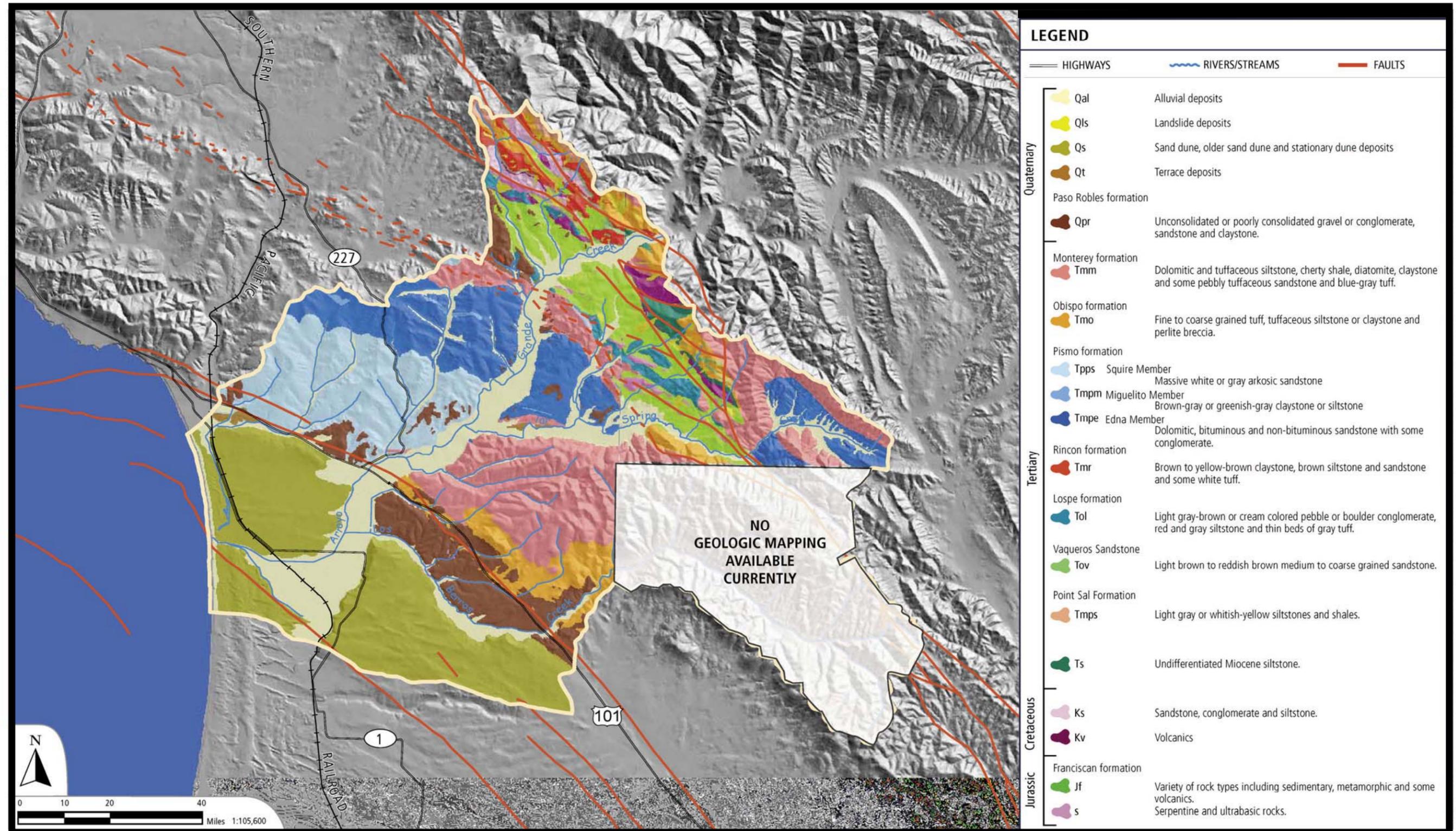
The Steering Committee elected to contract with a consultant to produce a hydrology study based on the collection and analysis of geologic and hydrologic data. CCSE, on behalf of the Steering Committee, contracted with Swanson Hydrology and Geomorphology (SH+G) in the spring of 2004. The technical memo produced is attached in Appendix B and includes detailed findings. Data sets compiled for the report are available upon request. Recommendations are integrated in the Critical Issues section; Erosion and Sedimentation.

Regional Geology

Arroyo Grande Creek watershed lies within a west-northwest-trending region of the southern central coastal area of California. It is part of a geomorphic transition between the adjoining north-northwest-trending Coast Ranges Geomorphic Province to the northeast and the west-trending Transverse Ranges Geomorphic Province to the south. The Transverse Ranges are described as an active fold and thrust belt (DWR, 2002).

The Coast Ranges Geomorphic Province, which extends from Monterey Bay to Santa Barbara, is distinguished by transpressive plate motion distributed over a complex system of active strike-slip faults, subparallel reverse and reverse-oblique faults, and folds (Clark and others, 1994). The Coast Range province consists of five structurally and stratigraphically distinct seismotectonic domains separated predominantly by faults with Quaternary activity. For a comprehensive discussion and maps of the regional geology, the reader is referred to Geological Society of America Special Paper 292 (Alterman and others, 1994) from which the following summary was derived.

Figure 2. Geologic Map of Arroyo Grande Creek Watershed



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Oceano lies within the Santa Maria Basin/San Luis Range domain, which extends approximately from San Luis Obispo southward to the Santa Ynez Mountains. This domain forms a structural and geomorphic transition between the Transverse Ranges and the southern California Coast Ranges. It consists of multiple faulted and folded structural blocks. Oceano lies near the western margin of the fault bounded by the San Luis Obispo/Pismo structural block, an uplifted block forming the core of the San Luis Range (Lettis et al., 1994). The Los Osos Fault, a southwest dipping reverse fault, forms the northeast boundary of the domain near Oceano, and the Wilmar Avenue Fault, a northeast dipping reverse fault, forms the southeast boundary of the block. Both faults show evidence of Quaternary activity.

Oceano sits atop an approximately 240 meter thick sequence of gently westward dipping unconsolidated sediment that has been the subject of geologic investigations prompted by salt-water intrusion into the coastal aquifer beneath Oceano (Weber and Hanamura, 1970). The uppermost sediment consists of a complexly interbedded sequence of Holocene dune sand, shallow marine or estuarine deposits, and fluvial sediments of Meadow and Arroyo Grande Creeks. These upper sediments rest on early Holocene/late Pleistocene marine and estuarine sediments. The thickness of the Holocene dune and fluvial sediment sequences was generally less than 10 meters. These sediments overlies approximately 100 meters of beds that are equivalent to the Lower Pleistocene Paso Robles Formation and 140 meters of upper Pliocene Careaga Sand, which is of primarily marine origin (Weber and Hanamura, 1970). These sediments in turn rest on sedimentary bedrock, the lower to upper Pliocene Pismo Sandstone.

The shallow (<30 meters) geology beneath Oceano consists of a complex sequence of interfingering unconsolidated sediments. The complexity results from the interaction of multiple geologic environments that are active in the area. These environments include the floodplains of Meadow and Arroyo Grande Creeks, aeolian (windblown) sand dunes, shallow bay, estuary, and marshes, and sandy beaches. The patterns of geologic deposition have been greatly influenced by a sea level fluctuation of about 100 meters associated with the last Ice Age, also known as the Wisconsin glacial stage. Before about 15,000 years ago, during the last Ice Age, little deposition occurred in the Oceano area and coastal streams eroded valleys into the landscape as they adjusted to the low sea level. From 15,000 to 6000 years ago, sea level rose rapidly as the continental ice sheets melted away. Since 6000 years ago, sea level has risen slowly, and the positions of the beaches, dunes, marshes, and river deposits near Oceano reflect the interplay of storms, floods, waves and tides on the beaches, dunes, marshes, and river floodplains. (Holzer et al., 2004.)

The watershed's soils are primarily loamy sand or sandy loam, with moderate to very high erosion potential (USDA-SCS, 1977). With the

installation of Lopez Dam, the natural source of coarser material to the creek was eliminated. Most of the premium size gravel for spawning has either moved out of the system or has been combined with finer material and become deposited in the flood control channel. The fragility of the substrate in the surrounding hills is illustrated by a storm event in March, 2001 which transported hundreds of cubic yards of fine sediment from a development upslope from Tally Ho Creek and deposited it in the storm drain confluence with Tally Ho Creek and downstream along main stem Arroyo Grande Creek to the ocean. Substantial sand banks remain along the creek due to that event. This sediment has caused numerous problems in the Tally Ho drainage, including flooding of residential areas. The fragility of underlying substrate is also demonstrated by the Lopez Dam retrofit. For the past few years, San Luis Obispo County Flood Control District maintained Lopez Reservoir at or less than 80 percent capacity due to concerns that its base material could liquefy and degrade in the event of a significant earthquake. A multi-million dollar retrofit project has recently been completed to address this issue. A more stable substrate has been imported to reinforce the base of the dam, and several more layers will be added to the structure itself. This retrofit project consumed approximately 100 yards of the creek immediately downstream of the dam.

Hydrology

Arroyo Grande Creek is part of the Estero Bay Hydrologic Unit (310.0), the Arroyo Grande Hydrologic Area (310.30), and the Oceano Hydrologic Sub-Area (310.31). Historical records indicate that prior to construction of Lopez Dam the creek was intermittent, with flow slowing or going sub-surface in the summer and early fall, with a sand bar forming at the mouth enclosing remaining surface waters in a small estuary.

Lopez Dam is the transition point from the higher gradient, entrenched creek profile, which is completely submerged, to the wider floodplain less than one mile downstream from the dam. Release from the dam through an outlet structure at the base of the dam into Arroyo Grande Creek generally occurs at a rate of 100 cubic feet per second or less. An average of 2,330 acre feet of water has been released from the reservoir into Arroyo Grande Creek each year, between April and October, to meet downstream demands for agricultural irrigation supplies (HCP, San Luis Obispo County, 2004). After construction of Lopez Dam, Arroyo Grande Creek appears to have continued its intermittent nature until 1998, when downstream releases for fisheries were instituted.

Extensive pre- and post-dam hydrologic records are included in the Draft Arroyo Grande Creek Habitat Conservation Plan for the Protection of Steelhead Trout and Red-legged Frog (HCP, San Luis Obispo County, 2004) and is summarized in Appendix B of this document (SH+G, 2004).

The following description of the watershed's hydrology is excerpted from the SH+G report.

Winter peak flow events on Arroyo Grande Creek can be characterized as flashy and are tied closely to the duration and magnitude of winter rainfall and antecedent soil moisture conditions. In most years, the rainy season begins in October, but the soil moisture demand of the surrounding areas is not met until a significant amount of precipitation has occurred. Once the ground is saturated, a greater percentage of the precipitation is converted to stream flow during storm runoff and the continual contribution of groundwater and subsurface flow to the surface channel increases the winter base flows. The precipitation is typically much lower during April, but the stream flows remain elevated as groundwater and subsurface flow continues to contribute water to the streams. By May, the water levels in the streams are typically low and relatively unresponsive to small spring thundershowers.

Lopez Dam has historically been managed to supply water for both municipal and agricultural use. Releases for groundwater recharge were closely monitored to obtain maximum infiltration into the groundwater basin. Recent concerns over habitat quality in lower Arroyo Grande Creek for Steelhead trout and California red-legged frog have resulted in an interim program (IDRS) to provide water for groundwater recharge, downstream agricultural usage and maintenance of natural systems.

A comprehensive analysis of the historic gauging record for Arroyo Grande Creek under both pre- and post-dam conditions was done by Stetson Engineering, Inc., during development of the Habitat Conservation Plan for San Luis Obispo County (Stetson, 2004) related to operations at Lopez Dam. Analysis of hydrologic data for the HCP included:

- Historical stream flow in Arroyo Grande Creek
- Pre- and post-dam hydrology
- Lopez Reservoir release and diversion data
- Reservoir inflow
- Unregulated Arroyo Grande Creek flow
- Comparison of unregulated and historical flow
- Classification of hydrologic water year types
- Comparison of flows for various hydrologic year types
- The Lopez Reservoir operation model

According to these data, the dam creates the most significant impact to stream flow in lower Arroyo Grande Creek. As is typically the case with large dams in semi-arid watersheds where water supply storage is the primary objective of reservoir operations, the presence of the dam reduces winter peak flow downstream and increases summer base flow. Based on data in the Stetson report, average annual inflow to the reservoir was estimated to be approximately 16,000 acre feet. The maximum storage volume based on a reservoir survey conducted in 2001 is approximately 49,400 acre feet. This suggests that, on average, approximately three years of runoff can be stored in the reservoir. Given that the reservoir has only spilled 14 times in 28 years of operation (data only analyzed to 1998 in Stetson report), peak flow events have either been muted or attenuated since construction of the dam. Additionally, lower discharge events, such as those that occur during dry periods or channel maintenance events, are muted completely. For example, Lopez Reservoir did not spill at all between 1986 and 1997 due to extended drought in the late 80's and early 90's. The US Army Corps of Engineers (USACE), Los Angeles District, conducted the most recent estimates of peak flow hydrology for the Arroyo Grande Creek channel in 1998-99. See Appendix B for a summary of the results of the USACE study and additional detail on dam hydrology.

Over half of the project's Safe Yield (4,530 acre-feet per year) has been apportioned by agreements to contract agencies that are primarily municipal water purveyors. The remaining 4,220 acre-feet per year is reserved for downstream releases to maintain stream flows and groundwater recharge downstream. Management of the releases to avoid surface flow to the ocean has generally resulted in releases less than the 4,200 AFY; this water is periodically offered to the contractors as surplus water. (County of SLO, Urban Water Management Plan, 2005, pg10)

Swanson Hydrology and Geomorphology conducted a preliminary survey of summer base flow conditions on the Arroyo Grande main stem and primary tributaries (where public access was available) as part of the hydrology study. The purpose was to assess where surface water persisted through the summer months. The results are shown in Figure 3. As a result of releases from Lopez Reservoir, flow persisted through the summer months along the entire main stem. In Los Berros Creek and Tar Springs Creek, surface flow is intermittent with a pattern most likely associated with the depth of alluvium and bedrock outcrops. Corbett Creek (Tally Ho), Carpenter Creek, and Newsom Creek are typically dry during summer months.

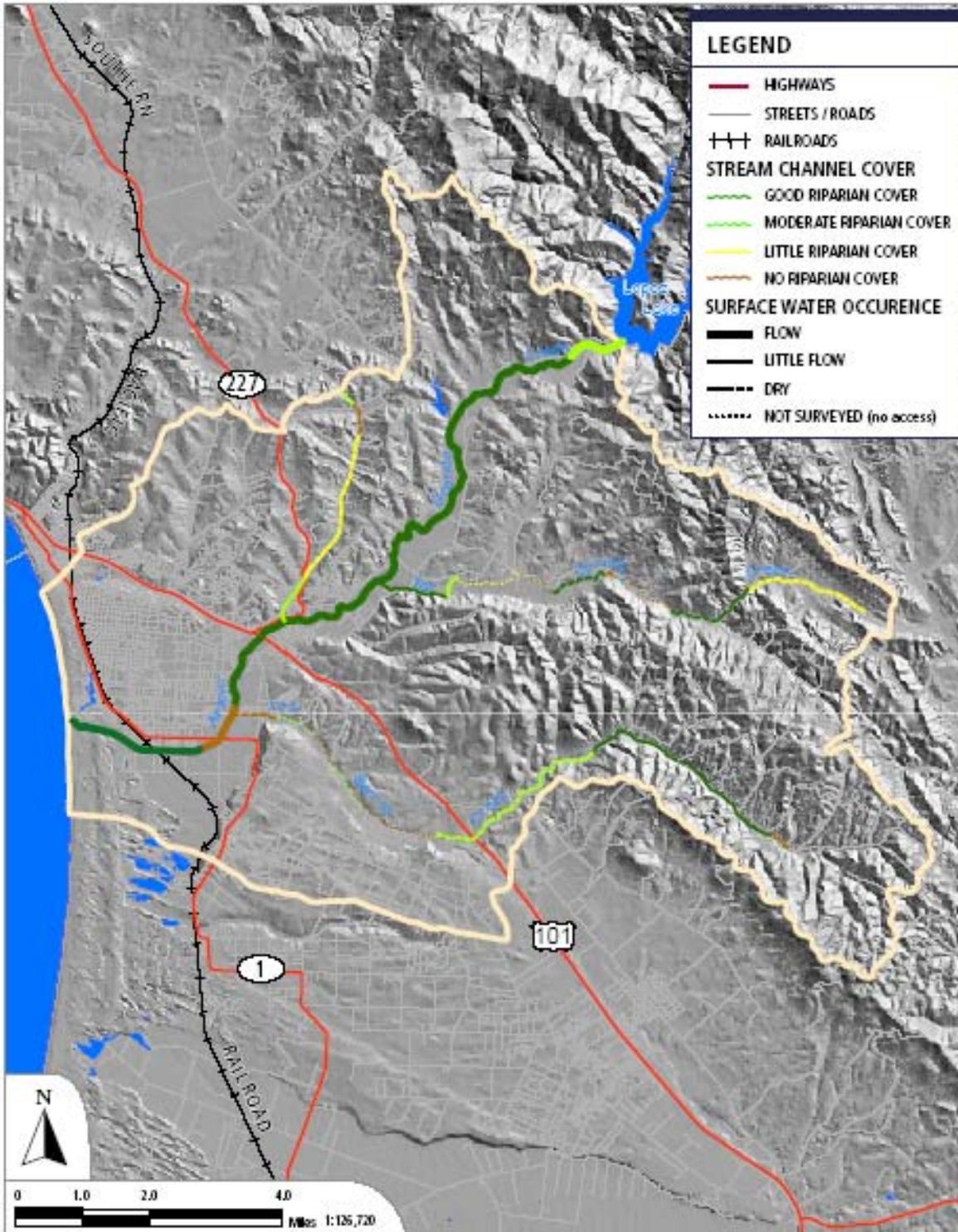
Morphology and Active Channel

In general, the current morphology of the Arroyo Grande Creek channel consists of an incised, single thread channel from the confluence of Los Berros Creek upstream to Lopez Dam. Downstream of the Los Berros

Creek confluence the channel is slightly incised and constrained by levees on both sides of the creek. Significant variability exists in the level of incision but current morphology does not resemble historic morphology.

The historic floodplain/active channel of Arroyo Grande Creek as measured on 1939 aerial photographs is 4,685 acres. Aerial photographs from 2002 indicate the current floodplain/active channel is 722 acres. This represents a reduction of almost 4,000 acres.

Figure 3. Cover and Surface Water



Biology

Fish and other wildlife species are present in these creeks, including two federally listed species: Steelhead trout and California red-legged frog. Steelhead trout population assessments were completed that are discussed below. Several adults have been found in Arroyo Grande Creek including individuals measuring up to 32 inches. Juvenile steelhead habitat was inventoried in 1999 in conjunction with the development of the HCP and again in 2005 in conjunction with the development of the Arroyo Grande Creek WMP. Population assessments were completed in 1996 as part of the HCP and in 2006 as part of this plan update.

A California Natural Diversity Database (CNDDDB) search was conducted for Oceano and Arroyo Grande and is included in Appendix C. Due to the nature of this watershed plan, site surveys to document the occurrence of species listed in the CNDDDB were not conducted. The County of San Luis Obispo did conduct vegetation surveys during the development of the HCP, and the November, 2001, Oceano Specific Plan and Environmental Impact Report includes species lists and a description of biological resources, special status species and important biological resource areas, as well as applicable regulations regarding the resources. The County of San Luis Obispo also commissioned a Habitat Assessment for the Arroyo Grande Creek Flood Control Project (July, 2000), which detailed sensitive plant and wildlife species for the flood control channel area of Arroyo Grande Creek. A Biological Assessment was conducted for the County in 2006 along the flood control channel in association with the Arroyo Grande Creek Erosion, Sedimentation and Flooding Alternatives Study conducted for the Coastal San Luis Resource Conservation District (RCD).

The HCP provides the most recent extensive survey of vegetation and wildlife for Arroyo Grande Creek. It includes sections related to stream flow, habitat conditions, vegetation, channel form, general land use, fish and other wildlife, and life histories of steelhead and California red-legged frog. A fisheries assessment was then conducted in October, 2006 by Swanson Hydrology and Geomorphology and describes the distribution and abundance of fish species in the creek.

Steelhead in the Watershed

Arroyo Grande Creek and tributaries have historically had significant steelhead runs. Spawning occurred in Arroyo Grande Creek and its tributary, Lopez Canyon Creek. Titus (1994) writes that 1895 reports call Lopez Canyon Creek, “the best-known trout stream in San Luis Obispo County.”

In 1961, the Department of Fish and Game conducted interviews with local landowners and sportsmen to gain insight into the size of the steelhead fishery prior the construction of Lopez dam. Findings concluded that in 1940-41 very large runs of thousands of fish occurred, and that in 1949-50, 1955-56 and 1957-58 fair runs of hundreds of fish occurred (Elwell, 1961). It was concluded that steelhead runs in Arroyo Grande Creek average at least 1000 fish annually in the 1940's and that since that time runs have decreased to an average of 100+ fish annually since the 1950's. Other assessments substantiate these findings.

Lopez Dam, built in the 1960's, blocked steelhead access to spawning and rearing habitats in the upper reaches of the watershed. Several fisheries assessments from 1959 to 1996 were reviewed to identify changes to steelhead runs due to Lopez dam. The assessments state that Arroyo Grande Creek should continue to be managed as a steelhead spawning and nursery stream until completion of the reservoir (Needham & Smedley, 1959 and Schreiber, 1960). These assessments also recognized the need for a different management plan upon dam completion and the negative impacts to steelhead runs due to water diversion (Elwell, 1962; Hinton, 1961; Needham & Smedley, 1959). In the 1970's, it was noted that silting, pollution and habitat degradation were problems in the watershed (Stone, 1978). A summary of these assessments and associated stream data is provided in Appendix M (stream survey history).

Life Cycle and Habitat of Steelhead

Steelhead trout, *Oncorhynchus mykiss*, are anadromous fish, that is, they live in the ocean but migrate into streams to spawn. Adult fish typically migrate into coastal streams from December to April after rains increase stream flows. Adult female fish prepare a redd (i.e., nest) in clean gravel and cobble substrate. Suitable spawning substrate is clean (i.e., containing little or no fine sediment) and ranges in size from that of pea to apple sized gravel/cobble. Mating occurs over the redd where the eggs are deposited; a male fish or multiple males fertilize the eggs; and the female covers the fertilized eggs with gravels and cobbles which allows for safe incubation. Redds will be constructed where cool oxygenated water flows through the redd, such as a pool tail crest. Unlike salmon, steelhead adults do not automatically die after spawning, and can return during multiple years to spawn in their natal stream. Spawned- out fish typically move downstream after spawning and return to the ocean.

