ISSN 0038-3872

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Cover: Santa Ynez River Steelhead Fishing. 1994. Roger W. Cooke (1941-2012) 123 West Ocean Blvd., Lompoc, CA. Lompoc Mural Society.

SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

BULLETIN

Volume 111 **Number 3**

A111(3) 163-222 (2012) **December 2012**

Southern California Academy of Sciences

Founded 6 November 1891, incorporated 17 May 1907

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Date of this issue 18 January 2013

Bull. Southern California Acad. Sci.
111(3), 2012, pp. 163–222

A History of Steelhead and Rainbow Trout (*Oncorhynchus mykiss*) in the Santa Ynez River Watershed, Santa Barbara County, California

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Abstract.—This study explores the historical distribution and abundance of anadromous steelhead and associated freshwater rainbow trout in the Santa Ynez River watershed of northern Santa Barbara and western Ventura counties, California, prior to the completion of Bradbury Dam in 1953. Steelhead and rainbow trout once occurred throughout the Santa Ynez River basin, which supported one of the largest steelhead runs in central and southern California. The size of the Santa Ynez River's steelhead runs varied dramatically due to climatic and hydrologic cycles. Yet the river still supported an important recreational steelhead fishery until the early 1950s, when the population collapsed following the construction of Bradbury Dam. Few steelhead spawn in the Santa Ynez today, but the river remains a crucial focus for the recovery of southern California steelhead, which since 1997 have been listed as endangered under the U.S. Endangered Species Act (ESA).

Introduction

This study explores the historical distribution and abundance of steelhead and rainbow trout in the Santa Ynez River watershed of northern Santa Barbara and western Ventura Counties, California, prior to the completion of Bradbury Dam in 1953 (Figure 1). We examined hundreds of primary and secondary source documents. The documents were often anecdotal and imprecise, which is typical of most historical sources used for reconstructing past fish and wildlife populations in North America. Data on population numbers were too vague to draw definitive quantitative conclusions. We did, however, find extensive qualitative evidence for large fluctuations in steelhead and rainbow trout populations over time and for the presence of native steelhead in almost every accessible stream reach at some point in the past during periods of suitable hydrologic conditions (e.g., Boughton et al. 2005; Boughton and Goslin 2006).

Steelhead and rainbow trout are two life history forms of the salmonid species *Oncorhynchus mykiss*, which occurs in Pacific Coast watersheds from Alaska to northern Mexico (Boughton et al. 2006; NMFS 2012). The steelhead life cycle involves three main stages: 1) adult spawning and the development of eggs and juveniles in streams and rivers,

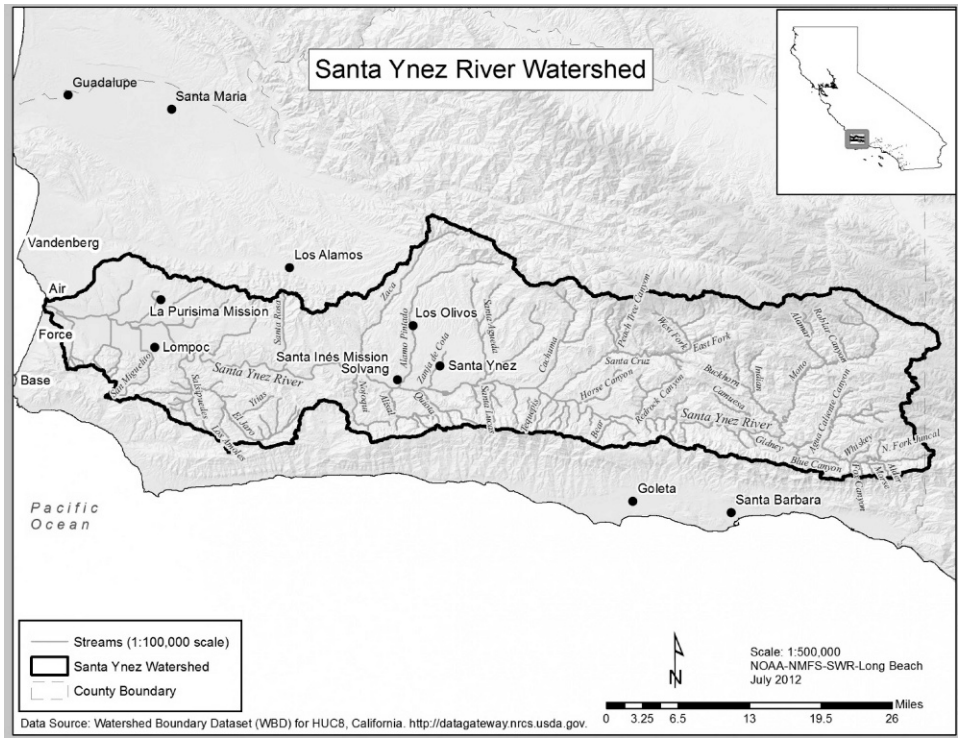

Fig. 1. Santa Ynez River watershed with location of principal sites referred to in the text.

2) migration of juveniles from natal streams to the ocean, sometimes with substantial residence in estuaries, while undergoing physiological and morphological changes for life in the marine environment (smoltification), and 3) the growth of oceanic steelhead into mature adults, which then return to their natal or other accessible streams or rivers for spawning. Generally, the freshwater juvenile stages last for one to two years, and the entire life cycle ranges over three to five years. Steelhead populations do, however, show considerable diversity in life history patterns, spending variable amounts of time in riverine, estuarine, and marine habitats, and sometimes dispersing to non-natal streams (Shapovalov and Taft 1954; Withler 1966; Quinn 2005; Hayes et al. 2011, 2012; NMFS 2012; Satterthwaite et al. 2012). Unlike some coastal *Oncorhynchus* species, steelhead can return to the ocean after spawning and may spawn multiple times over the course of their lifetimes, although spawning once is more typical.

Some individual *O. mykiss* spend their entire lives in freshwater streams and rivers and are referred to as rainbow trout (Quinn 2005; Pearse et al. 2007, 2009; Zimmerman and Reeves 2000). The relationship between rainbow trout and sea-run, or anadromous, steelhead in the same river or stream can be complex. But some studies indicate that steelhead and rainbow trout from the same stream or river system are more closely related, genetically, than steelhead or rainbow trout from other systems. The two forms can interbreed and contribute to the genetic pool of the population. Anadromous parents can produce non-anadromous progeny and vice-versa (Docker and Heath 2003; Thrower and Joyce 2004; Thrower et al. 2004; Boughton et al. 2006; Thrower et al. 2008; Olsen et al. 2006; Girman and Garza 2006; Garza and Clemento 2007; Christie et al. 2011).

Studies have shown that wild steelhead and rainbow trout from different parts of their range exhibit distinct ecological traits and genetic characteristics (Thorgaard 1983; Nielsen et al. 1994, 1997, 1998; Girman and Garza 2006; Pearse and Garza 2008; Clemento et al. 2009). Based on these characteristics, the National Marine Fisheries Service (NMFS) has recognized different Evolutionarily Significant Units (ESUs) or Distinct Population Segments (DPSs) for the listing and recovery of Pacific anadromous salmonid species (62 FR 43937; 67 FR 21856; 71 FR 834). Although limited, observational data indicate that steelhead and rainbow trout in southern California may be able to tolerate higher temperatures, lower dissolved oxygen levels, and highly irregular flow regimes, and have a greater propensity for dispersing from their natal streams, relative to steelhead or rainbow trout populations farther north (Matthews and Berg 1997; Spina et al. 2005; Boughton et al. 2007c; Spina 2007; Garza and Clemento 2007; SYRTAC 2009; Bell et al. 2011; NMFS 2012). Because of presumed evolutionary, ecological, genetic, and physiological differences from steelhead stocks in other parts of the range, NMFS has designated steelhead in California from the Santa Maria River south to the Mexican border as a DPS. Individuals within this DPS are referred to as southern California steelhead (see also NMFS 2000a).[1]