The eggs typically hatch in the redd after approximately three to four weeks. However, the fry do not emerge from the redd until approximately two to three weeks later at which time they move to quiet water along stream margins. Environmental conditions, such as water temperature, play a large role in the timing of these events.

Juveniles typically spend up to three years in freshwater, eventually moving from stream margins into riffles where they feed on drifting invertebrates. The best steelhead habitat features cool, clear, fast-flowing water which delivers invertebrate food in the drift. In addition, riparian vegetation, undercut banks, large and small woody debris, and large cobbles and boulders contribute to invertebrate production. When water temperature increases, fish may utilize pools, taking refuge in the cool, oxygenated water of the pool depths.

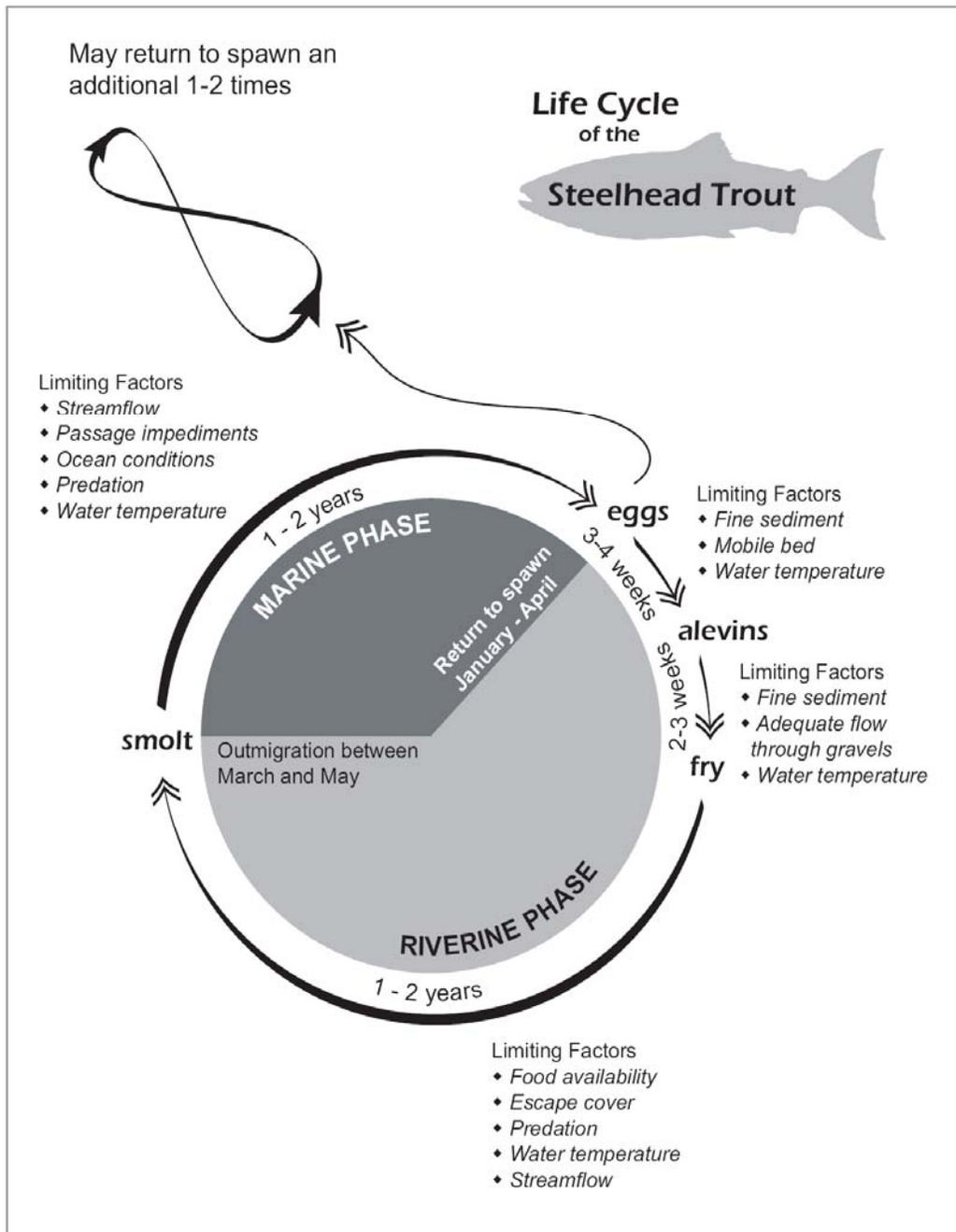
Juvenile steelhead can migrate out to sea when they are one to three years old, depending on the productivity (e.g., food abundance) and temperature of the stream, and how fast they grow. They typically spend some time smolting in an estuary/lagoon environment. During this time their color changes from spotted to silver, and their gills adjust to salt water. Once they have smolted, they migrate into the ocean where they will spend one to two years feeding and growing before returning to their natal stream to spawn.

The life cycle of steelhead varies by individual. The typical life cycle will favor anadromy, with rearing in freshwater for one to three years, migrating to the ocean for adult growth, then returning to the natal creek for reproduction. There is the potential for some juveniles to remain as residents of the creek, but the majority will out-migrate when conditions allow. Nomenclature of steelhead versus Rainbow trout by CDFG and NOAA Fisheries is based on location. If the fish are in a coastal stream below a permanent passage barrier, they are classified as steelhead. If they are upstream of a permanent migration passage barrier, they are classified as Rainbow trout. Genetic differences between fish upstream and downstream of migration barriers are being investigated by NOAA Fisheries biologists at the Santa Cruz, CA lab (Heidi Fish, pers.com).

Steelhead Habitat Criteria

Steelhead trout populations are defined by Evolutionary Significant Units (ESU) which is based on genetic and life history data. Steelhead in Arroyo Grande Creek are part of the South-Central California Coastal ESU, which extends from the Pajaro River (boundary of Santa Cruz and Monterey counties) in the north, to Point Conception (Santa Barbara County) in the south. These fish have evolved under environmental conditions typical to this area. As a result, habitat conditions such as quantity and timing of rainfall, water temperature, and climate, differ significantly from habitat conditions found further north or further south of this ESU.

Figure 4. Life Cycle of the Steelhead Trout



Depth of water

Steelhead prefer to spawn in an average depth of approximately 14 inches with a range of 6 – 24 inches. Fry prefer water approximately eight inches deep and can be found in water from 2 to 14 inches deep. Parr prefer depths of approximately 10 inches but can be found in water from 10 to 20 inches deep (Bovee, 1978). Migration of steelhead has been reported to require a minimum of seven inches of water. Stream conditions seem to be a more significant factor to migration potential. Excessive stream velocities and barriers, which limit swimming and jumping efficacy, are more significant in hindering or blocking migration (Barnhart 1986).

Velocity of flow

Steelhead spawn in water velocities ranging from 1.0 to 3.6 feet per second but prefer velocities on average of 2.0 feet per second (Bovee, 1978). The ability of an adult to negotiate different velocities is a function of size. A larger fish can overcome and spawn in higher velocities than can a smaller size fish.

Substrate

Substrate has the most significant impact on the ability of steelhead to spawn successfully. If there is not enough coarse gravel, the eggs will not survive. Good inter-gravel flow is required to bring fresh, clean water to sustain the developing eggs and increase the survival of the hatch. Substrates ranging in size from 0.2 to 4.0 inches in diameter are typically preferable. The eggs will suffocate if the gravel becomes clogged with fine sediment. Permeability of the gravel needs to be high to ensure survival of the eggs and should contain less than 5% sand and silt. Fry and juvenile steelhead generally prefer cobble/rubble, which is slightly larger than substrate typically used by adults for spawning (Bovee, 1978).

Water Temperature

While Steelhead trout are relatively resilient, temperature remains critical to their survival. Genetic differences between steelhead runs appears to account for differing abilities of fish along the west coast to survive in a wide range of temperature regimes. Optimal water temperatures expressed as degrees Fahrenheit for various life stages of steelhead are as follows: adult migration 46-52°, spawning 39-52°, incubation and emergence 48-52°, fry and juvenile rearing 45-60°, and smoltification less than 57°. Some steelhead runs are known to exist in relatively higher temperature regimes, some of which exceed the preferred ranges for considerable lengths of time (e.g. steelhead in south coastal streams) (McEwen, 1996). At high temperatures, steelhead survive oxygen concentrations as low as 1.5-2.0 milligrams per liter (mg/l) for brief periods, though concentrations close to saturation are normally required for growth. At dissolved oxygen levels of <5-6 mg/l, stress can begin to effect fish and other organisms. Saturation is a measure of quantity of dissolved oxygen in water at a given

temperature. Cold water can hold more dissolved oxygen than warm water. Water at 28 degrees centigrade, for example, will be 100 percent saturated with 8 mg/l dissolved oxygen. Water at 8 degrees centigrade can hold up to 12 parts per million dissolved oxygen before it is referred to as 100 percent saturated. Fish activity is reduced as oxygen concentration drops, even at low temperatures (Moyle, 2002).

Steelhead Status

Steelhead trout were listed under the Endangered Species Act (ESA) in August 18, 1997 and reaffirmed on January 5, 2006. Steelhead in the South-Central Coastal California ESU are listed as threatened under the ESA. Section 3 of the ESA defines endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range." Threatened species is defined as "any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Critical Habitat and Essential Fish Habitat designations have been under development. NOAA Fisheries designated Arroyo Creek and all other coastal rivers and streams in the region as Critical Habitat (NMFS, 2000). The Critical Habitat designation had been vacated by court order pending revision(s) to the economic analysis (NOAA Fisheries, 2002) with designations finalized September 2, 2005 (NOAA Fisheries, 2005).

Population Status in Arroyo Grande Creek Watershed

Arroyo Grande Creek steelhead population surveys were conducted in 1961, 1972, 1996, 1999 and 2006. In addition, California State Parks conducted a general fisheries survey from late 2003 through the present in the lagoon area. The 1961 survey included interviews with landowners and sportsman and indicated population levels ranging from 100-5000 adult steelhead depending on the amount of rain. All presently available information from 1961 indicates average annual runs of approximately 1,000 adults. More fish were reported during years with more rain. From 1941 on, the run was reported to be severely reduced. No steelhead sampling was conducted during the 1972 survey, but reports of steelhead being caught were reported.

The 1996 population estimate of juvenile steelhead in Arroyo Grande Creek below Lopez Reservoir was approximately 7,000 fish, about 3,500 young-of-the-year sized and 3,500 yearling-sized fish (Alley, 1996).

During the 1999 survey, sampling was done at one of the four survey locations along the creek. Twenty-seven (27) steelhead were found in the 90-foot long Strother Park section. The fish ranged in size from 62 – 197 millimeters fork length (FL) which is the measurement from the tip of the nose to the middle of the caudal fin, or tail. Three of the four larger

steelhead (> 145 mm FL) had the appearance of smolts (CDFG Stream Survey, 1999).

NOAA Fisheries consulted informally during Fall 2000 regarding steelhead and a sediment removal and vegetation maintenance project by the County of San Luis Obispo for the flood control channel. The NOAA Fisheries memo outlined measures to minimize adverse impacts on steelhead and critical habitat. (NOAA, 2000).

Appendix M contains a compilation of surveys and the following data types for each survey, if known: Area Observed, Reach (mi), Altitude (ft.), Gradient, Width (ft.), Depth (in.), Flow (c.f.s.), Velocity (ft/sec), Bottom, Spawning Areas, Pools, Steelhead, Barriers, Diversions, and Temperature (°F).

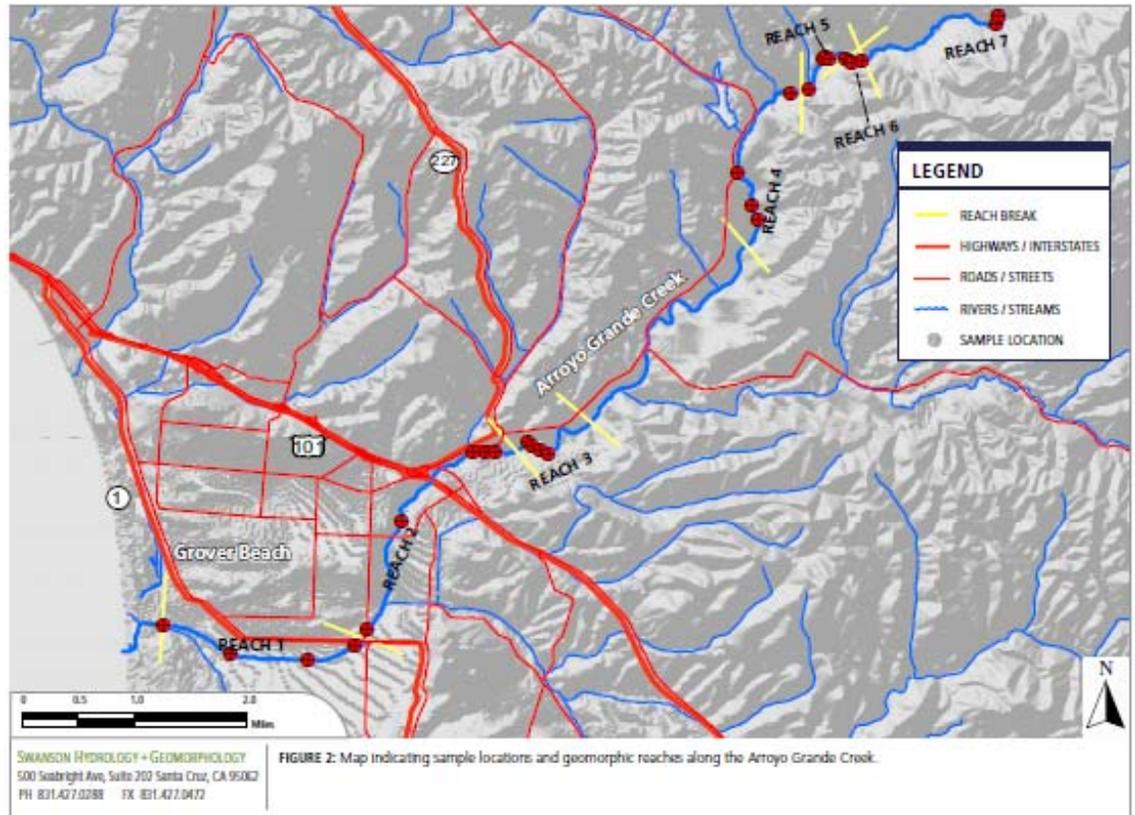
2006 Population Study

In 2006, Swanson Hydrologic and Geomorphology completed the *Arroyo Grande Creek Steelhead Distribution and Abundance Survey* as contracted by CCSE. Visual snorkeling surveys and electrofishing were conducted to establish a baseline for fish distribution and abundance that could be used to evaluate improvements in habitat conditions over time.

A total of 30 sampling locations were surveyed in October of 2006 on lower Arroyo Grande Creek within 7 identified reaches. Steelhead were observed in all but 4 sampling locations. In addition, a total of 8 other species were observed including Sacramento sucker (Catostomus occidentalis), California roach (Hesperoleucus symmetricus), threespine stickleback (Gasterosteus aculeatus), speckled dace (Rhinichthys osculus), sculpin (Cottus spp.), bullhead catfish (Ameiurus spp.), an undetermined centrarchid, and mosquitofish (Gambusia affinis).

The most common species observed during the survey were Sacramento sucker, California roach, and threespine stickleback.

Figure 5. Sample Locations and Geomorphic Reaches



Source: Swanson Hydrology + Geomorphology, 2008

The non-native fish species, including bullhead, centrarchids, and mosquitofish, were only observed in reaches closer to Lopez Reservoir, suggesting that the reservoir may be a source of these species in the system. Native species, including steelhead and non-steelhead natives, became less abundant closer to Lopez Reservoir suggesting unfavorable habitat conditions or possibly interactions with non-native species.

Figure 6. Fish Species Distribution, Snorkel and Electrofishing Surveys

Reach	Sample Unit #	Steelhead	Sacramento Sucker	California Roach	Threespine Stickleback	Speckled Dace	Sculpin	Bullhead Catfish	Centrarchid (species undetermined)	Mosquitofish
1	1	X		X	X	X	X			
	2	X		X	X	X				
	3	X	X	X	X	X	X			
	4	X	X	X	X		X			
2	5		X	X	X	X				
	6			X			X			
	7	X	X	X			X			
	8	X	X	X		X	X	X		
	9	X	X	X	X					
3	10	X		X	X	X				
	11	X	X	X	X					
	12	X	X	X	X	X				
	13	X	X	X	X	X				
4	14	X	X	X	X	X				
	15	X	X	X						
	16	X	X							
	18	X								
5	19	X			X					
	20	X	X	X	X	X				
	21	X	X	X						
	22	X	X	X	X					
6	23	X	X					X		
	24	X	X	X						
	25	X								
	26		X							
7	28	X	X						X	X
	29		X							
	30	X					X		X	

Note: Gray highlights denote habitat units that were electrofished and visually sampled.

Source: Swanson Hydrology + Geomorphology, Table 2, 2006

Steelhead were present in all 7 reaches but were found in relatively low numbers. Steelhead were most abundant in the upper portions of Reach 2, in Reach 3, and the lower portion of Reach 4. Steelhead length distribution in electrofishing surveys indicated the following size and age-class distributions: young-of-year or 0+ fish = 60-90 mm fork length; 1+ fish = 110-140 mm fork length; 2+ or older fish = >150 mm fork length. The length frequency distribution indicates that young-of-year fish may have grown larger than was anticipated (up to 90mm or 3.5 inches instead of 3 inches) and the age class designations used in the visual surveys may have resulted in counting some young-of-year fish as 1+. Correlations between electrofishing and visual survey results for steelhead were poor.

A rough estimate of trout density was developed from the electrofishing and snorkel data (Table 6), by using the maximum of the electrofishing catch or snorkel survey counts of 1+ and 2+ trout (usually the snorkel count). Young-of-year fish were excluded from the analysis since their numbers are highly variable and the abundance of older trout is a better indication of a streams

capacity to produce steelhead smolts. When these values are compared to estimated densities of smolt-sized fish in Central California streams in the 1980s, trout densities in Arroyo Grande Creek would be regarded as at the low end of the spectrum.

Figure 7. Density estimates for 1+ and 2+ steelhead

Unit #	Length Sampled (ft)	1+ and 2+ Trout in Electrofishing Survey	1+ and 2+ Trout in Snorkel Survey	Number 1+ and 2+ Trout per 100 feet sampled
1	185		1	0.5
2	145.5		0	0.0
3	217.4	0	0	0.0
4	180		2	1.1
5	114		0	0.0
6	250		0	0.0
7	95		4	4.2
8	119	4	12	10.1
9	103		2	1.9
10	162		6	3.7
11	125		2	1.6
12	153		8	5.2
13	116	3	4	3.4
14	77	1	4	5.2
15	102		1	1.0
16	143		0	0.0
18	93		0	0.0
19	111		0	0.0
20	82		8	9.8
21	81		2	2.5
22	59	6	0	10.2
23	74.4	3	3	4.0
24	82		1	1.2
25	75		2	2.7
26	52		0	0.0
28	120	0	4	3.3
29	62		0	0.0
30	89		9	10.1
Average				2.9

NOTE: Gray highlights denote habitat units that were electrofished and visually sampled.

Source: Swanson Hydrology + Geomorphology, Table 6, 2006

The following is the discussion and interpretation of these findings.

Low numbers of steelhead visually observed and sampled during the survey are consistent with previous studies on Arroyo Grande Creek which have suggested low steelhead adult returns, poor quality habitat, and impacts from loss of historic, high quality habitat present above Lopez Reservoir. The observations summarized in this report suggest that the best habitat present in the system occurs in the upper portions of Reach 2, Reach 3, and the lower portion of Reach 4. Habitat conditions in the upper portions of Reaches 4, 5, 6, and 7 appear to be significantly

influenced by a lack of high flows due to regulation by Lopez Reservoir. The lack of channel flushing flows has resulted in a narrow low-flow channel that lacks complexity (Close and Smith, 2004). In addition, much of the bed of the channel consists primarily of silt that likely limits spawning. The presence of excessive fine sediment loads in streams has been shown to limit macroinvertebrate production, reduce the amount of cover habitat available to juvenile salmonids, and limit successful spawning (Terhune, 1958; McNeil and Ahnell, 1964; Vaux, 1962; Cooper, 1965; Daykin, 1965). Portions of Reaches 2, 3, and 4 probably exhibit higher steelhead abundance because unregulated flows from Los Berros, Tar Springs, and Corbett/Carpenter Creeks allow for introduction of coarse material for spawning and flushing of fine sediment from pools and riffles.

Lagoon Population Studies

In 2004, California State Parks completed the *Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Summary Monitoring Report* (Appendix K). The report describes qualitative fisheries sampling completed in the lowest half mile of Arroyo Grande Creek and including the Ocean Lagoon. Electrofishing, seining, dip-netting and direct observation data were used to determine species use of habitat and gauge the degree to which Park activities may be impacting the fishery and aquatic habitat. The following is a summary of findings to 2004.

A total of 15 fish species were collected during the duration of the study, including eight species native to lower Arroyo Grande Creek and two other native California species. Among the latter were Sacramento sucker, an extension of the known range of this species. Noteworthy among the native fish collected were steelhead, a federally-listed Threatened species, regularly present in the study reach in low numbers. Non-native fish appeared present irregularly and also in low numbers. Though Park activities appeared to have little impact on the fishery or habitat, much of the study reach dried up for about 3 months in 2004 and decimated the fishery of the lower creek and lagoon. Future sampling and monitoring could document the recovery of this fishery following resumption of surface flow, as well as document the impacts of likely future disturbances.

Five juvenile steelhead were captured and measured during survey sampling. Reports of one dead adult steelhead (~25 inches long), and one live adult returned to the ocean were also included. The discussion section

of the report notes complexity of the fish assemblage and effects of traffic volume in the SVRA on fish and/or their habitat.

No known previous study of Arroyo Grande Creek has collected as many species as observed within the Park reach. In contrast, the first known published survey of San Luis Obispo County streams (including Arroyo Grande Creek) described County fish fauna in these terms: "In no other stream of the United States in which an equal amount of water flows has so short a list [of fishes] been recorded" (Jordan 1895). However, readily evident by the range of hydrologic conditions observed in 2004, the lower reaches of Arroyo Grande are potentially subject to severe disturbance with commensurate impact to the fishery. While additional information and discussion related to each of the seven surveys can be found within the summary reports (August 2003-November 2004) prepared for each individual fish-sampling survey (Rischbieter, various dates), the following discussion recaps the most significant observations and recommendations compiled over the study period.

Evaluation

With the exception of occasional Centrarchids and the ubiquitous mosquitofish, the fishes of lower Arroyo Grande Creek represent a rather remarkable assemblage of California native fish (though California roach and Sacramento sucker are not native to this watershed). Some species' use of the lagoon and adjacent habitat appears seasonal, and some are permanent residents. Hydrologic and other impacts to this dynamic fishery are discussed below.

One purpose of this monitoring was to gauge the degree to which high traffic volume in the SVRA (including vehicles fording the seasonal lagoon outlet) affects fish or their habitat; no significant vehicle impacts to fish or their habitat were observed. However, a seasonal vehicle closure of most of the back-beach reach was probably partly responsible for minimizing impacts. When allowed, vehicle traffic may disturb several common species' rearing habitat in the back-beach reach: staghorn sculpin, threespine stickleback, and striped mullet appear the species most likely subject to this periodic disturbance. In comparison, fish typically do not use the surf-line outlet reach, where vehicles most frequently and efficiently ford the stream. Furthermore, the quality of habitat in this lowest reach (sand banks, sandy channel) does not appear to be significantly altered by vehicle traffic, owing largely to the naturally transitory and dynamic nature of sandy features near the surf line and through the beach.

It appears the most significant potential impact to the fishery, including sensitive species such as steelhead, relates to the seasonality of surface flow. Cessation of flow across the beach area (lagoon closure) is a frequent but not necessarily annual occurrence. Lagoon water quality usually degrades during closed periods, especially if inflow is low, and poor water quality and lack of access to and from the ocean can impact steelhead. Even more severe, complete loss of inflow to the lagoon has occurred over a dozen times since 1940, though less frequently (if at all) since completion of Lopez Dam in 1969 (Stetson Engineers et al. 2004). In 2004, severe dewatering was likely due to local agricultural groundwater pumping that exceeded the recharge available from the creek. Future dewatering of this reach of stream is to be expected; the degree to which the fishery reestablishes itself will likely depend upon the number of years between such disturbances. However, recolonization by fishes can be expected to occur by both freshwater (from upstream) and marine (from ocean) species because of the normally-rich resources afforded by the lagoon environment.

The relationship between success of steelhead in Arroyo Grande Creek and variations in flow regime was documented decades ago. Hinton (1961) deduced that adult run size varied between wet and dry years and numbered in the hundreds, and occasionally thousands, up until about 1940. A series of dry years thereafter substantially reduced that fishery, and the construction of Lopez Dam in 1969 and "deteriorating" conditions downstream were believed to have further reduced runs (Schuler 1972). Indeed, noteworthy spawning and rearing habitat was observed to be in a tributary upstream of where Lopez Dam is now situated (Jordan 1895). Nevertheless, steelhead persist throughout much of the 15 miles of Arroyo Grande Creek below the dam (Stetson Engineers et al. 2004) and appear to use the Park reach in low numbers for late-stage rearing (smoltification). Current adult runs may only number in the dozens, perhaps occasionally low-hundreds in wetter years, but in any case all successful steelhead use the Park reach for migration. Adult runs should be expected annually unless low streamflow causes the lagoon to close for unusually-long winter periods.

The presence of Sacramento sucker is noteworthy because Arroyo Grande Creek is south of the expected range of this species. Some species not observed during this study may also be expected to occur periodically: introduced species such as catfish Ictalurus sp. and bullheads Ameiurus sp. and others are known to occur upstream in Lopez Lake (Stetson Engineers et al. 2004). It would be unusual not to find golden shiner Notemigonus crysoleucas, a

widespread bait-bucket introduction common in many reservoirs that support Centrarchids, in the watershed. In the creek, native species such as tidewater goby *Eucyclogobius newberryi* and even Chinook salmon *Oncorhynchus tshawytscha* (both federally-listed under the Endangered Species Act) have been reported in the past (Jordan 1895). Jordan (1895) also claimed to have identified riffle sculpin *Cottus gulosus* in San Luis Obispo County streams, but the southernmost coastal extent of the current known range is San Benito County (Moyle 2002; Rischbieter 2004). However, San Luis Obispo County is within the documented range of the coastrange sculpin *Cottus aleuticus* (Moyle 2002). Some other marine species may periodically occur in the Arroyo Grande Creek lagoon, depending on ocean conditions. Relatively warm ocean conditions may explain the appearance of striped mullet at the end of this study. California grunion *Leuresthes tenuis* are also known to run on the SVRA's beach, and may briefly use the lagoon, and jacksnelt *Antherinopsis californiensis* are often found with topsnelt (Moyle 2002). Just as striped mullet's range is typically further south unless warmer ocean conditions predominate (Moyle 2002), so instead might Chinook salmon stray into San Luis Obispo County streams during colder ocean conditions.

On March 2, 2005, an additional sampling survey was conducted. Tidewater Goby (*Eucyclogobius newberryi*) was documented in modest numbers (Rischbieter, 2005). The last reported sighting of the species in Arroyo Grande Creek is unclear. The US Fish and Wildlife Draft Recovery Plan for Tidewater Goby lists Arroyo Grande Creek as historically occupied. Tidewater goby is a native inhabitant of coastal estuaries and brackish waters found intermittently along the California Coast. It was listed as endangered in 1994. Currently 124 locales are known for presence of, or have historically supported tidewater goby. Of those locations, 28 are known to be extirpated. Future persistence of gobies in 55-70 locales is uncertain due to their small or degraded habitat features. Habitat requirements for tidewater goby are the uppermost brackish zone and coastal lagoons formed at mouths of coastal rivers, streams, or seasonally wet canyons. They are typically found in waters less than 1 meter deep and in salinities less than 12 parts per thousand. Arroyo Grande Creek is located in the Conception Unit in the CO 1c sub unit. Factors for decline and current threats include modification and loss of habitat, channelization of habitat, diversions of water flow, groundwater overdrafting, piscivorous birds of prey, and exotic fish predators such as like largemouth bass and bluegill (USFWS, 2004).

Quarterly lagoon sampling by California State Parks Off-Highway Vehicle Division (OHV) continues to occur. A compilation of OHV reports is posted on the Central Coast Salmon Enhancement web-site

(www.centralcoastsalmon.com). An excerpt of the summer 2008 survey report indicated the largest fish kill found to date in lagoon surveys.

This survey trip coincided with a period of rapid dewatering of lower Arroyo Grande Creek. It is unclear if this was directly related to the concurrent heat wave (hottest weather so far this year), or if it was primarily an artifact of waning hydrology following a relatively dry spring. In any case, we observed a significant fish-kill that claimed at least 10 very large stranded adult steelhead...

Surrounding and within the desiccated pool we recovered six dead adult steelhead (ca. 20-26" total length), most appearing in otherwise good condition (recently expired, not emaciated), and saw one dead juvenile steelhead (<6" TL).

In December 2008, lagoon sampling recorded scant fish in the sample area for the first time in the five year period of sampling.

The drying of lower Arroyo Grande Creek this summer and fall was the most severe and complete of several successive years we have observed. We have documented that these conditions have caused major fish-kills. However, never before have we documented such a complete eradication of native fish from what normally outwardly appears – and was once documented to be – good habitat.

The 2008 summary provided the following.

A total of ten fish species were collected during the 2008 sampling, and several observations were noteworthy: the apparent extirpation of the tidewater goby population established in 2005; observation of several adult steelhead included in a fish kill that affected thousands of fish of various species; and, in December, the fewest numbers of individuals and species ever observed in this area during any sampling effort here since 2003.

Beaver activity appeared to affect fish habitat. No beavers were seen, and a long-standing dam in the middle of the lagoon (originally constructed in 2005) was gone this year. However, the beaver(s) initiated dams in other upstream locations, and two in particular upstream from the Park seemed to contribute to the June fish kill by being an impediment to downstream fish passage.

The severity of the fish-kill observed in June, especially the degree to which adult steelhead were impacted, seems to have had more than one contributing factor. 2008 presented an unusually dry Spring, and unseasonably-low streamflows may have been insufficient to allow return passage of adult steelhead past several beaver dams down to the ocean. Thus they were trapped in the stream later in the season than they normally would've otherwise; these mature and, for the most part, good-condition fish (ca. 600+ mm lengths) then succumbed to a rapid elimination of surface flow and falling "beaver pond" water level that reportedly occurred within a day. The day of the stream drying-up was also the peak of a particularly extreme heat wave in the Oceano area. However, large-scale irrigation groundwater pumping from nearby wells is the likely direct cause of the rapidity of the interruption in Arroyo Grande Creek surface flow. The percolation of standing pools into the substrate was also

observed to be a rapid process, apparently greatly exceeding any conceivable rate of evaporation.

Habitat Assessment

The steering committee elected to contract with the California Conservation Corps (CCC) to survey habitat quality of Arroyo Grande Creek. The objective of such a survey, referred to as habitat typing, is to inventory features that define steelhead habitat. Steelhead habitat surveys have been previously conducted in the creek, most recently (year 2000) in association with the development of the Habitat Conservation Plan whereby fish habitat-mapping data were determined for differing water release rates from Lopez Dam. Although good and excellent habitat was present within various areas of the creek, overall habitat conditions for juvenile steelhead rearing were considered fair (Table 3-10, HCP, San Luis Obispo County, 2004). The protocol used to develop the HCP habitat maps differed from that utilized by the CCCs, but the data sets taken together will provide an excellent source for developing a steelhead restoration plan for Arroyo Grande Creek.

Prior to the survey, staff conducted landowner outreach activities to familiarize creek-adjoining property owners with the survey methods and to build confidence with landowners on how the survey information would be used. Because the majority of land adjoining the creek is privately owned, it is imperative that agreeable methods be jointly determined to assist in the development of projects that restore and enhance habitat for public trust species. It is critical to invest time and effort in building relationships that provide the context for win-win outcomes in project implementation.

The habitat and channel typing was conducted on Arroyo Grande Creek main stem during the summer of 2004. The survey was conducted in accordance with the California Department of Fish and Game; *California Salmonid Stream Habitat Restoration Manual* Habitat and Channel Typing Protocol. Of the 13.9 miles of creek, all but 3.09 miles was surveyed. All data collected and recommendations made based on the data were included in the Stream Inventory Report (Appendix D).

The report indicates that Arroyo Grande Creek should be recognized as an anadromous, natural production stream. According to the Stream Inventory Report, the primary limiting factors to steelhead habitat below the dam are the lack of riffles which represent feeding habitat, the high level of embeddedness of the existing cobble and gravel which represents limited spawning habitat, and the lack of habitat complexity overall. In

addition, the following findings may be useful in directing future enhancement goals for steelhead in Arroyo Grande Creek.

- The high percentage of mid-channel pools (41.6%) and combined percentage of glide and run habitat types of 42% indicates a relatively low level of habitat diversity. Mean pool shelter rating was calculated to be 58. This is another indication of low shelter diversity in pools.
- The low percentage of riffles (2% of habitat types by percent occurrence and 1% of habitat types by percent total length) indicates a limited food supply available. Riffle habitat is impacted adversely due to the influence of Lopez Dam.
- Over 85% of the pools counted were 2 feet deep or less, indicating a low level of habitat for over summering, thermal protection and predator avoidance. Pool length percentage to the total length was calculated to be 29% with 31.2% of the total stream not surveyed due to lack of access so this number could be higher.
- More than half of the creek surveyed has an embeddedness rating of 4-5, indicating unsuitable pool tail out areas where spawning takes place. The recommended substrate size for spawning is 0.25-5.0 inches, dominated by 2.0-3.0 inch gravel. The substrate measurements were 1% small cobble, 0% large cobble, 2% boulder and 4% bedrock respectively with 69% of the substrate composed of gravel. While the gravel level is adequate, taken with the low occurrences of the other components, there is the potential need for improving spawning habitat.
- Primarily overhanging terrestrial vegetation growing along Arroyo Grande Creek banks is providing the amount of cover that now exists. Terrestrial vegetation is the dominant cover type in pools followed by small woody debris. Increasing the number of log and root wad cover structures in the pool and flat-water habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing juvenile salmonids with protection from predation, rest from water velocity, divides territorial units to reduce density related competition, and is a substrate environment for benthic invertebrates that serve as food.
- The low percent of boulder formed habitat types compared to log and wood enhanced habitat types suggests that additional rock structure would enhance habitat overall. Boulders would not be expected to be found here at the same intensity as a high mountain creek but the addition of boulders can increase the

habitat complexity and suitability by providing structures for cover and scour for deeper pockets for over summer rearing for cooler temperatures. In addition, boulders would aid in the mobility of fine sediment, as increased water velocity along the structure would reduce the deposition of fines that embed the gravel.

The following are recommendations from the Stream Inventory Report. Due to the extensive number of data sheets generated, data sets from the Stream Inventory are not included in this document and are available upon request.

- Increase riparian corridor buffer width and complexity along Arroyo Grande Creek by planting appropriate native vegetation like willow, alder, sycamore and cottonwood. Plants are needed along the stream where shade canopy is not at acceptable levels and where the riparian buffer is very narrow.
- Where feasible, design and engineer pool enhancement structures like root wads associated with boulder structures. This will aid in the cover availability and scour effects to improve over summer suitability of the pool and increase habitat complexity within existing pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.
- There are logs and debris accumulations present on Arroyo Grande Creek that are retaining moderate quantities of fine sediment. Many of these sites are a result of beaver inhabiting various locations throughout the stream. The modification of these accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.
- Increase woody cover in the pools and flat-water habitat units. Most of the existing cover is from terrestrial vegetation. Additional overhead features observed included small woody debris, root mass and aquatic vegetation. Adding high quality complexity with woody cover is desirable.
- Design projects to trap and sort spawning gravel, as suitable size spawning substrate is limited to relatively few reaches.
- Riffle enhancement projects should be investigated since habitat typing data showed that less than 2% of the overall habitat surveyed was riffle habitat, which limits food production in the watershed.

Recommendations for additional data collection include:

- Perform 24-hour temperature monitoring during July and September for 3 to 5 years to establish a more complete temperature record using temperature loggers.
- Inventory, map and rank stream bank erosion and other erosion sites for sediment yield to the system.
- Gather continuous flow data to study impacts of de-watering.
- Update studies for fish distribution and abundance.
- Evaluation of fish migration barriers.
- Monitor and analyze water quality in reaches where fish kills occurred to identify pollution or dissolved oxygen issues.

The conclusions based on data collected and presented in the Stream Inventory are consistent with those of Alley (1996) and of the habitat surveys conducted during 1999 and 2000 (HCP), in that all provide evidence that the availability and quality of spawning and juvenile rearing habitat are limiting factors for steelhead production. A reach-by-reach comparison of results was not conducted due to the differing protocol used.

Release rates and quantities from Lopez Dam were documented for the duration of the habitat typing and are included in the Stream Survey. The flow data indicate that the July 2004, mean stream gage flow (1.73 cfs) was half of the June 2004 mean stream gage flow (3.43 cfs), even though the same amount of water was being released from Lopez Dam (6.2 cfs) in both months (memo from Tom Gaffney, NOAA Fisheries). It is hoped that a more extensive examination of groundwater/surface water interactions and implications for in-stream management and downstream recharge might be undertaken in coordination with United States Geological Survey and is currently under consideration by the Santa Maria USGS office (Greg Pope, personal communication).

Exotic and Invasive Plant Species

The Stream Inventory Report identifies areas of concern where exotic and invasive plant species occur in the watershed. The population densities of the problem plants are still relatively low and therefore reasonably easy to manage, given funds to plan and implement removal efforts. Most prevalent exotics are English Ivy, German/Cape Ivy, nasturtium, castor bean, pampas grass and Arundo. Arundo, also known as “giant reed,” is the most invasive plant in the Arroyo Grande Creek watershed, with the potential to cause the greatest detriment to habitat.

The success of non-native invaders can be minimized by natural high flows. The restriction of major flows by reservoirs plays an important role in the establishment and proliferation of exotic species in many river systems (Baron, 2004).

Beaver, Dams and Management

Beaver are active along many areas of the main stem. The Department of Fish and Game at one time conducted a cooperative program for trapping and removal (Arroyo Grande Creek Flood Control Project Annual Report 1969-1970). In many watersheds where beaver are native, they play an important role in wetland management, sediment transport, and vegetation management. Beaver dams are not blown out as frequently in the Arroyo Grande Creek watershed due to the presence of Lopez Dam that serves to mitigate high flows, allowing the dams to persist. It would be useful to once again examine the possibility of beaver management in the watershed as their presence degrades water quality, increases water temperature and poses barriers to juvenile and adult steelhead migration.

Water Quality

Water quality monitoring in the watershed is conducted by the Regional Water Quality Control Board's (RWQCB) Central Coast Ambient Monitoring Program (CCAMP) and by CCSE's Volunteer Water Quality Monitoring program. The trends from both CCAMP monitoring and CCSE volunteer monitoring are typical of most urban streams, in that the watershed is characterized by episodic, flashy storm systems that introduce sediment and nutrients into the system, then flush to "baseline" levels soon after.

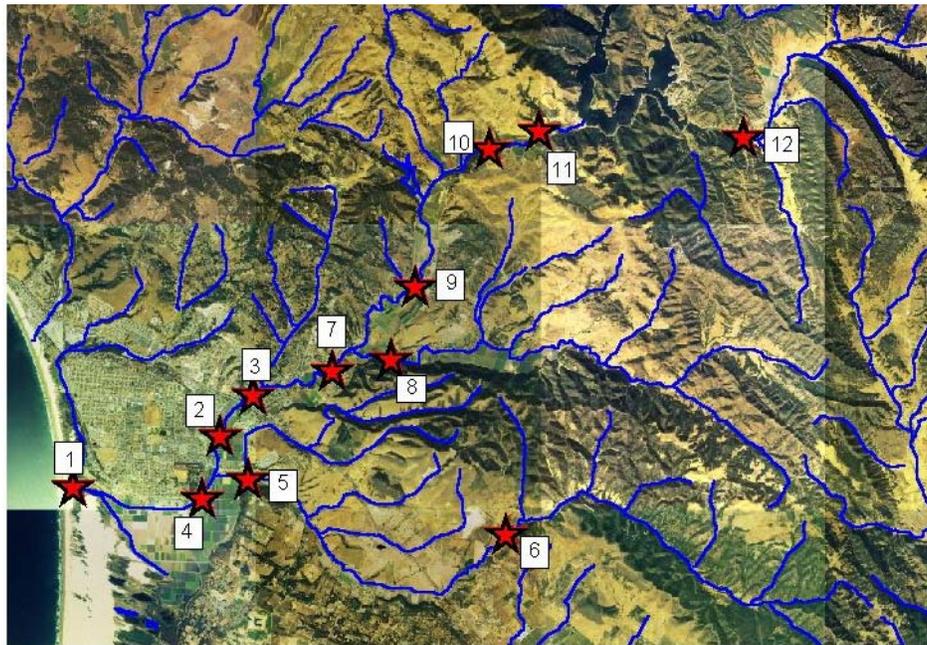
CCSE designed and established a Volunteer Water Quality Monitoring Program in 2000 as recommended by the CDFG 1999 stream survey. The CCSE volunteers are trained to use test kits purchased from Global Rivers Environmental Network (GREEN). The kits are designed to be user-friendly and to provide accurate results based on color comparative charts. However, the data are not digitally derived and are not defensible. The volunteer monitoring program provides public participation and awareness about water quality and a frequent quality check. The RWQCB staff was consulted in determining locations for the volunteer program so that expansion of their coverage was achieved and coordination ensured. Ten sites throughout the watershed are monitored monthly for nitrate, phosphate, pH, turbidity, dissolved oxygen, temperature, and percent saturation of oxygen. All but two sites are located on the main stem and allow for determination of influences from tributaries. By positioning a site above and below a confluence, it is possible to discern if some pollutant is entering from the tributary due to an upstream disturbance. If one or more parameters are not within acceptable limits during monthly

monitoring, the RWQCB water quality monitoring staff can be asked to corroborate and determine if subsequent action is warranted. Results from the volunteer monitoring program are compiled in Appendix E.

Consistently high phosphate readings, even from samples taken above Lopez Lake, have been the only potentially detrimental effects found by the volunteer water quality monitoring. This may come from the breakdown of soil and vegetation materials or leached out of the rocks and minerals. Downstream in the system, higher nitrate readings can be found but the level is still below concern. Temperature readings show that during the summer months, the creek does tend to warm, reaching the higher limit suitable for steelhead.

The Central Coast Ambient Monitoring Program (CCAMP) is the RWQCB's regionally-scaled water quality monitoring and assessment program. The purpose of the program is to provide scientific information to Regional Board staff and the public, to protect, restore, and enhance the quality of the waters of central California. A database has been developed for individuals, organizations, and agencies to collect and compare data within similar guidelines.

Figure 8. Water Quality Monitoring Sites



1. Estuary
2. Fred Gried Bridge
3. Kiwanis Park
4. Highway 1
5. Valley Road
6. Upper Los Berros
7. Strother Park
8. Tar Springs Creek
9. Cecchetti Road
10. Biddle Park
11. Upper Arroyo Grande Creek
12. Upper Lopez

Arroyo Grande Creek is included within the CCAMP program and is on a five- year rotational monitoring basis. An 18-month monitoring period has been conducted by CCAMP and the resulting data are consistent with CCSE's monitoring data. CCAMP utilizes meters such as the Hydrolab II,

rather than the more subjective color charts used by CCSE volunteers. In addition, quality assurance and quality control is achieved by calibrating some samples at a local environmental lab. The CCAMP monitoring protocol for Arroyo Grande Creek includes one coastal confluence site, three main stem sites and one tributary site.

The CCAMP data for the seven water quality parameters measured by CCSE volunteers (see above) are in agreement with CCSE results, in that all parameters are within allowable limits for basin plans or EPA recommendations. However, other water chemistry parameters tested by CCAMP exceeded EPA recommended levels. CCAMP water quality data from the coastal confluence site at the 22nd Street Bridge in Oceano, shows elevated levels of fecal coliform, sulfate, total dissolved solids and chloride, as well as depressed pre-dawn dissolved oxygen (DO) levels (measured below 5.0) (Appendix F). Low DO levels may occur during night hours as plants are respiring and therefore consuming oxygen, and not producing oxygen as they would during daylight when photosynthesizing. Elevated nutrient levels were not observed; however, dense in-stream vegetation and benthic algae was consistently observed, possibly indicating nutrient enrichment. These conditions were not consistent with data and observations from sites further upstream, particularly the two sites upstream of the city of Arroyo Grande. Sediment data does not show elevated levels of organic chemicals or metals, with the exception of nickel.