Human activities—from logging, grazing, mining, overfishing, and hatchery practices to the development of croplands and urban areas—have decreased the ranges and populations of wild fish in the family Salmonidae on the Pacific Coast of North America (Lufkin 1991; Capelli 1999, Lichatowich 1999; Stephenson and Calcarone 1999; Berg et al. 2004; Miller et al. 2005; Moyle et al. 2008, 2011; Hunt et al. 2008; NMFS 2012). Because of their migratory behavior and reproductive requirements of flowing, well-oxygenated, cool water, salmonids have been particularly affected by altered flow regimes due to the construction of dams and diversions, and the diminishment of dry season flows by groundwater pumping (McEwan 2001; McEwan and Jackson 2003; Hunt et al. 2008). Steelhead populations have declined precipitously throughout southern California, due to extensive habitat degradation, the alteration of natural flow regimes, and the restriction of access to upstream spawning and rearing habitats. In 1997 NMFS responded by listing southern California steelhead as an endangered species under the federal Endangered Species Act (62 FR 43937; 67 FR 21856; 71 FR 834).

Before the middle of the twentieth century, anadromous steelhead and freshwater rainbow trout were among the most abundant native fishes in the coastal streams of southern California (Moyle et al 2008; 2011; NMFS 2012). Their populations varied from year to year, however, and four river systems—the Santa Maria, Santa Ynez, Ventura, and Santa Clara—supported the region's principal steelhead runs (Busby et al. 1996; Moyle et al. 2008). The Santa Ynez River supported the largest of these runs (Shapovalov 1944, 1945; McEwan 2001; Moyle et al. 2008; Titus et al. 2010).

The Santa Ynez River flows from east to west between the San Rafael Mountains and Purisima Hills to the north and the Santa Ynez Mountains to the south, draining an area of 900 square miles (Norris 2003). The mainstem is 90 miles long, with upland areas being covered primarily by native chaparral vegetation, and foothills and valleys by grassland

[1] Separate steelhead populations were originally listed in 1997 as Evolutionarily Significant Units under NMFS's definition of a species developed specifically for anadromous salmonids (56 FR 224, 62 FR 43937; 67 FR 21856); subsequently, steelhead populations were re-listed in 2005 as Distinct Population Segments under a joint USFWS and NMFS definition of a species for the purposes of listing under the ESA (61 FR 4722; 70 FR 3704; 71 FR 834). A final critical habitat rule for the listed species was also adopted in 2005 (70 FR 52488).