The benthic macroinvertebrate samples collected at the coastal confluence site indicate fair to poor biological integrity, with scores ranging from 2.0 to 5.4. Sediment and water toxicity tests were conducted at the coastal confluence site. No toxicity responses (survival, growth or reproduction) were observed in tests conducted on fathead minnows, *Pimephales promelas*, or water fleas, *Ceriodaphnia dubia*. San Luis Obispo County beach water quality monitoring data collected at Sandpiper Avenue, north of the creek mouth shows some exceedance of the water quality criteria for coliforms; however, the majority of the data at this site is within acceptable limits (Surface Water Ambient Monitoring Program, Site-Specific Monitoring Workplan FY 2003-2004, Central Coast Regional Water Quality Control Board). Refer to Appendix F for the Coastal Confluence Results.

The RWQCB has instituted a program to determine Total Maximum Daily Loads (TMDLs) for specific water bodies. TMDLs establish a level of acceptable non-point source inputs from the watershed such as sediment or specific nutrients. TMDLs are only instituted for waters when non-point input standards are exceeded. At this time, TMDLs are not being considered for the Arroyo Grande Creek watershed due to the relatively high quality of its water which should, therefore be protected, as it is less

expensive and more efficient to protect a water body's health rather than to remediate it once it has been impacted.

Cultural Resources

A cultural resource survey was performed as part of the development of the Arroyo Grande Creek Habitat Conservation Plan for the Protection of Steelhead Trout and Red-legged Frog (HCP), which includes known archeological resources downstream of Lopez Dam as well as ethnographic and prehistoric background. Specific information can be found in the Draft HCP. In addition, the 2002 Annual Report of Habitat Monitoring for the Oceano Dunes State Vehicular Recreation Area includes a preliminary review of Chumash Ethno-historic Data for the OCSVRA prepared by Robert Gibson (2002). The following excerpt from the HCP is intended to provide a thumbnail sketch of cultural resources for the watershed.

County of San Luis Obispo, Draft Arroyo Grande Creek HCP 3-95

This section summarizes the cultural history of the Arroyo Grande Creek watershed based on Applied EarthWorks (1998), Greenwood (1978), and Moratto (1984). The San Luis Obispo area and the Arroyo Grande Creek watershed are the northernmost parts of the south central coast region of California historically occupied by the Chumash. The prehistory of the region can be divided into four periods based on changes in economy and technology, social organization, and population size (King 1990; Rogers 1929; Wallace 1953; Warren 1966). The earliest documented remains are associated with Paleoindians (12,000-9,000 years ago). Paleoindian sites in coastal California contain flaked stone tools but lack the milling stones common in later periods. Dates of 9,000 years before present (B.P.) have been obtained from several sites in San Luis Obispo County. CA-SL0-2 at Diablo Canyon also contains a paleocoastal component (Greenwood 1978; Morratto 1984). Later period sites are more common, reflecting better preservation and increasing population size. Milling stone sites (9,000-5,000 years ago) indicate more reliance on gathered resources, such as seeds and shellfish than on fishing and hunting. Mortars and pestles, projectile points, and diverse land and sea-animal remains became prevalent in sites of 5,000-2,000 years ago. About 2,500 years ago, sites gradually began to reflect the sophisticated and fully maritime culture of the coastal Chumash (Erlandson 1993). The Chumash of this period lived in well-organized towns of up to 1,000 people. Their culture featured hierarchical social organization, occupational specialization, a money-based economy, extensive trade, use of plank boats, and many kinds of material goods (Applied

EarthWorks 1998). The proposed HCP area is in territory historically occupied by Obispeño Chumash, the northernmost speakers of seven related Chumash languages (Gibson 1991, 1997; Greenwood 1978; Kroeber 1953). Chumash and Obispeño material culture, social organization, traditions and rituals, and cosmology are described in Blackburn (1975), Greenwood (1978), Gibson (1983), Grant (1966), Hudson and Blackburn (1982), Hudson and Underhay (1978), Hudson et al. (1978), King (1982), and Johnson (1988). Chumash contact with Europeans began with Spanish exploration in 1542 (Landberg 1956). In 1769, the Portolá expedition traveled overland from San Diego to Monterey, journeying inland to Morro Bay, and passed through the project area again on their return in 1770. Mission San Luis Obispo de Tolosa was founded in 1772, the first Spanish establishment in Chumash territory (King 1984). Most Obispeño were living at the mission or its outposts by 1804. By the time of secularization in 1834, missionization and disease had virtually eliminated the Chumash and their culture (Applied EarthWorks 1998), although there has been resurgence in cultural tradition by remaining Chumash in recent decades.

Land Use

Farmers and ranchers initially settled the Arroyo Grande Valley in the late 1800's. Agricultural land use continues to be an important economic factor to the area. Below Lopez Dam, cultivated fields and open farmland occupy both sides of the creek to Huasna Road. The creek enters developed residential neighborhoods as it nears Strother Park and continues into the downtown business section of Arroyo Grande. Below Highway 101, the creek passes again through cultivated fields and residential neighborhoods until the realigned and channelized section begins. There the creek is confined by levees where, in the final stretch, the creek empties into the estuary at the Oceano Dunes State Vehicular Riding Area. Thousands of vehicles drive over the flowing mouth of the creek during those times of the year when the mouth reaches the ocean.

The City of Arroyo Grande strives to preserve agriculture and natural resources within the city limits and its sphere of influence through the following principles found in its Agricultural, Conservation and Open Space Element of the General Plan:

- *That resources such as prime capability soils are highly productive whether for agricultural purposes, watershed or natural habitat.*
- *Resources that are irretrievable and/or irreplaceable need to be protected and preserved.*

• *Individuals and the community have a responsibility to future generations as well as to wildlife to preserve and protect finite natural resources.*

• *Resources lands contribute to overall public health, safety and welfare beyond provision of basic necessities such as food, fiber and livelihood.*

• *Land use and urban development shall be managed and limited to that which can be sustained by the available resources and serviced by the circulation and other infrastructure systems.*

A 2001 community visioning exercise for the City’s General Plan found that “ *participants were in general agreement regarding preservation of agricultural lands in and adjoining the City for a variety of purposes, including food production, open space, promotion of the City’s small town identity, employment, and as a consistent regional planning policy requiring both City and County cooperation.*”

Participants to the community visioning exercise also had “*a desire for more open space, active and passive recreational parks [and] include[ed] strong support for the development of a greenbelt and trail system along Arroyo Grande Creek system.*”

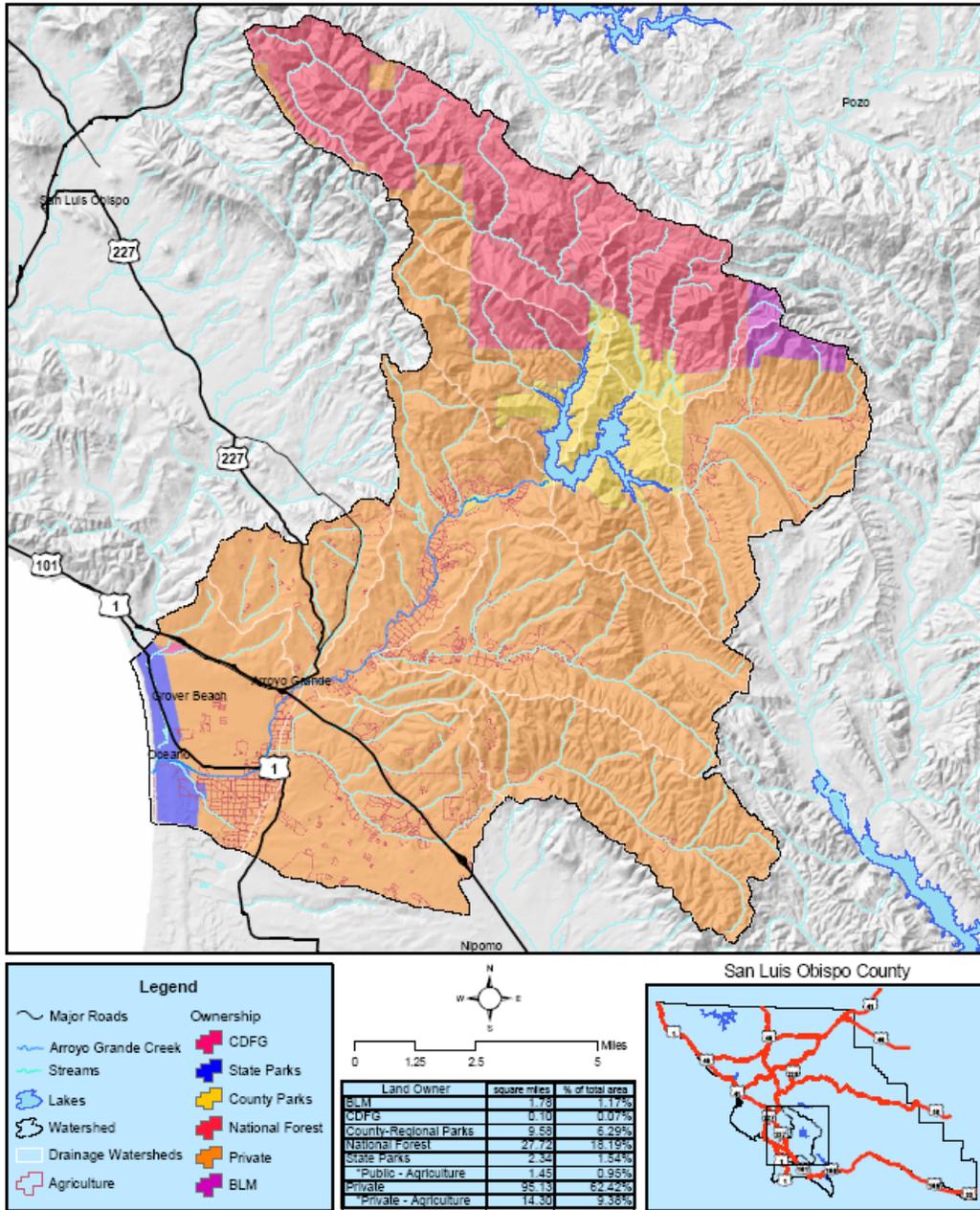
In 2007, the City amended the General Plan and Municipal Code to include creek setbacks (16.44.050) from the top of bank or edge of riparian habitat, whichever is farther from the creek flow line as follows:

Arroyo Grande and Tally Ho Creek: Minimum of 35 feet

Meadow Creek and East Fork Meadow Creek: Minimum of 50 feet

All other creeks and drainages: Minimum of 25 feet.

Figure 9. Land Ownership



Social and Economic Demographics

Demographics for income, race and ethnicity were gathered from the 2000 census to characterize future growth trends and how those trends might affect the creek ecosystem. It would be desirable to generate watershed build-out data and correlate it with extrapolated build-out appropriated water use, and link growth data with managing conjunctive uses of the watershed.

From 1970 to 2000, population census data indicate an increase of 84% from 17,580 to 32,327 people in zip codes 93420 (Arroyo Grande) and 93445 (Oceano). Total number of households for that time period and zip codes indicate an increase of 123.6% from 5,535 to 12,375. Summary reports are provided in Appendix G.

Critical Issues

In the developmental stages of the Arroyo Grande Watershed Organization, community members, landowners and various other stakeholders identified critical issues from their perspective. The following critical issues were extrapolated from this initial list, and through preliminary watershed assessments and observations of CCSE staff, steering committee members and landowners. The complete list of questions posed to the community that elicited the critical issues and their answers is compiled in Appendix H.

Water Quality

Temperature

Water temperature is related to the amount of riparian canopy cover available to provide shade and prevent stream flows from heating. A reduction of riparian canopy and vegetation has occurred along the stream corridors in the Arroyo Grande Creek watershed. This reduction is demonstrated in a comparative aerial photography analysis conducted by Swanson Hydrology and Geomorphology (Dvorsky, 2004). Private property land use changes and lack of set back standards have encouraged maximum use of the land thereby reducing riparian buffers in the watershed. With decreased canopy, increased water temperatures lead to decreased dissolved oxygen, which poses another hazard to the fisheries' health. CCSE has installed continuous temperature loggers to track stream water temperature changes in the watershed as build out of the community continues. More complete temperature data can be found in Appendix D – Stream Inventory for Arroyo Grande Creek and Appendix E – Volunteer Water Quality Monitoring Results.

Surface flow

The Department of Fish and Game Code section 5937 stipulates that

The owner of any dam shall allow sufficient water at all times to pass through a fish way, or in the absence of a fish way, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam. During the minimum flow of water in any river or stream, permission may be granted by the department to the owner of any dam to allow sufficient water to pass through a culvert, waste gate, or over or around the dam, to keep in good condition any fish that may be planted or exist below the dam, when, in the judgment of the department, it is impracticable or detrimental to the owner to pass the water through the fish way.

The County of San Luis Obispo, in its HCP for Arroyo Grande Creek, proposed several possible flow regimes that could potentially comply with CDFG regulations when instituted.

Prior to 1998, releases from Lopez Dam were not made for in-stream aquatic habitat. Since then, releases of 4 million gallons per day (mgd) or 2,800 acre feet per year have been made for this purpose. In January, 1999, two steelhead were stranded when a reduction in releases resulted in a portion of the creek being dewatered. It was at this time that the County of San Luis Obispo entered an agreement with CDFG to maintain a minimum flow on an interim basis, pending results of data collection and analysis of the HCP. NOAA Fisheries, as part of regulatory review of the HCP, is currently in the process of defining an ecologically-meaningful stream flow recommendation that will serve as the basis for guiding development of the HCP as it relates to in stream flow requirements for Steelhead trout (NOAA Memo to County of San Luis Obispo, November, 2004). The outcome of negotiations must also address flushing flows for gravels as the dam has eliminated this critical surface water surge. In the absence of flushing flows, there has been increasing encroachment in the channel of vegetation changing the hydrologic regime, reducing living space in the channel with a concomitant potential reduction of summer base flows.

During the summer of 2004, another dewatering incident and subsequent fish kill occurred in the lower creek, downstream of Highway 1. Several dead steelhead were recovered by community members in the area during July, 2004, and three more dead steelhead were recovered by CCC members while habitat typing near the dam in August, 2004. In 2006, a fish kill occurred as a result of a spill from the Lopez treatment plant. In 2008, a fish kill occurred in June during record high temperatures.

According to pre-dam hydrology (HCP, San Luis Obispo County, 2004), the creek may have gone dry during the late summer both prior and subsequent to the installation of the dam. However, proceedings of water rights applications dating back to 1925 indicate that evidence was presented during appropriation hearings that “during all of the winter months even during as dry a season as that of 1923-24 there is water running in the creek which finds its way to the ocean without being put to beneficial use...”

It has been within the past six years with the requirement to release water year ‘round that management of supply has become a matter of regulatory concern. Ensuring adequate flow to the ocean to support a steelhead population in addition to supplying needed acre-feet of water for agriculture in one of the county’s richest valley soils as well as meeting municipal drinking water needs poses challenges in timing and rate of extraction.

The steering committee is committed to addressing all intended uses of the watershed and in this light seeks to find a workable solution to meet the needs of fish and farmers. As was indicated above, there is a set of permitted users and a regulatory framework to suggest that applying a community approach to solving the supply is warranted.

Nutrients and Dissolved Oxygen

The types and levels of nutrient inputs entering the creek from adjoining land can impact water quality and potentially affect the assemblage of living organisms in or near the creek. The level of dissolved oxygen (DO) is also critical to fish populations, particularly during the night (referred to as the diel reading for DO) when plants within the water are using oxygen as well. The problem can be heightened when canopy is lacking and algae proliferate. Ideal levels of DO for steelhead are 10 mg/L but some levels below 7 mg/L have been shown to begin stressing the fish. Less than acceptable levels of DO for steelhead are 5-6 mg/l, though they can survive with concentrations as low as 2 mg/l (Moyle, 2002).

Dissolved oxygen levels are of concern especially in the evenings during late summer and early fall when stream flows are low and plants are consuming oxygen as they respire removing oxygen from the water; riparian canopy is absent that will further cause water to warm. Fish die-off did occur during the summer of 2004, and low diel (overnight) DO is under consideration as a contributing factor. Community concern about water quality led to the initiation of the volunteer water quality monitoring program to track nutrient levels and dissolved oxygen over time. As indicated above, overall water quality is relatively high for Arroyo Grande Creek and tributaries. However, sediment loads and water runoff carrying sediment and nutrients such as pesticides are of concern, and could

potentially be increasing as impervious surface area increases in the watershed with additional roads, homes and other development being added to the watershed.

Barriers to Fish Migration

The following barriers were identified by compiling pertinent information from a recently conducted Barrier and Culvert Assessment by the CCC, field inspection by CCSE staff, and the Stream Inventory conducted for this plan.

Arroyo Grande Creek Main Stem

Two Concrete Dams

This is identified in the Stream Inventory Report by the CCC. The dams seem to be nonfunctional as the creek flow has undermined the dams. A structure was identified in a 1972 Stream Survey from CDFG, which had the location at about ¼ mile downstream of the Fair Oaks Crossing. The CCC survey had placed the location of this structure at mile 2.88 from the confluence with the ocean and just over ½ mile downstream of the Fair Oaks Crossing.



Figure 10. Fish Passage Barrier - Two Concrete Dams

Stream Gauge

This is identified in numerous reports as probably the most significant barrier downstream of Lopez Dam in the watershed. It is identified in the California Fish Passage Assessment Database as I.D.# 8409. During the CCC stream survey, the structure was measured to be 34.2' wide x 17.5' thick x 4.7' high. It is located at stream mile 4.98 from the confluence with the ocean. There is a low-flow notch in the structure but it may add to the intensity of the barriers by not only being a height barrier but also a velocity barrier. This structure poses a complete barrier for juvenile steelhead as they have been seen jumping at the base of the structure. Adults should be able to pass the structure during migration periods, when there is more water coming over the spillway and back-flooding of the pool downstream of the gauge. The pool below the gage is over 5 feet deep and will aid in the migratory effort to pass the gauge. The County of San Luis Obispo had identified this site in the HCP as a mitigation project and subsequently removed it to allow Central Coast Salmon Enhancement to address the barrier prior to the finalization of the HCP. As of February 2009, project design to modify the structure to improve passage is 70% complete.

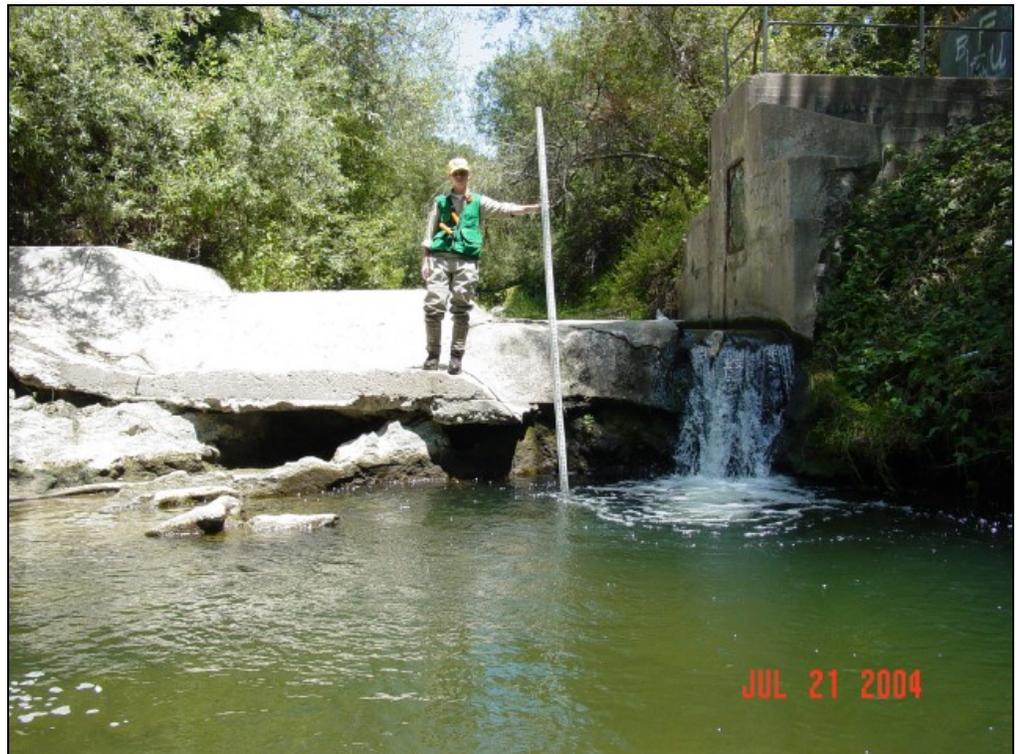


Figure 11. Fish Passage Barrier – Stream Gauge

Rip-Rap Dam

This is identified in the Stream Inventory Report by the CCC. This dam is located about 2000 feet upstream of the stream gage at mile 5.35 from the confluence with the ocean. The structure is 14' wide x 2' thick x 1' high. No pictures available.

Concrete Dam

This is identified in the Stream Inventory Report by the CCC. This dam is located at stream mile 5.82 from the confluence. The structure is 23' wide x 4' thick x 4.5' high. There is no low flow notch so the water sheets across the top. There is a significant plunge pool below the dam but unless there is enough flow, negotiating the sheet flow could limit fish. It is a barrier to juveniles migrating upstream.

Cecchetti Road Culvert

This crossing is identified in numerous reports. It is identified in the California Fish Passage Assessment Database as I.D.# 142. The structure was designed as an Arizona type crossing with a 5-foot Corrugated Metal Pipe (CMP) culvert. It is designed to overtop the crossing during high flows and has swept cars into the creek. This structure might pose a velocity barrier during heightened flows and passage might be an issue on the upstream side where sediment has been deposited. A thin steep channel is cut as the creek approaches the culvert. This structure has been identified in the HCP as a project that could be addressed with funding from the conservation account, but modifications are not specified.



Figure 12. Fish Passage Barrier – Cecchetti Road Culvert

“S” Rip-Rap Dam

This is identified in the Stream Inventory Report by the CCC. The dam is located at stream mile 9.31 from the stream mouth at the ocean. The structure is a dam shaped in a form of an “S”. It is 17’ wide x 13’ thick x 1’ high. No pictures available.