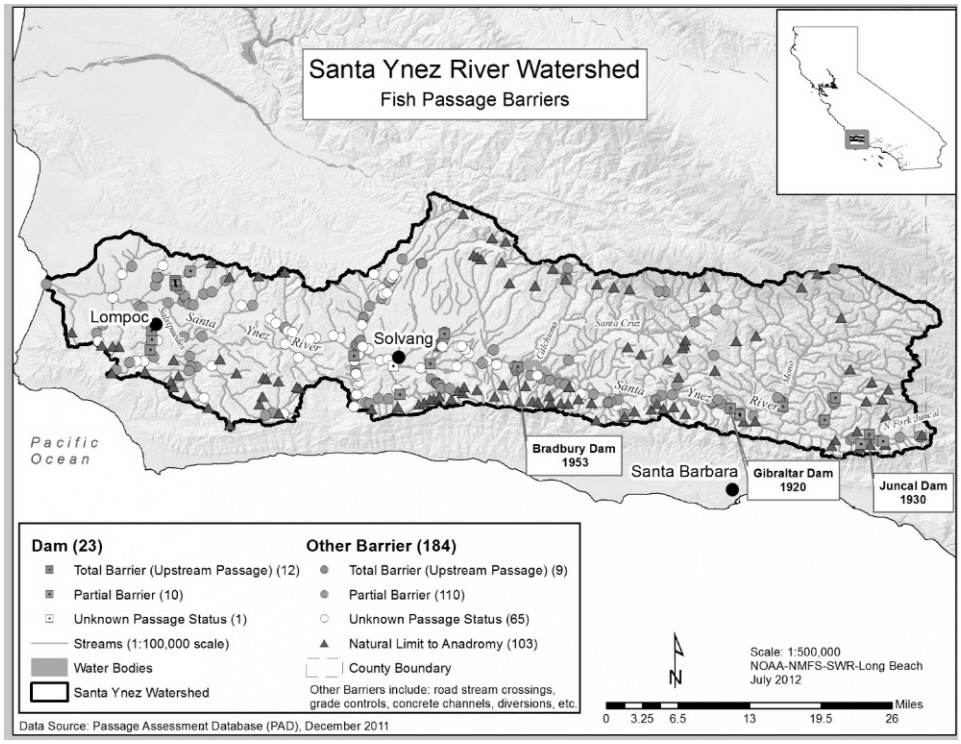

Fig. 2. Major fish passage barriers within the Santa Ynez River watershed.

and oak woodland, with lowland areas now used for agricultural, residential, or recreational activities. The river empties into the Pacific Ocean north of Point Conception near the city of Lompoc.

As early as the late 1800s the Santa Ynez River and its lower tributaries, such as San Miguelito and Salsipuedes Creeks, provided a steelhead and rainbow trout recreational fishery (Lompoc Record 1875a, 1875b, 1875c, 1875d, 1875e, 1875f, 1880, 1890a, 1890b, 1891a, 1891b, 1891c, 1892, 1893a, 1893b, 1893c, 1894a; Lompoc Centennial Committee 1974; Barker 1979; see also Bowers 2008 for additional newspaper accounts of steelhead and rainbow trout in the Santa Ynez River). Use of this fishery grew in the early 1900s, following completion of the coastal railroad between San Francisco and Los Angeles in 1901, and the subsequent extension of a spur into Lompoc (Lompoc Record 1908a, 1908b, 1908c, 1908d, 1914; Mears 1947; Kreider 1948; Tompkins 1974; Palmer 1999; Jacoby and Ward 2009). Santa Ynez River steelhead attracted anglers from around southern California and brought considerable benefits to the local economy. Beginning in 1920, a series of large dams were built along the Santa Ynez River: Gibraltar Dam, built by the City of Santa Barbara in 1920, Juncal Dam impounding Jameson Reservoir, built by the Montecito Water District in 1930, and Bradbury Dam impounding Cachuma Reservoir, built by the Bureau of Reclamation (the Bureau) in 1953 (Figure 2).

Several studies have attributed the decline of Santa Ynez River steelhead – fewer than ten migrating adults have reached Bradbury Dam annually in recent years – to these large dams, which inundate riverine habitat, block steelhead access to upstream tributary spawning and rearing habitats, and dewater lower stream reaches (CDFG 1975, 1993;

NMFS 2000b; Cachuma Operations and Maintenance Board 2008, 2009; Hunt et al. 2008; Santa Ynez River Adaptive Management Committee 2009; SYRTAC 2009; Capelli 2011; Williams et al. 2011; NMFS 2012). Bradbury Dam is a particular focus of concern because it is the largest and farthest downstream of these large dams, blocking more than two-thirds of the historic steelhead spawning and rearing habitat. Agricultural and residential development, barriers created by road crossings and debris dams, water extraction for irrigation, livestock grazing, wastewater inputs, and gravel mining also have reduced flows, increased sediment deposition, diminished water quality, decreased spawning gravel inputs, and increased impediments to steelhead migration. Introductions of non-native fish species and hatchery rainbow trout have increased predation, competition, and disease, all with negative repercussions for steelhead populations (Stoecker 2004; Hunt et al. 2008; SYRTAC 2009; NMFS 2012).

In the late 1940s and early 1950s, during the planning phases for the dam, the U.S. Fish and Wildlife Service (FWS) joined the California Department of Fish and Game (DFG) in expressing concerns about the effects of the proposed Bradbury Dam on the Santa Ynez River steelhead population. The FWS recommended adequate flow releases to maintain steelhead below the dam, a trap-and-transport program to rescue steelhead stuck downstream of the dam, and a fish ladder or hatchery to mitigate the dam's effects (U.S. Department of Interior 1948; CDFG 1950; Fink undated). The State Water Resources Control Board (the Board) granted a water rights permit to the Bureau to operate the dam in 1958, but none of the recommended mitigation measures were implemented. In 1988, the California Sportfishing Protection Alliance (CSPA) filed a complaint alleging that the Bureau was not releasing adequate flows consistent with California Fish and Game Code Section 5937 and the Board's responsibilities under the Public Trust Doctrine (California Sportfishing Protective Alliance 2000). The Board revisited the Bureau's water rights permits to address fishery and downstream water rights issues, which resulted in modifications to a previous water allocation agreement and mandated studies of fisheries and vegetation in the lower river (SYRTAC 2009; SWRCB 2003a, 2007). The Board again addressed the Bureau's water rights permits in 1994, ordering the Bureau to perform studies on public trust resources, including steelhead, above and below Bradbury Dam. The Board also held mandated hearings in 2000, 2003, and 2012, the latter of which was devoted to examining a Final Environmental Impact Report (FEIR) on the Bureau's water rights permits and impacts on public trust resources (SWRCB 2003a, 2007, 2011a, 2011b, 2012). In addition to addressing water releases, commentators on the FEIR have addressed the issue of steelhead passage around Bradbury Dam, echoing earlier recommendations by the FWS and DFG.

After listing southern California steelhead as endangered in 1997, NMFS convened a Technical Recovery Team, under the auspices of NMFS's Southwest Fisheries Science Center, to develop the scientific information necessary to issue a Recovery Plan. It released a series of technical memoranda, followed by a Final Recovery Plan, that identified a variety of measures designed to recover southern California steelhead (Boughton et al. 2006 and 2007a; Boughton 2010a and 2010b; NMFS 2012). In the years since the listing, researchers from NMFS as well as other agencies, organizations, and academic institutions have produced a growing body of research on southern steelhead history, biogeography, ecology, demographics, behavior, genetics, and other topics (Fusaro 1995; Chubb 1997; Capelli et al. 2004; Spina et al. 2005; Boughton and Goslin 2006; Girman and Garza 2006; Garza and Clemento 2007; Spina 2007; Boughton et al.

2007b; Pearse and Garza 2008; Boughton et al. 2009; Boughton 2010b; Hayes et al. 2011; NMFS 2012). Such information will be crucial for future southern steelhead science and management. Yet until now, the history of steelhead and rainbow trout in the Santa Ynez River watershed and its recreational fishery – historically one of the most productive southern California steelhead rivers – has not been examined in detail. This study explores the history of steelhead and rainbow trout in the Santa Ynez River watershed with the goals of promoting a better understanding of change over time, including the factors that led to the species decline, and providing a crucial context for future steelhead management and recovery programs throughout the region.

Methods

Since at least the 1930s, fish and wildlife managers in California have recognized the importance of historical knowledge for policy and planning (Wright et al. 1933), particularly regarding efforts to restore a degraded or lost resource. The emergence of fields such as conservation biology and restoration ecology in the 1980s generated increased interest in historical research to establish reference conditions for endangered species recovery and land rehabilitation programs (Swetnam et al. 1999; Pauly 1995; Whol 2001, 2004; Jackson et al. 2011). Historical research can illuminate important changes in the structure and function of ecosystems, as well as the ways people have documented, understood, and attempted to manage those changes over time (Stein et al. 2007; Pauly 1995; Whol 2001, 2004; Jackson et al. 2011; Beller et al. 2011). For this investigation, we followed the general methods described in Leidy et al. (2005), Hamilton et al. (2005), and Becker and Reining (2008) to examine the history of steelhead and rainbow trout populations in the Santa Ynez River watershed.