Biddle Park Culverts

In the early 1990’s, five 4-foot culverts were installed at stream mile 10.9 by the County Department of General Services after El Nino-generated flows plugged the existing culverts with debris, and washed out the road. The culverts were staggered in placement to prevent debris accumulation and allow the creek to meander over time. The culverts seemed to be sized appropriately for water flows, but their ability to pass fish is unknown.



Figure 13. Fish Passage Barrier – Four Culverts at Biddle Park

Abandoned Dam/Diversion Footings

Identified in numerous reports and also identified in the California Fish Passage Assessment Database as I.D.# 141 and located at stream mile 11.22 from the confluence with the ocean. This structure appears to be an old flash-board dam footing. Wood slats could be placed spanning the channel to impound water for irrigation or municipal use. The structure has not been used in many years and is one structure with three steps. The flow over the structure is sheet in form and does not allow for a plunge or scour pool to form. The structure is 48' wide x 10' thick x 2.2' high with two tiers. The middle section is filled with gravel and this structure is a very important grade control structure now. Modification rather than removal might be the best option to aid in fish passage for both adults and juveniles. As of November 2008, Central Coast Salmon Enhancement, the landowner and the CCC are in the process of modifying this barrier.



Figure 14. Fish Passage Barrier – Abandoned Dam Footings

Concrete Grade Control Weir

Identified by CCSE staff, this structure is located at a water-monitoring site and is located at stream mile 13.29, the Rodriguez Road crossing. It may be a partial barrier to juvenile fish but there is good flow since it is in proximity to Lopez Dam. There is a deep plunge pool, so with good acceleration, passage could be achieved. There is some sheet flow across the structure but it is semi-concentrated over half the structure. The structure is 20' wide x 5' thick x 2' high.

Removal for uninterrupted passage is not an option as it is the primary water supply line from Lopez Dam. Notching the weir or concentrating more of the flow could be a viable solution, but coordination with the County will be required to ensure the line is not damaged.



Figure 15. Fish Passage Barrier – Concrete Grade Control Weir

Lopez Dam

Identified in numerous reports and in the California Fish Passage Assessment Database as I.D.# 100132, and is the end of anadromy. Erected in 1968, Lopez Dam cut off the remnant population of steelhead from their historic spawning areas that were located where the reservoir now sits. The dam cut off 23 miles of spawning habitat in the Arroyo Grande Creek drainage representing 95% of all available spawning habitat. Landowner reports put fish counts into the thousands before the dam, but numbers were drastically reduced in the years following the completion of the dam. This was solely the biggest impact to the decline of Steelhead trout in Arroyo Grande Creek. The dam is located at stream mile 13.94. A multi-million dollar earthquake retrofit was completed in 2004.

Los Berros Creek

Los Berros Creek Gauge

Los Berros Creek Road Crossing/Gauging Station – The first road crossing, 5.6 miles upstream of the confluence with Arroyo Grande Creek, is a gage station for United States Geologic Survey (USGS). The crossing is a box culvert with a 15-foot concrete lip that has become a grade control structure. The channel downstream has down cut significantly to form a barrier to fish passage. There is sheet flow through the culvert and across the concrete lip into the pool.



Figure 16. Fish Passage Barrier – Los Berros Creek Gauge

Tar Springs Creek

Low Flow Concrete Structure at Branch Mill Rd - There is an apparent low-flow concrete weir structure under the Branch Mill Road Bridge as it crosses Tar Springs Creek, 0.5 miles from the confluence that has been undermined by the active creek and most likely presents a full barrier to both adults and juvenile migrating steelhead. The weir is 20' wide x 2' thick x 3' high where the creek has undermined it. There is a 6-foot span from where the creek goes under one side and comes out the other as the downstream footing has been uncovered as the channel has eroded away below the weir. The pool below is up to 3' deep but strewn with boulders so a clear jump is not possible. The structure may have been installed as a grade control structure as there has been active down cutting in the channel and the footings of the bridge are becoming exposed.

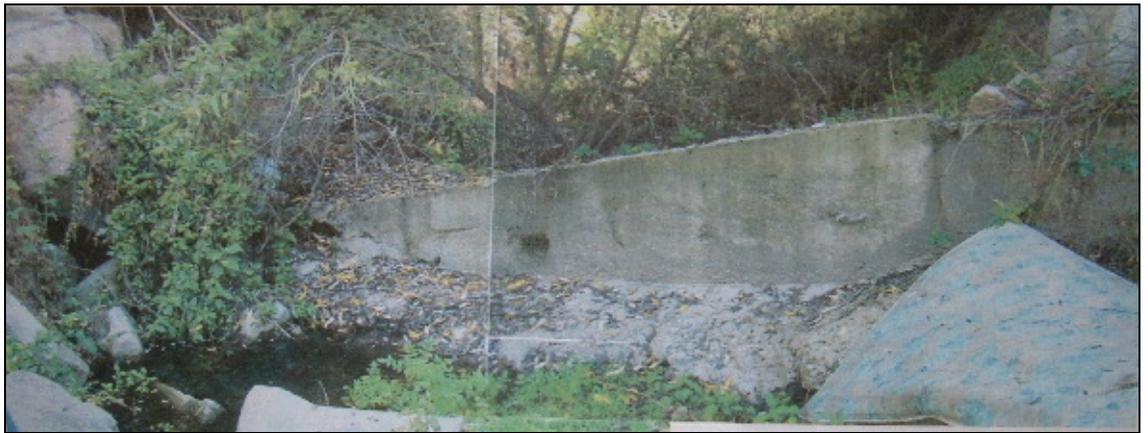


Figure 17. Fish Passage Barrier – Tar Springs Creek Concrete Weir

Tally Ho Creek

Branch St Road Crossing –The lower reach of the Corbett Creek Watershed is also known locally as Talley Ho Creek. Talley Ho Creek goes under Branch Street through an arch topped box culvert. The culvert is 6' wide x 90' long x 8' high. There are three steps entering the culvert and once inside, there is over 80 feet of flat concrete that fish must traverse to cross the barrier. The pool below the culvert is 2 feet deep.



Figure 18. Fish Passage Barrier – Tally Ho Culvert

Meadow Creek

Historically the lower part of the watershed was marsh / bog area that joined the main stem Arroyo Grande Creek before the confluence with the ocean. Meadow Creek is the remnant drainage that still consists of marshy pools, slow flowing channels, and lowland drainage areas. Upon spot checks, the watershed doesn't appear to have Steelhead trout. The water is not cold enough, the substrate is not clean enough due to the lack of velocity in the creek, and there do not seem to be any areas suitable for spawning. Meadow Creek contains habitat for other endangered species like California red-legged frogs, western pond turtles, and should be managed for those species. It is mentioned in this plan due to its proximity and potential influence on the lagoon as a source of exotic fish species and its interaction with the hydrology of the lower Arroyo Grande Creek.

Additional Barriers to Fish Migration

Beavers

Beaver have become established in Arroyo Grande Creek and have been documented since 1970. Local landowners have indicated their presence as far back as the 1940's (George Cecchetti, personal communication). Beaver dams create pools for fish, but their overall impacts may be more negative than positive. When there are limited surface flows, beaver dams impound water, allowing for percolation and ground water recharge, but reducing surface flow to the ocean. Beaver dams also present migratory problems for both adult and juvenile salmonids. Although it has been shown that dams aid in the rearing of Coho salmon, beaver as a non-native species have not historically played an evolutionary role for winter run steelhead. This could be a serious detriment to both adult and juvenile to safely pass the dams. There is typically a small overflow or water sheeting over the top of the dam that can confuse the returning adults as to where to pass over the dam. Juveniles out-migrating to the ocean can get caught or impaled on the exposed branches, as there is no dedicated flow over the dam and out of the pond. As the adults return, there is usually not an adequately deep plunge pool below the dam to clear it from lack of concentrated flow over the dam as the beavers are constantly patching overflow sections. If the dams are not too overgrown it is likely they will be blown out during winter storms.



Figure 19. Beaver Dam

As the beavers are historically exotic species and potentially harming the native steelhead population, CDFG has done some preliminary investigation into the beaver issue.

Water Quantity

The rain patterns that determine California's Central Coast flashy water systems are characterized by winter storms that typically begin in November, with the majority of rain falling from February to April. Many years of drought conditions had stressed water supply resources and reservoirs in the county were well below average. The rains of 2005 have substantially increased reservoir levels. Since Lopez Reservoir releases are targeted for irrigation, habitat and recharge, the in-stream water amount has been closely regulated. Increased development in the watershed along with low accumulation from winter storms have not brought sustaining flows to fill the reservoir. As indicated above, the lower section of the flood channel was de-watered during the summer 2004. Prior to the de-watering, downstream releases from Lopez were about 7.5 cubic feet per second (cfs). Following a fish kill within the dewatered flood channel and later near the dam, downstream releases were increased to about 9.5 cfs.

This increase also coincides with requests to the County from flood channel area farmers to release additional water for agricultural use, as creek adjacent wells were low to dry. Anecdotal reports state that the County is obligated to release adequate water for surface flow to reach the 22nd Street Bridge for ground water recharge, while NOAA Fisheries' agreements with the County stipulate a 5 million gallons per day (mgd) release to ensure adequate flow for habitat (Anthony Spina, personal communication). The summer of 2004 de-watering incident is being investigated by NOAA Fisheries enforcement division (Tom Gaffney, personal communication) in order to determine the specific causes.

The County and NOAA Fisheries are finalizing in-stream flow requirements for the HCP. Included in the requirements are attraction flow releases and the installation of a real time water level gauge at the estuary lagoon near the sandbar to confirm instigation of attraction flows.

Beaver are also implicated in the dewatering incident, as their dams could have impounded water long enough to allow significant infiltration, therefore decreasing the amount of water left for surface flow to the ocean. The tributaries show the same effects of drought or water shortage. Perennial sections still have water but with the ground water level sinking, and the lack of good recharge from winter storms, less surface flow is available.

Status of Fish Passage Barrier Remediation

Arroyo Grande Stream Gage

The CDFG FRGP provided funding in 2006 to design remediation of the Arroyo Grande Stream Gage. The design is approximately 70% complete as of March 2009 and consists of lowering the existing weir while keeping the gage fully operational.

Cecchetti Road Crossing

As of November 2008, there is a concept plan complete for this crossing completed by Questa Engineering with funding from the Tri-Counties Fish Team's Fisheries Restoration Grant Program. Central Coast Salmon Enhancement is in possession of these plans.

Abandoned Dam/Diversion Footings

Central Coast Salmon Enhancement and the CCC are partnering to seek funds from the US Fish and Wildlife program, Partners in Fish and Wildlife to address this passage impediment.

Erosion and Sedimentation

The underlying geology of the watershed is described in the Soil Survey of San Luis Obispo County and summarized by Dvorsky (2004 technical memo). The formations are predominantly unconsolidated and easily eroded Cenozoic sediments of Pliocene through Eocene age (Inman, 1999). The soils derived from these formations are highly erodible and easily weathered. In a study of the stream flow and sediment flux of the 20 largest streams entering the Pacific Ocean along the central and southern California coast, the Transverse Ranges province, with its thrust-faulted and over-turned formations of Cenozoic sediments, provided by far the greatest yield of sediment. This province, with one-quarter of the total study area, yields over one-half the measured sediment flux of all rivers studied (Inman, 1999). The nature of the Arroyo Grande Creek watershed's geology is such that sediment delivery to the creek and subsequent transport downstream through the system is extensive, and further exacerbated by anthropogenic (human-induced) impacts, perhaps by a factor of about two on a global scale (Inman and Jenkins, 1999).

Lopez Dam acts to prevent sediment from moving downstream from the headwaters of the watershed, as the dam structure traps material that moves into the reservoir from upstream. However, the tributaries downstream of the dam do continue to deliver sediment to the system, likely at an advanced pace due to the sediment-free, or "hungry water" coming from Lopez Dam. "Hungry water" is created because the water does not carry any sediment when it is released from the dam, so it is free to perform work on the bed and banks of the creek downstream of the dam to reach its sediment-carrying potential. This, in turn, may exacerbate the

erosion potential along the tributaries as the system attempts to achieve equilibrium. The stability of the main stem's banks is most at risk given the sediment hungry nature of the water (Dvorsky, 2004).

Further, the DWR Environmental Services Office in its February 1998 Habitat Restoration and Management Plan for the Arroyo Grande Mitigation Site, Coastal Branch, Phase II State Water Pipeline, indicates that:

...because there is very little sand and gravel present in the main stem below the dam, clays and silts will predominate. As pre-Lopez Dam sand and silt move downstream or are buried, the fine sediments will come to dominate channel processes. In the absence of natural flushing flows, channel scouring and sediment removal will not occur, or if so, very infrequently.

Swanson Hydrology and Geomorphology completed a preliminary inspection of aerials from 1939 and 2002 to determine changes in vegetative cover and subsequent potential for erosion and sedimentation. This plan begins to identify erosion sources and suggests recommendations to support reducing sediment loads to the creek with a preliminary ranking of sites providing the most detrimental levels of sediment to the main stem based on a single point in time (Dvorsky, 2004).

The dominant erosion processes occurring in the watershed in order of importance are:

- Head-ward expansion of drainage networks and associated gullying due to lowering of the base level of the main stem associated with down-cutting and higher runoff associated with an increase in impervious surfaces
- Bank erosion from expansion of drainage networks and hungry water released from Lopez Dam. Bank erosion sites were measured for height and length. This has provided an index of bank erosion on the main stem.
- Erosion from roads and fields lacking vegetated buffers strips and unmaintained ditch and culvert systems present erosion hazards during peak storm events, and release fine sediment to nearby stream channels.
- Debris flows and landslides could become significant sediment sources following large fires or during low frequency, high magnitude storm events.
- Bare areas associated with urban development contribute fine sediment for the short-term. The long-term impact of these sites is often associated with an increase in impervious

surfaces, which, in turn increase the “flashiness” of the hydrologic regime.

Recommendations for addressing erosion and sedimentation include, (not in order of priority):

- Where feasible, reduce runoff from impervious surfaces by developing detention basins and encouraging on site detention such as storm water ponds, cisterns, or rain barrels.
- Improve conditions for sediment storage in tributary drainages through restoration of floodplains in lower portions of sub-watersheds and/or development of low maintenance sediment retention basins in non-fish bearing streams.
- Implement erosion control projects that focus on headward expansion of drainage networks such as gully erosion in headwater channels.
- Where feasible, bank erosion repair projects should include floodplain enhancement elements such as creating floodplain benches, laying back the slope to reduce future erosion, and planting of riparian vegetation.
- Vegetated buffer strips along farm roads and seeding of grass in agricultural ditches should be encouraged to reduce fine sediment erosion from these features.
- The riparian corridor through the flood control reach of the Arroyo Grande should be managed to maximize channel shading and minimize overall channel roughness.
- Replace ford crossings within the watershed with culverts or bridges to reduce chronic sources of fine sediment.
- Update stream and road ditch culvert crossing throughout the watershed to improve flood capacity and allow for passage of debris and sediment.
- Where feasible, enhance floodplain area throughout the watershed through levee setbacks, laying back of slopes, and adding riparian vegetation. Enhancement of the sediment storage and buffering capacity of the watershed will be a key component of any plan to reduce flood impacts in the lower valley.

Flood Protection

In the past, flood impacts were widespread and acute along the entire valley floor. Over time, humans occupied and developed the valley,

creating ditches, rerouting and deepening the upper portion of the creek, producing a single and incised channel. At one time the channel may have been braided and meandered across a wide floodplain with riparian forest at the same elevation as the valley floor. Because of these alterations, flooding in the upper portion of the valley is no longer a problem. The incised channel, however, moves sediment and water more efficiently to the lower portions of the valley.

Through loss of floodplain, an increase in erosion from the bed and banks of the main stem, and increased erosion from the tributaries, natural sediment attenuation, through floodplain buffering, has been lost with devastating flood impacts to the lower river. (Dvorsky, 2004)

Designed and built in the late 1950's to protect adjoining farms and residences from flooding, the flood control channel originally consisted of a channelized streambed and a set of levees along approximately the last three miles of the creek, essentially shortening and straightening the creek. Due to changes in environmental regulations and the economics of channel maintenance (discussed below), the flood channel has not been maintained to its original design since mid-1990. It has consequently become filled with sediment, and perhaps as little as 15% of its original capacity remains. About 52,000 cubic yards of sediment have been removed since 1988. A more complete history of the flood control channel is explored in the Story of Arroyo Grande Creek (Brown, 2002) and Arroyo Grande Creek, Disaster Waiting to Happen (Honeycutt, 2004).

Aerial photographs comparing the course of the creek in 1939 and 2002 reveal that its position prior to, and after, the construction of the flood control channel is very much the same, the difference being that the Los Berros tributary was diverted from its original course below the Nipomo Mesa to its current channelized flow beginning downstream of Century Road and joining Arroyo Grande Creek at the upstream end point of the flood control channel.



Figure 20. Historic Location of Flood Channel



Figure 21. Present Location of Flood Channel

Natural Resource Conservation Service (NRCS) maintenance reports of the Arroyo Grande Creek Flood Control Channel (Honeycutt, 2004) indicate the downward trend of maintenance on the channel and levees beginning in the 1970's and continuing to 2005 with the last indication of excellent condition in the early 1990's. A combination of hand cutting, herbicides, goat grazing and infrequent dredging have taken place in the intervening years to address vegetation growth and sediment accumulation. However, in the mid 1990's the center portion of the channel began to be colonized by willows as sediment continued to be deposited in the channel. By the year 2000, the county had begun a multi-phased sediment removal project upstream of the 22nd Street Bridge.

In 2001 the Arroyo Grande Creek levee system was breached on the south side with severe impacts to adjacent agricultural lands. The northern levee remained intact, thereby protecting several residential developments, as well as the regional wastewater treatment plant that services the communities of Arroyo Grande, Oceano and Grover Beach.

In April 2003, the County Board of Supervisors passed a "Resolution to Relinquish the Arroyo Grande and Los Berros Diversion Flood Control Channels and Appurtenant Structures to the State of California". County Public Works Department staff recommended that maintenance responsibilities be turned over to the State Department of Water Resources (DWR) because the County had not been able to maintain the channel due to regulatory requirements, inadequate funding from the Zone 1/1A assessments, and the cost of liability insurance.

The Arroyo Grande Creek Erosion, Sedimentation and Flooding Alternative Study was completed in 2005 and includes an analysis of a detailed set of flood reduction alternatives for the flood control channel. The study focuses on an in-depth evaluation of erosion sources, sedimentation and hydrology as they related to recurring flooding in the lower reaches of the creek.

In 2006, a 218 vote was passed in Zone 1/1A which allowed landowners to increase their assessments. Consequently, the County reversed their relinquishment resolution. In the intervening years, annual vegetation maintenance has been conducted to reduce flooding potential while encouraging the enhancement of riparian vegetation in the flood control channel. The Arroyo Grande Creek Waterways Management Plan, now in its early stages of development, will plan the implementation of selected alternatives 3a and 3c of the Alternative Study. Central Coast Salmon Enhancement will continue to be an active participant to ensure long-range steelhead restoration is part of the process.

Implementation

My concerns: The more agencies involved the more regulations, paperwork, restrictions, etc. The word monitoring scares me. Is this whole process going to end of making some lawyers a lot of money? I like fish as much as the next person, but this whole process is going to (or has the potential to) have a big effect on my livelihood. I love Arroyo Grande Creek, but don't see that it needs to be changed (or my business changed).
-Watershed Organization Participant

Approach to Implementing the Plan

The implementation of the watershed management plan is completely voluntary. Implementation will be guided by the steering committee to ensure projects of community concern and support are considered and that the original intentions of the stakeholder group are upheld. In addition, efforts will be made to overlay projects recommended in this plan with other emerging plans including the Oceano Drainage and Flood Control Study, the Arroyo Grande Creek Habitat Conservation Plan and the Watershed Assessment and Flooding Alternatives Analysis for Arroyo Grande Creek Flood Channel, as well as use of opportunities related to required mitigation projects in the watershed to implement already targeted projects. Further, this plan will make recommendations for articulation with the above plans for an on-going organizational framework for coordinating management activities within the watershed.

It is the desire of the Arroyo Grande Watershed Forum steering committee that this plan maintain its roots in the public arena for ready access to public input as CCSE continues its mission in creating a sustainable watershed management plan that will reflect all intended uses while enhancing the watershed's natural resources. To this end, the plan will become a living document responsive to changes in the watershed. The steering committee will be seeking support for the plan by regional municipalities and regulatory agencies to familiarize them with the grassroots effort to enhance and restore the watershed. The plan will be available on our web site and linked to all supporting entities' sites.

Support of the plan is being sought to increase the likelihood of garnering funds for implementation and to continue to foster a spirit of cooperation among groups working in the watershed. An informational map will be included for the public to use for educational purposes and will be integrated into our watershed education program.

Benefits to Landowners and Community

Through the development of the plan, the landowners, community members, agencies and organizations working and living within the watershed have gained new perspectives about other stakeholders' needs and the resources the community depends upon. Benefits will be short-term as well as long term.

With the assistance of the information in the plan, landowners will be able to implement projects that benefit not only their own property but benefit the environment as well. Projects such as bank stabilization ensure the landowner will retain his/her "property" as the same time it is protecting habitat by reducing excess sediment inputs to the stream. Tools provided in this plan in the form of information on agency jurisdiction will facilitate project design, permitting and planning.

In addition to project design and implementation information, financial support will be developed using this plan as a basis for grant applications. Landowners will be able secure funding to complete projects defined in this plan. Funding opportunities are available for on the ground projects, installation of management practices and for landowners interested in easements to achieve specific objectives.

Recommended Projects

The following set of projects has been developed based on landowner input, with Steering Committee priorities, projects previously identified by California Department of Fish and Game (CDFG), and the Stream Inventory and Geomorphic and Hydrologic Conditions Assessment (Appendices D and B). Projects are grouped on the basis of limiting factor(s) and critical issues brought forth by stakeholders. Status of projects as the Update will be included.

Conduct Steelhead Restoration Planning

CCSE will continue to follow the National Oceanic and Atmospheric Administration South-Central California Coast Technical Recovery Team's progress for Phase I Recovery. In addition, the following are data gaps that might be treated as future planning needs:

- Information regarding steelhead population trends through time, articulated with monitoring program in Habitat Conservation Plan for Steelhead of Arroyo Grande Creek.
- Hatching success and juvenile survival rate of steelhead. Migrant trapping on the creek.
- Evaluation of creek mouth as passage barrier in Off-Highway Vehicle Riding Area.
- Fish sampling to identify predatory fish species within Arroyo Grande Creek.
- Fisheries Assessment of gravel pool pit downstream of Lopez Dam.
- Steelhead use of Arroyo Grande Creek estuary and lagoon for rearing.