Reliable information about the past distribution and abundance of steelhead is essential for recovery planning and environmental management, including determining state public trust obligations, federal ESA compliance, and the allocation of scarce water resources (Leidy et al. 2005; Becker & Reining 2008; Boughton 2010b; NMFS 2012). Yet historical documents provide an incomplete record of the anadromous fisheries in any given watershed (Hamilton et al. 2005; Boughton et al. 2006, 2007c; Swift 1975). Historical researchers must make judgments about the reliability of their sources (Boughton et al. 2006; Boughton and Garza 2008), particularly in cases where a single document describes a potentially important event or observation. Although scientists prefer quantitative data, historians do not favor quantitative over qualitative information because both can be important though equally anecdotal (Titus 1995a; CDFG 1995; Titus et al. 2010). Scientists can, however, help fill gaps in historical knowledge with additional evidence from current ecological and genetic studies (Leet et al. 2001; Boughton and Fish 2003; Boughton and Goslin 2006; Girman and Garza 2006; Garza and Clemento 2007; Boughton 2010b). In this study, we drew from diverse and numerous sources to reconstruct a historical narrative.

Since the nineteenth century, scientists and managers have debated the taxonomic status and reproductive relations of anadromous steelhead and rainbow trout (New York Times 1889, Los Angeles Times 1912, 1913, 1916, 1918b; Coker 1920; Kendall 1921; California Fish and Game Commission 1921b; Evermann 1922; Hamilton et al. 2005; Moyle et al. 2008). Biologists Leo Shapovalov and Alan C. Taft (1954) recognized this life history diversity more than half a century ago when they wrote that variation is ‘‘one of the most marked characteristics of animal life. And of the vertebrates, the trout are among the most variable of all. Further, of the trout the steelhead is one of the most

variable forms.'' Scientific debate and popular confusion about the nature of this variation appears throughout the historical record (Hedderly 1910; Fry 1930), and is evident in the large number of terms used over time to describe the species' various life history stages and forms. The long history of steelhead and rainbow trout propagation, stocking, and relocation programs has made this situation even more complicated (Butler and Borgeson 1965; Nielsen et al. 1997, 1998; see also Behnke 1992, 2002).

Even when the life history form is clear for a given observation, the conclusions historical researchers can draw from the available data are often limited to snapshots of the presence or absence of a species (Hamilton et al. 2005; Boughton and Fish 2003). A lack of steelhead observations for a particular stream reach or time does not mean that steelhead were absent, but simply that we did not find a record of their presence as part of this study. Some important records also may have been lost through prior disposal or accidents, such as the fire that apparently destroyed all copies of the Lompoc Record for the years 1877 to 1889.

Although historical observations can provide important information on the historical geographic distributions of a species, they can suffer from limitations due to the resolution of the data (Hamilton et al. 2005; Adams et al. 2007). Some sources give precise locations, but these are relatively few in number and distributed unevenly throughout the historical record. Many sources offer only general impressions of areas where steelhead or rainbow trout were found, and are based on second-hand or inexpert observations.

The dynamic nature of southern California aquatic ecosystems poses another challenge to reconstructions of past steelhead distributions and abundance. Habitat conditions in southern California's coastal streams may vary widely due to multiple factors, such as severe winter storms, droughts, the seasonal formation and breaching of river mouth sandbars, sediment inputs from post-wildfire erosion or debris flows, variable oceanographic conditions, climatic oscillations, and long-term climate changes (Davis et al. 1988; Florsheim et al. 1991; Keller et al. 1997; Spina and Tormey 2000). All of these perturbations and processes affect steelhead populations, which may have varied by two orders of magnitude annually owing to natural changes alone (Titus 1995a; Titus 2010).

In this study, we consider steelhead and rainbow trout as two poles along a continuum of morphologies, physiologies, and life history strategies within a broader breeding population or metapopulation (Nielsen et al. 1994; Hendry and Stearns 2004; Hendry et al. 2004; Payne and Associates and Cramer and Associates 2005; Boughton et al. 2006, 2007a; NMFS 2012). In southern California streams, this diversity of forms and behaviors enables steelhead and rainbow trout to persist despite erratic, unpredictable, and often adverse conditions (Hubbs 1946; Nielsen et al. 1994; Harper and Kaufman 1988; Schafer 1997; Zimmerman et al. 2000; Boughton et al. 2006, 2007a).