Fish Passage Projects

To regain lost contiguous habitat, fish passage projects will restore connections between areas of the creek that now function as potentially isolated habitats. Recommended priority for fish passage projects:

Modify County Stream Gage

The United States Geological Survey (USGS) installed a stream gage upstream of the village of Arroyo Grande to record flow and level of the creek. In the past, USGS maintained the gage but has since relinquished that responsibility to the County. The gage is located on a bedrock outcrop, and a concrete landing was installed to direct flows for the recording. The landing is about 10-feet long and a low flow section is available for fish passage but the height of the plunge to the pool below is a barrier for juveniles trying to migrate upstream.

The County had identified the stream gage for removal as mitigation for the HCP. It was expected that the project would take about three years to complete once the HCP was approved to ensure unimpeded migration potential for steelhead in Arroyo Grande Creek. The County released this project as mitigation (Doug Bird, personal communication). CCSE has received CDFG Fisheries Restoration Grant funds to design modification to this barrier. Once design is complete, Salmon Enhancement will seek funds to implement the design.

Replace Cecchetti Road Culvert

Arroyo Grande Creek passes through a single 5-foot culvert as it passes under Cecchetti Road, a County maintained road. The crossing may act to

limit the upstream migration of both adult and juvenile steelhead. The Arizona Crossing apron was designed for the creek to overtop it, but, during high flows passage could be a problem for aquatic organisms, and it has been a problem for people as well (during the storms of March 2001, a driver and car were swept into the creek). The County has identified this as a project type that could be funded through their conservation account that is referenced in the Arroyo Grande Creek Habitat Conservation Plan for the Protection of Steelhead trout and Red-legged Frog (HCP). This crossing has been ranked #2 by a county-wide barrier assessment. The barrier has received preliminary concept design treatment under the Land Conservancy of San Luis Obispo's barrier modification design and permit grant and final concept design treatment through Tri-Counties Fish Team Fisheries Restoration Grant Program funding. CCSE will proceed with identifying specification level design and construction funding to modify this barrier.

Modify Abandoned Dam/Diversion Footings

An old footing in the creek channel at mile 9.5 potentially impedes migrating steelhead under low flow conditions, restricting fish access to the upper portion of the watershed. That section of creek would encompass Biddle Park and about 2 miles of creek for spawning and rearing. From pictures and information received from Dave Highland (CDFG, pers. comm.), there are three "step" type structures spanning the creek channel. CCSE staff has investigated the footings, and measured the structure. We plan to apply for funds to modify the structures after implementation of the Stream Gage Modification project.

Modify Concrete Dam

During the Stream Inventory, a non-functional concrete dam was identified at stream mile 5.82. The structure is 4' thick and 4.5' high - under normal to low flow, a significant barrier. There is a significant plunge pool below the dam but, due to the height and thickness of the structure, negotiating passage is difficult. If the structure was to be notched both for height and thickness, significant improvement in passage could be achieved. Concentrating the flow through a notch would increase the quality of the plunge pool below the structure as well. The structure does not present as significant a grade control structure as does say the stream gage, but careful engineering and modification should be done to ensure no adverse impacts come from the barrier modification.

Remove Huasna Road Debris

As Arroyo Grande Creek goes under Huasna Road, the channel is highly entrenched and laid in bedrock. Old water pump parts and water lines are still in the creek and on the "bank" immediately upstream from the bridge.

Under low-flow conditions this debris could hinder upstream migration. These pieces could be removed and taken to an area with other historical materials or simply recycled. A crane would be required due to the size and weight of the items, but they can be accessed directly from the bridge with slings and lifted from the bed.

Modify Los Berros Creek Gaging Station

The first road crossing of Los Berros Creek above Hwy 101 is a USGS Gaging station. A concrete lip extends from the base of the crossing 15 feet downstream and creates sheet flow into the plunge pool below, as this structure functions as a grade control structure as well. The pool below the lip is about 2 feet deep but could be deeper if surface flow was present and continuously scouring. At the top of the lip, there is a concrete curb that concentrates flow to the left bank. This could present a significant barrier to juveniles and adults migrating upstream under normal flows. This is passable under higher flows, as documented by a steelhead carcass found by a volunteer water quality monitor. Modification advised, based on hydrologic conditions of the area.

Replace Los Berros Creek Culvert

There was a culvert discovered at the fifth road crossing after getting on to Los Berros Creek Road behind Latetia Winery that could be a barrier to migrating juvenile steelhead. The CMP appears to be about 3-feet in diameter, and perched about 12-inches above the pool. This could present a barrier to juveniles and under certain conditions, a barrier to migrating adults. Under normal flows, it should be passable to adult salmonids.

Modify Tar Springs Creek Road Crossing

There is an apparent low-flow concrete weir structure under the Branch Mill Road Bridge as it crosses Tar Springs Creek that has been undermined by the active creek and most likely presents a full barrier to both adults and juvenile migrating steelhead. The weir is about 2-feet wide, about 3-feet high where the creek has undermined it, and spans about 6-feet from where the creek goes under one side and comes out the other. It does not appear to have any structural significance for the bridge itself, so it could probably be notched for unimpeded flow or removed altogether.

Replace Biddle Park Culvert

While functional in its current state, the Biddle Park Culverts could be modified to improve passage. Biddle Park is located approximately ten river miles upstream from the creek's confluence with the Pacific Ocean. Five culverts direct creek flow under the park's entry road. These culverts

were installed by the County Department of General Services in the early 1990's after El Nino-generated flows plugged the existing culverts with debris, and washed out the road. 1998 was the most recent date that the culverts had been washed out. Five 4-foot culverts were staggered in placement to prevent debris accumulation and allow the creek to meander over time. A better strategy might have been an 8-foot central culvert buried 25% below stream grade with 4-foot culverts on either side. To allow better fish passage, the creek could be spanned with a bridge, but concrete abutments would possibly need to be installed and the structure brought in. Railroad car frames seem to be the cheapest and easiest to install but the feasibility and engineering need to be worked up before this project can proceed. Another alternative is the use of a pre-cast concrete bridge. The pieces are cast off site and then trucked in, assembled on site, and installed as a single piece.

Gravel Augmentation

The 69% of gravels observed in the surveyed section of the creek (Stream Inventory, CCC, 2004) are embedded with silt. Over 50% of the substrate sampled was rated as unsuitable for spawning. Despite the high percentage of spawning gravels, the quality of spawning habitat is therefore reduced. Of the four tributaries, only one has been reported to support steelhead and is not as heavily impacted as the main stem with sediment. The HCP has identified gravel augmentation as a potential project for funding under the conservation account. By removing material from the flood control channel and devising a hopper system to sift or grade some of the coarser sediments, and repositioning endemic gravels at the top of the watershed, capacity could be increased in the flood control channel and clean gravels could be re-introduced to the system. Gravel augmentation can act as a form of bank stabilization. When placed and associated with active erosion sites the gravel can dissipate energy directed at the erosion site and aid in the active sorting of gravels for downstream use. An area of active bank erosion is usually a good site for this technique because the stream has demonstrated the ability to move substrate material. The project may also provide temporary protection for the bank until the gravel is washed away (Flosi et. al., 1998). Reducing embeddedness with the re-introduction of clean spawning gravel through this process could potentially boost egg survival and aid the steelhead population.

Remove Exotic Species

Investigate Presence of Exotic Predators

Although Sacramento Pike minnow has not yet been recorded in the watershed, it would be useful to investigate its presence, as it has been recorded in Chorro Creek to the north in the Morro Bay watershed. Field reconnaissance has not yet validated their presence in Arroyo Grande

Creek. Large-mouthed Bass, Black Crappie, and Green Sunfish have been documented in the watershed (Rischbieter, 2004).

According to DW Alley (1996), bluegill, *Lepomis macrochirus*, largemouth bass, *Micropterus salmoides*, and brown bullhead, *Ictalurus nebulosus*, were found during electro-fishing surveys in watershed. Bluegill and bass were found in the lower estuary area and may have come from Meadow Creek drainage as it supports habitat for warm-water fishes. Both could be predators to juvenile steelhead if they were to establish populations in the estuary.

According to the Oceano Dunes SVRA, Pismo SB Dune Preserve Aquatic Survey (2004), largemouth bass, *Micropterus salmoides*, juveniles/ Young-of-Year (YOY) were captured in three of the seven surveys. Black crappie, *Pomoxis nigromaculatus*, green sunfish, *Lepomis cyanellus*, and bluegill, *Lepomis macrochirus*, were also collected in the SVRA surveys. These three species were collected in different surveys but only once for each species in all seven surveys. There is notation that these exotic fish may have come from Lopez dam or farm ponds within the watershed. It is also plausible these fish may have come from Meadow Creek where the habitat supports warm-water fishes. In addition, their age class indicates they would not have come from Lopez as Young-of-Year (YOY) as the last time the dam spilled was in 1997.

Coordinate an Exotics Mapping and Removal Program

Exotic species seed sources can enter the watershed from adjoining public and private lands. It would be useful to coordinate with county, regional, state, and federal weed eradication programs to ensure the watershed is included in a coordinated effort.

Remove Exotic Species in Kiwanis Park

Arroyo Grande Creek runs through the downtown section of the Village of Arroyo Grande adjacent to the City's Kiwanis Park. Several years ago, English ivy began colonizing a section of Kiwanis Park. This escaped exotic has begun to overrun the banks along the creek as it flows through the Village and is choking out native bank and upslope vegetation, as well as mature trees.

The challenge of a removal program is to ensure regular maintenance to keep the ivy from returning. In the long term, the plan is to employ a corps of volunteers who would monitor this and other restoration and enhancement projects along the creek. The removal methods under consideration are cited below in Combating the "Ivy Desert": The Invasion of *Hedera helix* (English Ivy) in the Pacific Northwest United

States by Anne Okerman

(<http://www.hort.agri.umn.edu/h5015/00papers/okerman.htm>).

Persistent cutting of *H. helix* is a method that is being used in many parks and nature areas within the Northwest United States. Cutting with pruners and then pulling the plants from trees and the forest floor may be the most effective technique. Tryon Creek State Park in Portland, Oregon has an official Ivy Removal Day on a monthly basis; volunteers visit the park and cut *H. helix* from the infested areas. In these areas, it is most effective to separate the climbing ivy from its roots by cutting a 3-foot swatch around the host tree. *H. helix* vines begin to die after 2 weeks during drier summer months and within a month during the early spring or early fall. If vines are too thick to cut, one can strip back the bark, notch the exposed section, and apply a diluted herbicide such as Round-up (glyphosate). Other programs in state parks include “Adopt-a-Plot,” where volunteers visit the park and remove ivy in a specific place and then routinely visit for two years to check for new shoots.

Other physical removal methods include using an edger/trimmer (manufacture’s name: weed eater) to cut the woody stems of *H. helix*, exposing the inner bark. An application of an herbicide such as Round-up (glyphosate) or Garlon (2,4-d) on cut stems and leaves can then effectively penetrate into the plant (Reichard, 2000). In one case where a string trimmer was used in combination with herbicide application, the treatment successfully killed the plants though the area was invaded soon after by adjacent populations of *H. helix* (Reichard, 2000).

http://www.noivyleague.com/Pages/control_methods.html

CCSE and the City of Arroyo Grande began an ivy removal pilot project in 2007. CCC hand crews removed ivy between the Mason Street Bridge and the hanging bridge. CCSE volunteers are pulling re-sprouts on a quarterly basis for three years. An area between the hanging bridge and Bridge Street is receiving a chemical treatment approved for use near water to compare this type of treatment with hand-pulling.

Trap and Remove Beaver

The recorded presence of beaver within the watershed for the past thirty years has contributed to watershed management challenges. While not depicted to be native, though they may have become naturalized, they continue to enter the watershed from adjacent areas, probably emigrating from more northern watersheds. The CDFG had conducted a trapping program in the past but presently does not remove beaver from the watershed. Therefore, it would be helpful to once again consider a beaver management program for the watershed.

Control Erosion to Reduce Sediment for Improved Water Quality

Dams alter sediment flows, both for the reservoirs behind them and the streams below, silting up the former while starving the latter. Sediment capture behind dams cuts off normal sand, silt, and gravel supplies to downstream reaches, causing streambed erosion that both degrades the channel habitat and isolates floodplain and riparian wetlands from the channel during rejuvenating high flows (Baron, 2004). As removal of the dam is unlikely, managing the sources of erosion and sediment is necessary. The management of erosion and sediment has beneficial implications for the management of the Zone 1/1A Flood Control Channel downstream. In addition to dam impacts, land use can exacerbate erosion and sedimentation by increasing surface runoff and further altering hydrologic conditions. The suggested projects below aim to regain attributes that have been lost or reduced and are listed in priority order.

Promote Low Impact Development Principles to Reduce Sources of Runoff

Healthy, functioning watersheds naturally filter pollutants and moderate water quality by slowing surface runoff and allowing the infiltration of water into soils. Agriculture and development activities can compact soils causing erosion and runoff which in turn decreases surface water quality and alters hydrologic flows. Other land uses such as residential and commercial can also produce pollution, runoff and erosion issues. Managing the causes of erosion and sedimentation such as surface runoff provides long term benefits. The implementation of low impact development (LID) redevelopment and retrofits can reduce surface runoff and protect water quality. Integration of LID principles can serve to minimize impervious cover and maximize groundwater recharge. In turn, the sources of runoff and potential erosion and sedimentation are reduced. A description of these practices and resources can be found on the RWQCB's LID website:
http://www.swrcb.ca.gov/centralcoast/water_issues/programs/stormwater/low_impact.shtml

Individual property owners, developers and municipalities can promote and implement LID principles. Landowners may consider project implementation to include specific LID concepts such as unit pavers for patios and walkways, driveway paving only under car wheels, dry wells connected to roof downspouts, vegetation at the drip line of the roof, and concave lawns that also serve as infiltration basins. Developers can attend educational trainings and consider using narrow residential streets, shared driveways, pervious overflow parking, notched curbs, swales, and playfield/infiltration basins. Municipalities can consider adopting policies and standards in line with LID principles. The City of Arroyo Grande has evaluated their policies and regulation in the Arroyo Grande Draft Creek Resource Protection Study (2007) and is finalizing its Stormwater Management Plan as required as part of NPDES Phase II. Cities can also partner with appropriate entities to provide annual educational training for private contractors and county maintenance and road crews to include instruction on the use of Low Impact Development (LID) and management practices for road and construction projects. Cities and the County may conduct community outreach regarding newly revised Storm water Management Programs and ordinances. These programs are to include more frequent, comprehensive grading/storm water inspections and enhanced enforcement of violations as provided for in revised County ordinances and new inspection programs scheduled to be implemented between 2010 and 2011.

Floodplain Enhancement Projects

Conduct Floodplain Enhancement Inventory

Inventorying potential sites for floodplain enhancement and seeking participation from willing landowners would serve to increase the watershed's natural capacity to hold sediment. Once an inventory is complete, an acquisition/conservation easement plan could be undertaken to include incentives to landowners to participate. By laying back and re-vegetating banks, allowing for greater volumes of water to be carried and slowing the velocity along banks, erosion potential is reduced as sediment can be deposited on the enhanced floodplain. Appendix I describes types of conservation easements and their utility.

Restore Talley Ho Creek

Talley Ho Creek is the smallest tributary to Arroyo Grande Creek, yet has some significant issues that can and have affected the water quality of Arroyo Grande Creek. During the winter rains of 2001, a development on James Way contributed a considerable amount of sediment to Talley Ho Creek and ultimately into Arroyo Grande Creek. The CSLRCD, City of Arroyo Grande and Salmon Enhancement are developing a restoration plan to include repair of a head-cut, purchase and development of an

upstream detention area on private property inside city limits to be protected with a conservation easement, and sediment removal to reduce impacts of flooding to Tally Ho residents.

Develop a Bank Stabilization Plan for Arroyo Grande Creek

CCSE will continue to work with landowners, NRCS and the CSLRCD to refine a plan to stabilize banks on private property. During the past seven years, several residential landowners have approached CCSE for assistance in addressing bank problems on their creek adjoining properties. We will continue to seek solutions to assist these homeowners by exploring options of articulating their projects with larger projects for cost effectiveness or combining several small-scale projects that could possibly be addressed together.

Conduct Road Inventory

The road system throughout the watershed could be inventoried to identify areas where sediment is entering the creek in order to modify structures or initiate BMPs to reduce inputs. This would lead to reduced sedimentation to the system which could, in turn, reduce the level of embeddedness of gravels in the creek bed.

Watershed-wide Storm Drain Stenciling

Most storm drains go either directly into creeks or the ocean. Unfortunately, they are still common dumping stations by those unaware of their actions' impacts. Stenciling on the drains reiterates the fact that serious impacts can result from materials dumped into the storm drains. This is an inexpensive and easy project to accomplish, netting big results and was initiated in October, 2003, during Arroyo Grande Creek Clean Up events. The City of Arroyo Grande's Storm Water Management Plan contains this project in its public participation and involvement section (BMP 3.2 measurable goal). At this writing, many of the stencils are very worn or absent and need to be re-painted and replaced.

Promote Policy Planning and Education

Produce Ordinances Which Benefit Watershed Health

CCSE will continue to work with local jurisdictions to generate concepts for local ordinances, researching currently applicable ordinances, regulations, resolutions and institutional incentives to protect and restore watershed health, particularly regarding sediment generation and control. Potential activities include:

- Work with the California State Association of Counties to provide information on the model county ordinance proposed by the Task Force to Remove Barriers to Restoration.
- Investigate methods of incorporating channel evolution time frames into urban planning models so that a riparian channel is given an opportunity to reach a stable urban condition within the context of current land use planning principles.
- Investigate the Public Benefit Rating System as a watershed action tool.

Research Relationship between Surface Flows, Groundwater, Recharge and Management

CCSE has initiated discussions with USGS to include in its work plan further investigation of surface and groundwater flows adjacent to the lower reaches of the creek to examine dewatering potential, particularly under drought conditions. It would also be useful to understand the acre-feet of diverted water, an aggregate reporting of water used for agricultural pump usage, and the acre-feet of water devoted to the City of Arroyo Grande and other municipalities. Conservation programs to improve efficiencies could then be initiated which encourage water supply pumping overnight. Stream flow is often highest at night when evaporation and transpiration are reduced, and when fish are less active. During the late summer, water that is being stored off-channel for use during peak demand periods could be diverted between the hours of 9pm and 5am. Municipal suppliers could assess their operations during low-flow summer months and pumping at night might also be less expensive.

Develop Framework for Articulation with Implementation of Arroyo Grande Creek Habitat Conservation Plan for the Protection of Steelhead Trout and California Red-legged Frog (HCP)

CCSE suggests developing an organizational framework to facilitate coordination of implementation of the priority projects proposed herein and in the HCP. There is sufficient overlap in project goals and objectives to advocate for an implementation team approach whereby coordinating funding, design, construction and monitoring of projects would be useful and efficient. The involvement of the community via CCSE would enhance funding opportunities for both entities, leveraging sources that each has access to, and could be multiplied through matching/in-kind resources. The vehicle for this may unfold as the MOU is signed and implemented by signatory entities.

Streamline Permits for Restoration Projects

As CCSE works to fund and implement restoration projects, it would be useful to examine streamlined permit programs in adjacent watersheds such as Morro Bay and help to facilitate and institute such a program in this watershed with as many regulators as possible. At this writing, Sustainable Conservation in conjunction with the Coastal San Luis Bay RCD and NRCS has developed a streamlining program for San Luis Obispo County. It would be useful to get on the radar of the California EPA's and the California's Resources Agency's Strategic Watershed Plan which is exploring options for permit assistance centers, regional pilots for coordinated technical review and permitting of restoration projects, watershed-based permit coordination programs, using funds such as Prop 40 (AB 2534), and developing a watershed planning guide.

Continue Steering Committee/Watershed Forum or Council and Community Education and Awareness

It would be useful to continue the Arroyo Grande Watershed Forum as a platform for receiving public input on watershed wide issues. To that end, there is a need to continue community education and awareness. Some educational opportunities include: (1) inviting National Riparian Service Team to conduct a workshop on Proper Functioning Condition (NRCS, BLM and USFS); (2) initiating Adopt-a-Watershed program to further community involvement; (3) placing watershed signs at creek crossings and at watershed divides; (4) Continuing and expanding monitoring activities; (5) working to reduce road drainage to waterways; (6) supporting the development of watershed-based general plans; (7) producing a watershed owner's manual; (8) developing a concept proposal for a Watershed Education and Training Center at the site of the current site of Central Coast Salmon Enhancement's office adjacent to Arroyo Grande Creek; (9) offering classes for urban users in storm water issues; (10) creating a watershed stewards education class; and (11) continuing existing community education projects such as Arroyo Grande Creek Clean Up and Education Fair.

Fixing the underlying causes of flooding, erosion and sediment problems in the creek, rather than fixing the actual flooding, erosion and sediment problems requires a watershed approach with participation from all sectors of the community. The projects outlined herein address both aspects of restoration in recognition that resolving the underlying causes requires cultivating sustainable relationships requires time and patience.

Promote Safe Harbor Agreements

Promote Safe Harbor agreements for areas where threatened and endangered species are a concern on private working landscapes like farms and ranches to provide protection to landowners from regulatory action related to the Endangered Species Act.

Figure 22. Matrix of Recommended Projects

Recommendation	Specific Project	Limiting Factor	Assessment of Condition	Management Actions	Potential Project Partners
Conduct Steelhead Restoration Planning	Modify County Stream Gage at stream mile 4.98	Fish passage barrier	Concrete landing with shallow sheet flows	-Finalize design plans -Identify funding for implementation	San Luis Obispo County, Salmon Enhancement
	Replace Cecchetti Road Culvert at steam mile 8	Fish passage barrier	Single 5' culvert is ranked #2 in county assessment	-Develop final designs -Identify funding for implementation	San Luis Obispo County, Salmon Enhancement
	Modify Abandoned Dam at stream mile 9.5	Fish passage barrier	Three step footings	-Evaluate severity of barrier -Design modification if needed	Private landowner, Salmon Enhancement and California Conservation Corp
	Modify Concrete Dam at stream mile 5.82	Fish passage barrier	4.5' high structure	-Evaluate severity of barrier -Design modification if needed	
	Remove Debris at Huasna Road	Fish passage barrier	Water lines and other garbage clog the creek	-Evaluate severity of barrier -Design modification if needed	
	Modify Los Berros Creek Gage at stream mile 5.6	Fish passage barrier	Concrete lip creates sheet flow	-Evaluate severity of barrier -Design modification if needed	
	Replace Los Berros Creek Culvert	Fish passage barrier	3' culvert is perched 1' above pool	-Evaluate severity of barrier -Design modification if needed	
	Modify Tar Springs Creek Road Crossing at stream mile 0.5	Fish passage barrier	Low flow concrete weir	-Evaluate severity of barrier -Design modification if needed	

Recommendation	Specific Project	Limiting Factor	Assessment of Condition	Management Actions	Potential Project Partners
	Replace Biddle Park Culvert at stream mile 10.9	Fish passage barrier	5-4' culverts are functioning, but could be improved	-Evaluate severity of barrier -Design modification if needed	County Parks, Salmon Enhancement
	Gravel Augmentation	Spawning habitat	Substrate is highly embedded or unsuitable for spawning	-Develop plan that identifies gravel sources and placement sites	San Luis Obispo County, Salmon Enhancement
Remove Exotic Species	Investigate Presence of Exotic Predators	Rearing survival	Pike minnow may be present. Bass, crappie, sunfish, bluegill and bullhead are present.	-Identify survey sites -Snorkel survey or electrofish for presence	State Parks, Salmon Enhancement
	Coordinate an Exotics Mapping and Removal Program	Riparian cover		-Survey all creeks in the watershed through site surveys. -Prioritize sites for treatment	Coastal San Luis RCD, The SLO Land Conservancy, Salmon Enhancement
	Remove Exotics in Kiwanis Park	Riparian cover	English ivy and cape ivy are present	-Continue volunteer work days for removal	City of Arroyo Grande/Salmon Enhancement
	Trap and Remove Beaver		Beaver are naturalized and may impact steelhead populations	-Evaluate benefits of beaver management plan	
Control Erosion to Reduce Sediment	Promote Low Impact Development Principles	Water Quality, Sedimentation		-Work with City and County to update ordinances -Work with municipalities to implement Stormwater Management Plans	City of Arroyo Grande, Salmon Enhancement

Recommendation	Specific Project	Limiting Factor	Assessment of Condition	Management Actions	Potential Project Partners
	Conduct Floodplain Enhancement Inventory	Water Quality: Sediment		-Inventory floodplains for potential enhancement -Develop acquisition/easement plan	Natural Resources Conservation Service, Coastal San Luis RCD, Salmon Enhancement, City of Arroyo Grande, Land Conservancy of SLO County
	Restore Tally Ho Creek	Water Quality: Sediment; Flooding		-Identify funding for floodplain easement and creek restoration	City of Arroyo Grande, Salmon Enhancement, Coastal San Luis RCD
	Develop a Bank Stabilization Plan for Arroyo Grande Creek	Water Quality: Sedimentation	Creek incised, banks eroding, gravels embedded	-Survey creek for erosion sites and prioritize -Work with landowners to change management practices -Develop and distribute educational materials to landowners and managers.	Natural Resources Conservation Service, Coastal San Luis RCD, Salmon Enhancement, City of Arroyo Grande,
	Conduct a Road Inventory	Water Quality: Sedimentation	Creek incised, banks eroding, gravels embedded	-Survey all roads with in the watershed through aerial photos and site surveys.	Natural Resources Conservation Service, Coastal San Luis RCD, Salmon Enhancement
	Watershed-wide Storm Drain Stenciling	Water Quality		-Coordinate volunteer work days	City of Arroyo Grande, County of San Luis Obispo, Salmon Enhancement

Recommendation	Specific Project	Limiting Factor	Assessment of Condition	Management Actions	Potential Project Partners
Promote Policy Planning and Education	Produce Ordinances which Benefit Watershed Health			-Work with City and County to define appropriate creek setbacks -Investigate other tools that marry municipal activities with watershed planning	City of Arroyo Grande, San Luis Obispo County
	Research Relationship between Surface Flow, Groundwater, Recharge and Management	Water Quality	Unknown interactions between groundwater and surface water	-Complete a water budget for the watershed -Work with landowners to develop a non-municipal water conservation program	USGS, City of Arroyo Grande, Salmon Enhancement
	Develop Framework to Articulate with Implementation of the Arroyo Grande Creek HCP				San Luis Obispo County, Salmon Enhancement
	Streamline Permits for Restoration Projects		Permitting can be an impediment to restoration	-Research statewide activities that may compliment the SLO County permit streamlining program	Coastal San Luis RCD, Salmon Enhancement
	Continue Steering Committee and Community Education	Community knowledge		-Continue Watershed Forum -Develop education plan that may include brochures and maps	City of Arroyo Grande, San Luis Obispo County, Coastal San Luis RCD, Salmon Enhancement

Recommendation	Specific Project	Limiting Factor	Assessment of Condition	Management Actions	Potential Project Partners
Promote Safe Harbor Agreements				-Educated landowners -Identify interested landowners	USFWS, NRCS, Coastal San Luis RCD, Salmon Enhancement

Status of Recommended Projects

The City of Arroyo Grande has been proactive in establishing funding mechanisms and coordination for improvement projects on city creeks and drainages. The City of Arroyo Grande Creek Resource Protection Study (2007) includes chapters on existing setting and resources, issues and impacts, policies regulation and potential deficiencies and recommended policies and regulations. The City convenes a monthly creek work group meeting with representatives from Salmon Enhancement, Coastal San Luis RCD and lead city staff.

The City spear-headed the development of an MOU to define potentially participating parties to manage the watershed collaboratively.

The Creek Maintenance Memorandum of Understanding (MOU) intends to provide an overall understanding and accountability between Parties to collaboratively pursue a more efficient and effective means of watershed management. The Parties involved agree to develop recommendations to fund programs and develop policies that better protect, manage and enhance the watershed.

Parties that have signed onto the MOU include the City of Arroyo Grande, San Luis Obispo county Flood control and Water Conservation District, Zone 1/1A and Zone 3, County of San Luis Obispo, City of Grover Beach, City of Pismo Beach, Oceano Community Services District, South San Luis Obispo County Sanitation District, Coastal San Luis Resources Conservation District, Central coast Salmon Enhancement, and California Department of Parks and Recreation. As of March 2009, the Natural Resources Conservation Service and U.S. Fish and Wildlife Service are pending parties to the MOU.

In November 2006, the voters of Arroyo Grande approved Measure O-06, which established a half-cent local sales tax to meet City needs identified in the City's long-range financial plan. Included in the established priorities was an annual allocation of \$75,000 for creek related projects.

As a first step in the removal of exotic species, the City of Arroyo Grande and CCSE began the English Ivy Removal Pilot Project in fall 2007. The project site is located between Bridge Street and Mason Street, and included tests of manual removal versus chemical removal. It was found that chemical removal is considerably less effective with the thick waxy leaves of the ivy and that manual removal is necessary for eradication. Chemical removal may be considered for very steep slopes that are not accessible to hand crews and will be further studied. After the initial clearing, volunteers returned to the site to remove re-sprouts and plant native species. The following plants were used.

<i>Artemisia californica</i>	California sage
<i>Artemisia douglasiana</i>	Mugwort
<i>Baccharis pilularis</i>	Coyote brush
<i>Baccharis salicifolia</i>	Mulefat
<i>Carex senta</i>	Rough sedge
<i>Cornus sericea</i>	Creek dogwood
<i>Equisetum sp.</i>	Horsetails
<i>Fragaria vesca</i>	Wood strawberry
<i>Juncus effusus</i>	Common rushes
<i>Lonicera involucrata</i>	Twinberry
<i>Lotus scoparius</i>	Deerweed
<i>Mimulus guttatus</i>	Seep monkeyflower
<i>Myrica californica</i>	Pacific Wax myrtle
<i>Platanus racemosa</i>	California sycamore
<i>Populus balsamifera ssp. trichocarpa</i>	Black cottonwood
<i>Quercus agrifolia</i>	Coast live oak
<i>Ribes sanguineum var. glutinosum</i>	Pink flowering currant
<i>Rosa californica</i>	California wild rose
<i>Sambucus mexicana</i>	Blue elderberry
<i>Symphoricarpos mollis</i>	Snowberry
<i>Umbellularia californica</i>	California Bay laurel

Salmon Enhancement volunteers will continue to monitor site progress through 2010. The initial removal by hand crews and chemical application was funded through Measure O.

Central Coast Salmon Enhancement has been contracted by the City of Arroyo Grande to produce a Creek Care Guide for Arroyo Grande residents and businesses, partially funded by Measure O.

Pending Changes to the Watershed

Flood Control Channel

As indicated above, a program EIR is under development to guide the implementation of flood control channel management alternatives 3a and 3c. These alternatives if implemented would:

- manage vegetation along the channel bed and banks,
- remove sediment in strategic areas using side channels to mimic flood plain action for scour and sediment transport
- raising the levee without raising the Union Pacific Railroad Bridge to provide 10 year flood protection or raising the levee to a higher degree for 20 year flood protection and raising the bridge above the 50-year water surface elevation (a requirement stated by Union Pacific)

Lopez Dam

The County of San Luis Obispo has prepared a pre-planning assessment of the concept to install Obermeyer gates at the Lopez Dam spillway that will allow additional storage at Lopez Reservoir. The proposed 3-foot raise assumes an additional storage capacity of 2,850 acre-feet (AF), increasing the maximum storage capacity of Lopez Lake from 49,400 AF to 52, 250 AF (URS Memorandum, Zone 3 Advisory Committee, November 11, 2008).

County of San Luis Obispo

An agricultural cluster development project has been proposed by Laetitia Winery located adjacent to Los Berros Creek. Water resources would be developed which are projected to reduce in-stream flows in the project area from 145 days per year to 40 days per year in drought years. In addition, drought conditions (less than 10.7 inches of annual rainfall) and excessive well pumping could reverse flow gradient so that groundwater from Los Berros Creek flows toward the pumping wells (Draft EIR for the Laetitia Agricultural Subdivision (2008).

Tally Ho Creek

Development plans for two properties adjacent to Tally Ho Creek present an opportunity to work voluntarily with landowners to enhance habitat and reduce sedimentation as the projects enter the City planning process. One site is in the Village of Arroyo Grande while the other is at the intersection of 227 and Corbett Canyon Road.

Record of Watershed Activities and Project Treatments as Carried Out

- 1960 CDFG Communication from Robert Jones regarding application 18375 in relation to Lopez Project and fisheries.
- 1960 Response to above by Robert Born of San Luis Obispo Flood Control and Water Conservation District regarding application 18375 in relation to Lopez Project and fisheries.
- 1961 CDFG Hinton report of Interrogation of landowners and sportsmen regarding steelhead runs in AG Creek as early as 1938. CDFG Wardens Al Stewart and Gene Needham are recorded as rescuing 127 adults from 1 hole in 1 day in 1957.
- 1972 CDFG James A. Schuler Stream Survey.
- 1996 D.W. Alley. Assessment of Juvenile Steelhead Habitat and Fish Densities in AG Creek.
- 1998 Habitat Restoration and Management Plan for the Arroyo Grande Mitigation Site, DWR, Environmental Services Office, Coastal Branch Environmental Support Unit. Details mitigations to off-set impacts from construction of the Coastal Branch, Phase II Project pipeline.
- 1999 CDFG Stream Survey including Habitat Inventories of Strother Park, Cecchetti Road, Biddle Park and Upper road crossing leading to Lopez Reservoir; one qualitative fish sampling site at Strother Park.
- 2000 Habitat Assessment for the AG Creek Flood Control Project, prepared for Arroyo Grande Creek Sediment Removal Project within the Flood Control Channel.
- 2001 Post-construction Monitoring Report for the Arroyo Grande Creek Sediment Removal Project.
- 2002 Post-construction Monitoring Report for the Arroyo Grande Creek Sediment Removal Project.
- 2003 Corbett Canyon Stream Restoration Project. A request was made of San Luis Obispo County Public Works Department to restore native riparian vegetation to an approximately 1,900 foot reach of Corbett Canyon Creek, 900 feet of which was

previously cleared of riparian vegetation in the Spring of 2002. The proposed project is within the Residential Suburban land use category, and is located on the east side of Corbett Canyon Road, approximately 0.5 mile north of Carpenter Canyon Road, northeast of the City of Arroyo Grande. ED01-480 (P12B559).

- 2003-08 California State Parks Doug Rischbieter Bi-monthly fisheries sampling in AG Creek Estuary.
- 2004 Stream Habitat Inventory conducted by Independent Contractor Bobby Jo Close and California Conservation Corps crew member Stacey Smith.
- 2004 Hydrology and Geology Assessment from Swanson Hydrology.
- 2004 County of San Luis Obispo Final Draft Arroyo Grande Creek Habitat Conservation Plan for the Protection of Steelhead trout and California red-legged frog (HCP) and Environmental Assessment/Initial Study for the Protection of Steelhead and California red-legged frogs
- 2004-2008 Vegetation Management along Flood Control Channel by the California Conservation Corps under contract with the Coastal San Luis RCD.
- 2005 Final Arroyo Grande Creek Watershed Management Plan
- 2005 Arroyo Grande Creek Erosion, Sedimentation, and Flood Alternatives Study and Biological Assessment
- 2007 English Ivy Removal Pilot Project in the City of Arroyo Grande by the City, CCSE and California Conservation Corps

Additional References about Activities and Treatments

There is a very large record of communication among the County of San Luis Obispo, the Coastal San Luis RCD, the NRCS and the DWR regarding maintenance of the flood control channel. A brief summary of maintenance reports by the county for the NRCS is included above in critical issues, flood protection.

It is hoped that as landowner relationships are cultivated that an aggregate accounting of treatment activities and potential impacts to the watershed may be accumulated and summarized in subsequent editions of this management plan. For example, the Bartleson Development Plan, 1996, concluded that stream flow in Los Berros Creek would not be impacted by

the proposed development during normal conditions. During the first year of stream flow at the end of an extended dry period, the amount of rainfall required to initiate flow at the gage may be increased by about three percent due to the project. The goal would be to track development project permits and project monitoring results within the watershed and develop a database to assist in evaluating cumulative impact to creek resources.

Regulatory Setting / Agency Jurisdiction

The Arroyo Grande watershed lies within many local, state and federal governmental jurisdictions. In order to work effectively to restore the watershed, it is important to understand the regulations and jurisdictions. The following gives a brief overview of these organizations. Contact names, addresses and phone numbers for the agencies can be found at the end of this document and will be updated to account for staff changes.

Federal Agencies

United States Army Corps of Engineers (ACOE)

The Arroyo Grande Creek Watershed lies in the Los Angeles District of the South Pacific Division. The local office is located in Ventura, CA. The Congress of the United States has assigned the U.S. Army Corps of Engineers the responsibility for regulation and construction and other works in the waters of the United States. The Corps is charged with protecting our nation's harbors and navigation channels from destruction and encroachment, and with restoring and maintaining environmental quality. This is accomplished by regulating activities in three areas (1) discharge of fill or dredged materials in coastal and inland waters and wetlands; (2) construction and dredging in navigable waters of the United States; and (3) transport of dredged materials for dumping into ocean waters.

The principal regulatory mechanisms of the Army Corps that relate to watershed enhancement are the Clean Water Act, Section 404(b)(1) Guideline; Marine Protection; Research and Sanctuaries Act; Endangered Species Act; National Historic Preservation Act; Coastal Zone Management Act; National Environmental Protection Act; and others as they relate to the regulatory actions of the District.

United States Fish and Wildlife Service (USFWS)

The U.S. Fish and Wildlife Service is the principal federal agency for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the public. The Service enforces

federal wildlife protection laws such as the Endangered Species Act, and works in consultation with the Army Corps to ensure that permitted projects protect fish and wildlife. When protected species are involved, the Service prepares “Biological Opinions” on the project to assess the potential impacts and restrict potentially harmful activities.

The Arroyo Grande Creek Watershed lies in the Service’s Pacific Region (Region #1). This region headquarters is located in Portland, OR and the region contains the states of Washington, Oregon, California, Idaho, Nevada, Hawaii, and the Pacific Islands.

NOAA Fisheries *formally known as National Marine Fisheries Service (NMFS)*

NOAA Fisheries is a division of the National Oceanic and Atmospheric Administration (NOAA). The NOAA Fisheries strategic plan contains three goals: rebuilding and maintaining sustainable fisheries, promoting the recovery of protected species, and protecting and maintaining the health of coastal marine habitats.

The Arroyo Grande Creek Watershed is in the Southwest Region (California, Hawaii, and the Pacific Trust Territories) with headquarters, located in Long Beach, California. The region is responsible for managing fisheries in the Pacific Islands for lobster, ground fish, swordfish, and precious coral; off the coast of California for salmon, ground fish, and anchovies; and or conducting enforcement, marine mammal and habitat programs to protect fishes, marine mammals and endangered species within the region.

Enforcement activities are carried out in cooperation with other State and Federal agencies in the Southwest Region to ensure compliance with various federal regulations relating to stewardship of fishery and protected species resources. For example, NOAA Fisheries works locally with the Army Corps permitting process by providing “Biological Opinions” on proposed projects. These opinions describe potential impacts to protected species and contain restrictions that assure protection of these species during project implementation.

United States Environmental Protection Agency (EPA)

Founded in 1970 as an independent agency, the Environmental Protection Agency (EPA) is generally responsible for protecting human health and safeguarding the natural environment (air, water, and land) in the United States. In its mission statement, the EPA identifies as its charge, research, standard setting, monitoring and enforcement with regard to five environmental hazards: air and water pollution, solid waste disposal, radiation, and pesticides.

While presiding over the entire country, the EPA also coordinates and supports research and pollution mitigation activities by state and local governments as well as private and public groups, individuals and educational institutions. The Arroyo Grande Creek Watershed lies in the USEPA's Southwest Region (Region 9). This region contains Arizona, California, Hawaii, Nevada, and the Pacific Islands and the headquarters are in San Francisco.

State Agencies

California Department of Fish and Game (CDFG)

The Department of Fish and Game is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. To meet this responsibility, the law requires any person, state or local government agency, or public utility proposing a project that may impact a river, stream, or lake to notify the CDFG before beginning the project. If the CDFG determines that the project may adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement (1602 Agreement) is required. The principal enforcement mechanism for the CDFG is the California Fish and Game Code, Section 1602.

The Arroyo Grande Creek Watershed is in CDFG's Central Region, a region that included Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, San Benito, San Luis Obispo, Stanislaus, Tulare and Tuolumne counties.

The CDFG currently holds a California Environmental Quality Act (CEQA) mitigated negative declaration for projects conducted using CDFG fisheries enhancement funds for this area. Exclusions include projects conducted by a governmental agency and permits requirements from the Army Corps of Engineers.

Regional Water Quality Control Board (RWQCB)

The Regional Water Quality Control Board is the local administrative unit of the State Water Resource Control Board. The Arroyo Grande Creek Watershed is in Region 3, the Central Coast Region. The local office is in San Luis Obispo.

The mission of the RWQCB is to develop and enforce water quality objectives and implementation plans that will best protect the beneficial uses of the State's waters.

Each RWQCB has nine part-time members appointed by the Governor and confirmed by the State Senate. RWQCB's are responsible for developing

“basin plans” for their hydrologic areas, governing requirements, issuance of waste discharge permits, enforcement actions against violators, and monitoring water quality.

The focus of the RWQCB is water quality; the Clean Water Act is the primary enforcement tool. The RWQCB also maintains the State’s 303 d. list of impaired water bodies (section 303 d. of the Clean Water Act). When a water body is listed on the 303 d. list, regional offices prepare studies and remediation plans to bring water quality to within the State’s standards.

The RWQCB becomes involved in watershed enhancement projects as part of Section 401 of the Clean Water Act (CWA). The Board works in coordination with the Army Corps of Engineers (ACOE) to issue compliance documents for this section of the CWA.

The RWQCB modified discharge permits associated with irrigated agriculture requiring landowners and farm operators to enroll in the Conditional Ag Waiver program which requires the development and implementation of a farm water quality management plan for the reduction of water quality impacts. Plans include use of Best Management Practices among others. The RWQCB is currently enrolling landowners and farm operators in the program. Arroyo Grande Creek is to be initially included in the core-monitoring network for the implementation of the waiver.

The RWQCB is moving towards a vision for Healthy Watersheds and measurable goals that include healthy aquatic habitat, sustainably managed land and clean groundwater. The Healthy Watersheds vision will refocus staff attention on ‘regional benefit’ and ‘leveraging’ when developing, reviewing and awarding proposals for funding.

California Coastal Commission

The California Coastal Commission was established by voter initiative in 1972 (Proposition 20) and was made permanent by the Legislature in 1976 (the Coastal Act). The primary mission of the commission, as the lead agency responsible for carrying out California’s federally approved coastal management program, is to plan for and regulate land and water uses in the coastal zone consistent with the policies of the Coastal Act. Commission jurisdiction in the coastal zone is broad and applies to all public and private entities and covers virtually all manner of development activities, including any division of land, a change in the intensity of use of state waters and of public access to them.

According to the Public Resources Code:

“Coastal zone” means that land and water area of the state of California from the Oregon border to the

border of the Republic of Mexico set forth in Section 17 of the chapter of the Statutes of the 1975-76 Regular Session enacting this division, extending seaward to the state's outer limit of jurisdiction, including all offshore islands and extending inland generally 1,000 yards from the mean high tide line of the sea. In significant coastal estuarine, habitat, and recreational areas as it extends inland to the first major ridge line paralleling the sea or five miles from the mean high tide line of the sea, whichever one is less, and in developed urban areas the zone generally extends inland less than 1,000 yards.

The Coastal Zone in this region only extends one-mile inland from the coast. Therefore, the Coastal Commission affects only a small area of the Arroyo Grande Creek.

Department of Water Resources (DWR)

DWR operates and maintains the State Water Project, including the California Aqueduct. The department also provides dam safety and flood control services, assists local water districts in water management and conservation activities, promotes recreational opportunities, and plans for future statewide water needs. The mission of the Division of Flood Management is to prevent loss of life and reduce property damage caused by floods, and to assist in recovery efforts following any natural disaster.

Although this agency had not historically been involved in decision-making or daily maintenance for the Arroyo Grande Creek watershed, the state water code and the county's relinquishment action required that the DWR study what was necessary to undertake maintenance responsibilities for the flood control channel, including consideration of the flood control channel's benefit district. The DWR Division of Flood Management discontinued the development of a flood maintenance district following the successful out of the 218 vote which enabled landowners in the zone of benefit to raise their assessments to fund maintenance on the flood control channel.

DWR's Division of Planning and Local Assistance operates the Urban Streams Restoration Program. The program offers grants to assist communities in reducing damages from stream bank and watershed instability and floods while restoring the environmental and aesthetic values of streams. This program is a potential funding source for project implementation and restoration of certain creek areas such as Tally Ho Creek.