We began our study by querying experts, residents, and others with local knowledge and access to important information about steelhead and rainbow trout in the Santa Ynez River watershed. We searched for historical, archaeological, and scientific records using standard library and internet-based search tools. Additional information came from published documents, including explorers' accounts, journals, periodicals, oral histories, scientific and museum papers, and government and industry reports. We then turned to a more specific set of library and archival collections and databases. Together, these investigations provided us with diverse and abundant sources of data for constructing our historical narrative.

Historical Narrative

We consider the history of steelhead in the Santa Ynez River, up to the completion of Cachuma (Bradbury) Dam in 1953, as falling into five distinct periods: the 1) Pre-Colonial Period (Chumash Era), 2) Mission and Rancho Eras, 3) Early American Era, 4) Progressive Era, and 5) the Era of Big Water Projects. The following narrative explores the development and condition of the fishery in each of these five periods.

The Pre-Colonial Period

Early Spanish explorers, such as Juan Rodríguez Cabrillo and Fray Juan Crespí of the Portola Expedition, who visited the California coast during the sixteenth century, noted the fishing skills of the Chumash people living along the Santa Barbara Channel (Bolton 1916, 1926, 1927). These chroniclers emphasized the importance of fish to coastal Chumash diets and received gifts of fish during their visits. Later historical, ethnographic, and archaeological observations corroborated the importance of fishing in marine and estuarine waters to coastal Chumash peoples. Yet we found relatively few explicit records of Chumash exploitation of riverine fish, such as steelhead in the Santa Ynez River, from Spanish, Mexican, and early American explorers and settlers.[2]

As part of efforts to document Native American cultures before they disappeared, John P. Harrington, who served for forty years as a field ethnologist with the Smithsonian Museum's Bureau of American Ethnology, collected information on Chumash language dialects, activities, beliefs, habits, and material culture, completing most of his field work in the early 1900s (e.g., Rogers 1929; Harrington 1942; Craig 1967; Hudson and Blackburn 1982). Harrington documented the exploitation of marine and estuarine fishes by the Chumash, including verbal accounts, observations of fishing artifacts, and demonstrations of fishing activities. Evidence for the capture and consumption of freshwater fishes, however, was more limited.

Fishing equipment of coastal and island Chumash populations was diverse and included fish traps, dip nets, gill nets, seines, hook and line, harpoons, bows and arrows, spears, and natural fish poisons, but only a few items were related to the capture of fish in rivers (Craig 1967; Hudson and Blackburn 1982; Gamble 2008; Lightfoot and Parish 2009). Harrington (1942; see Craig 1967; Timbrook 2008) described long, conical weir traps (wisay) placed with their mouths facing upstream in gaps in rock dams that were built across rivers. Chumash individuals entered the water and drove fish downstream into the traps using a strategy corroborated by more recent Chumash accounts and demonstrations (Craig et al. 1988). Harrington also wrote that freshwater fish (primarily steelhead or "salmon") were caught with fishing poles, fish spears, nets made from Indian-hemp (*Apocynum cannabinum*) or nettle (*Urtica dioica holosericea*) cordage, hook-and-line, and fish poisons, notably pounded soap plant (*Chlorogalum pomeridianum*) (also see Craig 1967; Hudson and Blackburn 1979–1984; Timbrook 2008). One of Harrington's informants remarked that a local woman used a fishing pole to catch trout and said that a particular fish spear, called the ti'wo'y, was used to spear "salmon" but not trout. This individual had never seen spears used in the Santa Ynez River, but another informant said that such gear was used in the Ventura River (Craig 1967). A transcription of Harrington's field notes also includes a Chumash myth about salmon

[2] The term "steelhead" did not come into common use until the end of the 19th century, and the earliest published use of the term we found in connection with the Santa Ynez River was 1908 (Lompoc Record 1908d); but see the discussion of ethnographic evidence below.