Local Agencies

City of Arroyo Grande

The City of Arroyo Grande's Municipal Code (<http://www.arroyogrande.org/city-hall/municipal-code.html>) defines regulations that protect and promote public health, safety, and welfare. The Municipal Code applies only to those areas within city limits. In 2007, an ordinance (ORD 591) was passed that defined creek setbacks as follows:

Arroyo Grande Creek and Tally Ho Creek: Minimum of 35 feet

Meadow Creek and East Meadow Creek: Minimum of 50 feet

All other creeks and drainages: Minimum of 25 feet.

The City also has a pending Storm Water Management Plan for the National Pollution Discharge Elimination System Phase II Program that regulates water being discharged to creeks.

County of San Luis Obispo

The County's Land Use Ordinance (http://www.slocounty.ca.gov/planning/General_Plan_Ordinances_and_Elements/Elements.htm) includes regulations established and adopted to protect and promote public health, safety, and welfare. Regulations are also adopted to implement the County General Plan, guide and manage the future growth of the county in accordance with those plans, and regulate land use in a manner that will encourage and support the orderly development and beneficial use of lands within the county. The ordinance applies to development in non-incorporated areas of the county including Oceano, Tar Springs Creek and Los Berros Creek areas, and upstream of the City of Arroyo Grande.

Legal Regulatory Framework

California Environmental Quality Act (CEQA)

CEQA is the foundation of environmental law in California; it strives to protect all aspects of the environment through thorough analysis. CEQA requires state and local agencies to prepare Environmental Impact Reports for all most projects. These reports are then analyzed and used to make decisions about the severity of the impacts on the environment. CEQA also requires that mitigation measures are identified for all impacts. If an action is identified as a project an Initial Study is required, after analysis of the initial study occurs the decision is made to either make a Negative Declaration of environmental impacts or to prepare an Environmental Impact Report. If impacts are found mitigation measures and project

alternatives must be discussed. The responsible agency can decide to go forward with a project despite environmental impacts with a Statement of Overriding Consideration, which explains why the benefits of a project outweigh the environmental impacts.

National Environmental Protection Act (NEPA)

NEPA is the federal law that requires all federal agencies to prepare Environmental Impact Statements for actions that have a significant impact on the environment. NEPA is also a model for several policies at the state level, including CEQA. Environmental Impact Statements are very similar to EIRs and require that any environmental impacts be identified as well as creating mitigation measures to address the impacts.

Resource Agencies – Non-Regulatory

Within the watershed there are numerous agencies and organizations conducting activities many of which serve as a resource for landowners. Listed below are some of these organizations along with their scope of work.

Federal Agencies

Natural Resources Conservation Service (NRCS)

The Natural Resources Conservation Service (NRCS) provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

The Programs Deputy Area mission in NRCS is to manage natural resource conservation programs. These programs provide environmental, societal, financial, and technical benefits that include both on-site benefits and off-site benefits. Program benefits include many, but are not limited to, many of the following aspects:

- Sustaining and improving agricultural productivity.
- Cleaner, safer, and more dependable water supplies.
- Reduced damages caused by floods and other natural disasters.
- Enhanced natural resource bases that support continuing economic development, recreation, and other purposes.

Grants and technical support are available to landowners interested in improving the environment with projects on their property.

National Oceanic and Atmospheric Administration (NOAA) Restoration Center

The National Oceanic and Atmospheric Administration performs many non-regulatory tasks through its Restoration Center which plans, implements, and funds coastal restoration projects throughout the United States. The NOAA's website identifies that the Restoration Center's mission is to "enhance living marine resources to benefit the nation's fisheries by restoring their habitats". The NOAA Restoration Center accomplishes its mission by restoring degraded habitats, advancing the science of coastal habitat restoration, transferring restoration technology to the private sector, the public and other government agencies and by fostering habitat stewardship and conservation ethics. Three primary programs allow the Restoration Center to restore fisheries habitat. The first is the Community-based Restoration Program which takes a grass-roots approach to restoration and engages communities to participate in hands-on local habitat restoration projects. The second program is the Damage Assessment Remediation and Restoration Program, which brings in scientists and managers after oil spills, toxic releases, or ship groundings to restore injured marine resources. The Restoration Research Program works to advance new science and technology within the restoration field.

State Agencies

California Department of Parks and Recreation (State Parks)

The mouth of Arroyo Grande Creek empties into the Pacific Ocean as it passes through Oceano Dunes State Vehicle Recreation Area (ODSVRA). The ODSVRA is managed as part of the Off-Highway Vehicle Division of California Department of Parks and Recreation. State Parks has partnered with the Arroyo Grande Watershed Forum in a variety of activities that are mutually beneficial including exotic species removal, fish surveys and has contributed funding for the Flood Analysis Study that was conducted by the Coastal San Luis RCD. The Coastal District is engaged in developing a Habitat Conservation Plan for its coastal parks including ODSVRA.

California Coastal Conservancy

The Coastal Conservancy, while not a regulatory agency, is a state agency that works with the people of California to preserve, improve, and restore public access and natural resources along the coast and around San Francisco Bay.

Local Agencies

Coastal San Luis Resource Conservation District (CSL RCD)

Resource Conservation Districts (RCDs) are local units of government organized by local residents under State law. The Coastal San Luis Resource Conservation District (CSLRCD) is considered a legal subdivision of the State of California.

Under state law, the CSLRCD is responsible for soil and water conservation work within its boundaries. The Directors of the Coastal San Luis RCD are elected by district voters or appointed by the County Board of Supervisors, and they are not compensated for their work. The Board of Directors can make legal agreements with county, state and federal governments for work in the district. Associate directors may be appointed by the CSLRCD to assist in special areas of interest. Consultants and other individuals with special expertise may be called upon to achieve conservation goals. A characteristic unique to Resource Conservation Districts is their ability to work directly with landowners on private lands.

The CSL RCD has worked with the SLO County Agriculture Commissioner's office to set up an alternative review program for Level Three agricultural grading projects within the district, which includes the entire Arroyo Grande Creek watershed. Applicants for County agricultural grading permits may elect instead to use alternative review, inspection, and sign-off through the CSL RCD, rather than go through the County permit process, if their project fits the criteria of a Level Three project (as defined in County Land Use Ordinance, Title 22, Grading and Drainage: 22.52.050.C.2.c.). Level Three eligible projects include many standard agricultural grading projects on a natural grade of over 30 percent, or which involve runoff management systems or construction of stock ponds, or are otherwise not exempt from permit requirements under Levels One and Two.

County of San Luis Obispo Flood Control and Water Conservation District - Zone 1/1A

As an appointed body by the County Board of Supervisors (BOS), citizens who live within the zone's boundaries and who own five or more acres of land are eligible to serve on the Flood Zone Community Advisory Committee for the Arroyo Grande Creek flood control channel, which includes the channel and adjoining levee system. They serve at the pleasure of the Board and have advisory authority. They convene monthly.

County of San Luis Obispo Flood Control and Water Conservation District - Zone 3

Also appointed by the County BOS, zone 3 members advise the county as to the operations and maintenance of the Lopez Project and the Water Treatment plant associated with it.

County of San Luis Obispo Parks Department

The County Parks Department manages Lopez Lake Reservoir activities and has included Arroyo Grande Creek in its parks master plan.

Oceano Community Services District

Oceano, as part of the unincorporated area of the county, elects residents to the OCSD board of directors. OCSD is responsible for providing water and sewer to residents within its boundaries and not jurisdictionally responsible for flood control or storm water management.

Oceano-Halcyon Area Advisory Committee

Residents at-large serve at the pleasure of the County BOS to act as the Supervisor's eyes and ears in the community, soliciting information from the community and feeding it back to the BOS on development projects and other pertinent issues within the district's boundaries.

South County Sanitation District Board

Representatives from the communities served by the Wastewater Treatment Plant located along Arroyo Grande Creek, serve on this board as a decision-making body for the operation and maintenance of the facility. The Board is administered by John Wallace and Associates of San Luis Obispo.

Relationship to Other Existing Plans

In an effort to coordinate resources and avoid duplication of efforts, CCSE has actively participated as allowed in the development and review of plans that affect the watershed. CCSE and the Arroyo Grande Watershed Forum members will continue to monitor the progress of these plans and their implementation as it affects the activities of this management plan.

Arroyo Grande Creek Habitat Conservation Plan for the Protection of Steelhead trout and California Red-legged Frog (HCP)

San Luis Obispo County Flood Control and Water Conservation District Zone 3 is in the process of completing an Arroyo Grande Creek Habitat Conservation Plan for the Protection of Steelhead trout and California Red-legged Frog (HCP). The draft plan is currently (as of Spring 2005) undergoing regulatory review. The Final Draft Plan is expected once in-stream flow releases have been established and integrated into the plan. Once finalized, the plan will be in effect for twenty years.

The HCP has been prepared as part of the renewal process of the current water rights permit to utilize water from the Lopez project for municipal uses. The purpose of the HCP is to authorize the District for incidental take from current and anticipated operations of the Lopez project, while providing protection for steelhead and California red-legged frogs. The HCP documents the technical and scientific basis for the proposed conservation actions, based on the best scientific and commercial data available for Arroyo Grande Creek. Operations, maintenance, habitat improvements, and protective measures identified as part of this HCP will be the sole responsibility of the District.

In 1994, a water rights complaint was filed by the California Sport Fishing Protection Alliance alleging that improper operation and maintenance of the dam was detrimental to the steelhead habitat and Steelhead trout within Arroyo Grande Creek. Subsequently, District staff met with State Water Resources Control Board, NOAA Fisheries, U.S. Fish & Wildlife Service and California Department of Fish and Game representatives at which time it was determined that the District would be the lead agency in the development of a Habitat Conservation Plan.

In January 1998, the death of two Steelhead trout prompted discussions between the County and the regulatory agencies and based on those discussions the District initially agreed to maintain an interim minimum release from Lopez Reservoir of 7.7 cfs (5 mgd). Subsequently, after completion of a series of stream studies and additional discussions with CDFG and NOAA Fisheries, the release rate was adjusted to 6.2 cfs (4 mgd) to protect the steelhead habitat and to support the scientific data collection for this HCP.

The Final Draft HCP is available at <http://www.slocountywater.org/site/Popular%20File%20Downloads/pdf/Arroyo%20Grande%20Creek%20Habitat%20Conservation%20Plan.pdf>

The plan outlines several alternatives for operation of the Lopez Project which when finalized would provide incidental take authorization for Steelhead trout and CRLF resulting from operations and maintenance activities of the Lopez Project affecting Arroyo Grande Creek. Incidental take refers to the legal killing of species protected under the Endangered Species Act. When final, the HCP will also address mitigation measures to protect CRLF and steelhead, stipulate a water release schedule and in stream water regime, and includes measures for on-going restoration of the creek.

Watershed Assessment and Flooding Alternatives Analysis

The Coastal San Luis Resource Conservation District in association with San Luis Obispo County Flood Control and Water Conservation District Zone 1/1A Advisory Committee and Central Coast Salmon Enhancement developed a plan for the restoration of flood protection surrounding the channelized portion of the creek. The Flooding Alternatives Analysis includes further refined hydrology and erosion data than generated in this plan. The Alternatives Analysis includes specific project sites and methods for reducing flood hazards in the flood channel region as well as watershed wide treatments for sediment and erosion control.

Alternative Access Study, Oceano Dunes State Vehicular Recreation Area, California State Parks Oceano Dunes District (2006)

The study evaluated six alternatives in addition to the two paved roads the currently provide public access. Options for construction of a bridge on the beach were also developed and considered. The existing access roads of Grand Avenue and Pier Avenue constitute the environmentally superior alternative.

Lower Arroyo Grande Creek and Lagoon Fishery and Aquatic Resources Monitoring Reports

California Department of Parks and Recreation, Off-Highway Vehicle Division is conducting on-going fisheries studies. The 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. Steelhead trout and tidewater goby have been identified through this monitoring study. Contact Central Coast Salmon Enhancement for more information.

Oceano Drainage and Flood Control Study

The County of San Luis Obispo has prepared the Oceano Drainage and Flood Control Study within which are project alternatives referencing draining Oceano streets to Arroyo Grande Creek including an alternative suggesting the use of airport land as a detention basin. The drainage study suggests that all proposed developments that generate off-site runoff should investigate the drainage flow patterns from the lot to the discharge point. The conveyance path investigation requirement can be placed in the building or grading permit. If the investigation concludes that the proposed development is contributing to an existing problem, then on-site mitigation with a detention basin or equivalent functional fix could be required.

San Luis Obispo County Fish Passage Design Plan

The State Coastal Conservancy funded the Land Conservancy of San Luis Obispo County to prepare engineering designs, environmental documentation, and permit applications for fish passage improvements in San Luis Obispo coastal streams (State Coastal Conservancy staff recommendation, January 29, 2004). Two barriers among those listed within this report are within the top seven ranked barriers. The Cecchetti Road Culvert is ranked second and the Arroyo Grande Creek Stream Gage is ranked seventh (Land Conservancy of San Luis Obispo County, 2004). Both had been considered as mitigation within the HCP, but have been released from HCP mitigation requirements (Doug Bird, personal communication).

The Cecchetti Road crossing has received design and permit treatment through this program, as well as through Tri-Counties Fish Team funding. The concept plan is complete. Engineer designs to improve fish passage at the Arroyo Grande Stream Gage are completed to the 70% specification level. Both projects require funding for implementation.

Central Coast Region Basin Plan (1994), California Regional Water Quality Control Board

The goal of the Central Coast Region Basin Plan is to show how the quality of the surface and ground waters in the Central Coast Region should be managed to provide the highest water quality reasonably possible. The plan lists the various water uses and describes the water quality level that must be maintained to allow those uses. The Regional Board implements the Basin Plan by issuing and enforcing waste discharge requirements to individuals, communities, or businesses whose waste discharges can affect water quality. The Basin Plan is implemented by encouraging water users to improve the quality of their water supplies. Public works or other projects that affect water quality are reviewed and

their impacts identified. The Central Coast Regional Board has jurisdiction over a 300-mile long by 40-mile wide section of California's central coast. Its geographic area encompasses all of Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties.

The Arroyo Grande Creek Watershed Management Plan clearly addresses aquatic habitat, land management and groundwater issues at the watershed scale.

Storm Water Management Plans – National Pollution Discharge Elimination System (NPDES)

The County of San Luis Obispo and the City of Arroyo Grande have each prepared Storm Water Management Plans as required under NPDES Phase II permitting <http://www.epa.gov/npdes/>. Stormwater Management Plans serve as a framework for identifying, assigning, and implementing control measures and Best Management Practices (BMPs) intended to reduce the discharge of pollutants and protect downstream water quality. These BMPs affect the activities of developers, business owners and landowners in terms of water and stormwater.

The County Stormwater Management Program encompasses the designated unincorporated urbanized areas of San Luis Obispo County and can be found at <http://www.slocounty.ca.gov/PW/Stormwater/SWMP.htm>

The City Stormwater Management Program is being reviewed by the RWQCB and is expected to be adopted in 2009.

San Luis Obispo Integrated Regional Water Management Plan (2005), San Luis Obispo County

The San Luis Obispo Integrated Regional Water Management Plan identifies five water management planning objectives which include water supply, water quality protection and improvement, ecosystem preservation and restoration, groundwater monitoring and management and flood management. The Arroyo Grande Creek watershed falls in the Five Cities Water Planning Area. Immediate-term implementation priorities in the watershed include a Flood Management Plan and the Flood Control Zone 1/1A Waterway Management Program.

Local Coastal Plan, San Luis Obispo County

In the Watershed Summary of the periodic review of the San Luis Obispo County Local Coastal Plan (LCP preliminary report dated February, 2001) Arroyo Grande Creek is identified in terms of LCP zoning/land characteristics as including mix of ag, open space/recreation, large-lot rural, small lot rural, and urban reserve/village reserve lands. Main threats identified include Total Dissolved Solids, sodium, chloride in

groundwater, pesticides in Arroyo Grande Creek and seawater intrusion/overdrafts in Arroyo Grande and Nipomo Mesa basins.

City of Arroyo Grande General Plan

The following are summaries of General Plan policies that are relevant to the Arroyo Grande Creek watershed. The summaries are broken down by element.

Land Use Element (Fringe and Urban Area)

The Land Use Element contains policies that guide the density and use of development within the city as well as its sphere of influence.

Agriculture, Open Space and Conservation Element

The Agriculture, Open Space and Conservation Element contains policies that safeguard environmental and sensitive biological resources such as streams and riparian corridors.

San Luis Obispo General Plan

The following are summaries of General Plan policies that are relevant to the Arroyo Grande Creek watershed. The summaries are broken down by element.

Land Use Element (Inland Framework for Planning)

The Land Use Element contains policies and procedures that apply to the unincorporated area outside the coastal zone, and defines how the Land Use Element is used together with the Land Use Ordinance and other adopted plans. The Element also explains the criteria used in applying land use categories and combining designations to the land, and the operation of the Resource Management System. Combining designations are special map categories that identify areas of unique resources or potential hazards that necessitate more careful project review.

Conservation Element

The Conservation and Open Space Element outlines policies to protect and preserve natural resources. The Element is in the process of an update initiated in 2006. The draft plan is in a public comment period with Planning Commission hearings in February 2009 and Board of Supervisors hearings scheduled for August 2009. There is an existing Conservation Element included in the "Environment Plan" from 1974.

Agriculture and Open Space Element

The Agriculture and Open Space Element outlines policies for the development and management of agricultural and open space lands within the County’s jurisdiction, and is focused on “wisely managing and protecting these important land resources in San Luis Obispo County.” Recognizing the value of agriculture to the economy and character of the county as a whole, the goals of the plan are to support agricultural production, conserve and protect agricultural lands and resources, and encourage public education and participation in their management. Open Space contributes in large part to the quality of life enjoyed in San Luis Obispo County; the County’s goals are to identify, protect, and manage the existing open space by preventing urban sprawl and encouraging public education and participation in the decision making process. The protection of open space is considered essential to the preservation of the rural nature and lifestyles that characterize the county.

San Luis Bay Coastal Area Plan, San Luis Obispo County

Arroyo Grande Creek is part of the County’s San Luis Bay Coastal Planning Area. The plan can be accessed at <http://www.slocounty.ca.gov/Assets/PL/Area+Plans/San+Luis+Bay+Coastal+Area+Plan.pdf>

All proposed development projects within the watershed have implications for potential impacts to critical issues identified above. Given the standards for development within the City of Arroyo Grande and County of San Luis Obispo, it would be prudent to work with municipalities to fashion measures that will protect and enhance the watershed as the human population continues to grow and the watershed is developed, increasing impervious surfaces and subsequent run-off which in turn impacts the creek environment.

Oceano Specific Plan, San Luis Obispo County

The Oceano Specific Plan and Final Environmental Impact Report includes areas of the lower Arroyo Grande Creek and estuary, and references the area’s geology, biology and hydrology, and applicable regulations for each. The plan references Arroyo Grande Creek and its habitat in the following segments.

Flood Hazard Zones

The entire southern end of Oceano is within a Flood Hazard combining designation due to its proximity to Arroyo Grande Creek. This includes portions of the mobile home parks, the portion of Highway 1 where

Cienaga turns into Front Street, the entire airport, and the lower portion of the Oceano Lagoon. Any development within this combining designation must adhere to special regulations to reduce damage from flooding. Care should be taken with the types of development allowed in this area. The flood hazard area is within the jurisdiction of a number of agencies, including the Army Corps of Engineers, the U. S. Fish & Wildlife Service, the California Department of Fish & Game, the County Engineering Department, and the Coastal Commission.

Sensitive Resource Areas

The Oceano lagoon is designated a Sensitive Resource Area. It is a riparian habitat that supports fisheries, birds and other wildlife. Other sensitive resource areas exist in Oceano (e.g. dune habitat near Pier Avenue and beach area, including wetland habitat in the vicinity of Palace Ave., Fountain Ave., and the Oceano Airport) and must be considered in new development proposals.

Oceano County Airport Master Plan

The Oceano County Airport is adjacent to Oceano lagoon. The County of San Luis Obispo has prepared the Oceano Airport Master Plan found at http://sloairport.com/index.php?p=custom_page&page_name=Oceano%20Airport%20Master%20Plan that includes an environmental overview of the area.

Conclusion

Our property fronts the creek for over a mile. The recharge of the aquifer is extremely important to our business.

-Watershed Organization Participant

While Arroyo Grande Creek has been impacted by many human activities, it remains an extremely valuable asset to the community. There is much that can be done to enhance structural qualities such as re-vegetation and bank stabilization, and to restore functional qualities for flood protection and sediment reduction such as floodplain development. The steering committee is encouraged by the level of participation in the community and recommends expanding participation with the above listed projects.

Communities up and down the state are facing very similar watershed issues as urbanization continues its forward motion. Many towns and cities are responding to development pressures in creative and resourceful ways by using development as an opportunity. The Napa River Flood Management Project is an example of a multi-objective project that provided economic benefits and resolved flooding issues. As specific project recommendations of the Arroyo Grande Watershed Management Plan are implemented, it is important to remember the potential value added to the community. For example, when a flood plain is restored in the upper watershed, the cost associated with impacts from flooding in the lower watershed may be reduced as flood plain enhancement reduces flooding and sediment deposition in the lower watershed.

Watershed management is as much a people process as it is a science of manipulating the natural and human influenced landscape. With this watershed management plan, the community can continue its conversation on the creek's future. To develop a truly operational watershed management strategy, it is necessary to address the motivation, needs and hopes of stakeholders in the watershed in a way that maintains and improves the natural attributes of the watershed. Creatively addressing the needs of the community requires vigorous and continuous community dialogue. CCSE and the Arroyo Grande Creek Watershed Steering Committee members hope this plan represents a vigorous start.

While the intent of this plan was to provide a preliminary assessment of the watershed and generate a prioritized list of projects to address keystone issues affecting the steelhead fishery, it has become a great deal more, involving countless volunteer hours and input from the community regarding ideas for the creek's future. The productivity of the process of networking and meeting among members of the regulatory and planning communities and the local residents cannot be underestimated. The process is just as important, if not more important, than producing the document.

However, no amount of networking will preserve in-stream flows if water resources are increasingly scarce. It is ever more important to preserve base flows, manage Stormwater as a water quantity resource rather than an urban water problem, scrutinize development of water resources near riparian corridors, and work hand-in-hand with water managers to research and ensure adequate in-stream flows.

We cannot go back in time and restore the watershed to what it once was when early settlers arrived. However, we can look forward and address watershed issues, keeping in mind the need to preserve and enhance the aquatic resources within the limits imposed by past human modifications, and the needs of the community to protect and enhance the creek's resources for generations to come.

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Acknowledgements

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