(cited in Spanne 1975). The Samala (Ineseño) Chumash dialect had words for trout (*'oncho'*) and salmon (*'okowoch'*), but it is not clear if "salmon" referred to adult steelhead or to other Pacific anadromous salmonid (*Oncorhynchus* spp.) species (Santa Ynez Band of Chumash Indians 2007).

To explain historical records of seasonal cycles in the populations of coastal Chumash villages, Spanne (1975) hypothesized that Chumash in the Santa Barbara area migrated seasonally, inhabiting coastal dwellings and exploiting marine resources in the spring and summer when oceans were calm and some large fish species (e.g., tuna) were abundant, and moving inland in the winter to make use of large, predictable steelhead runs in the Santa Ynez River. To establish the plausibility of such a hypothesis, he argued that flows in the Santa Ynez River would have been larger and more continuous before large-scale development. Spanne (1975) noted that runs of anadromous fish in the Santa Ynez River occurred right up to the construction of Bradbury Dam, but that they were much more predictable and frequent in the late nineteenth and early twentieth centuries based on the memories of elderly residents. He also drew from individual experience, recalling "walking along the river in summer and observing dozens of dead or dying salmon in the shallow water along a few hundred feet of stream." Based on these and similar memories, anecdotes, ethnographic evidence, and the relative consistency of the regional climate over the previous 100 years, he argued that Chumash exploited abundant salmon and steelhead in the Santa Ynez River prior to the Mission era.

Spanne's (1975) informants also noted migratory runs of chinook (*Oncorhynchus tshawytscha*) and coho salmon (*Oncorhynchus kisutch*) in the Santa Ynez River. *Oncorhynchus* fossils from the Pleistocene Era (1.8 million to 10,000 years ago) have been found as far south as the Mexican Plateau at 20° N latitude. It appears that the southern range limits for *Oncorhynchus* spp. varied over geological time, moving northward with drier, warming trends and southward during cooler, wetter periods (Minckley et al. 1986). It remains unclear whether, when, and to what degree Pacific salmon occupied southern California rivers over the Quaternary period spanning the most recent episode of repeated glaciations.[3] Recent photographic evidence of Chinook salmon in the lower reaches of Calleguas Creek, Ventura County, in 1999, 2003, and 2006 and in lower San Juan Creek, Orange County, in 2004 have documented the contemporary presence of this species (Mark Capelli, personal information and photographs). The origins and significance of these rare sightings of other species of

[3] The arrival and settlement of humans in North America, including coastal southern California, occurred largely during the very late Pleistocene and early Holocene. The Pleistocene Epoch, from 2,588,000 to 10,000–12,000 years ago, known as the "Great Ice Age," was characterized by repeated cycles of glacial advances and retreats, with corresponding effects on climate, river flows, and the distributions of plants and animals, including riverine fish (Minckley *et al.* 1988). The Holocene Epoch, from 10,000–12,000 years ago to the present, represents a general warming period characterized by the retreat of glaciers, sea level rise, and increasing aridity. Although the large-scale topography, drainage patterns, vegetation, and climate seasonality of southern California have remained relatively constant throughout the Holocene Epoch, there have been significant fluctuations in temperature and rainfall (summarized in Kennett 2005). Superimposed on these long-term trends are shorter term cycles related to the Pacific Decadal Oscillation and El Niño Southern Oscillation phenomena. Because of the profound effects of temperature and river flows on salmonid reproduction, survivorship, and migration, salmonid evolution, population sizes, and geographic distributions undoubtedly were affected by these climatic changes. The southern distribution of Pacific anadromous salmonids in central and southern California is constrained by increased temperatures, decreased and highly variable flows in coastal rivers and streams, and changes in oceanic conditions. The current distribution of *O. mykiss* extends south into northern Mexico, but the level of anadromy in the southernmost populations is not known (Miller 2005; Boughton et al. 2006).

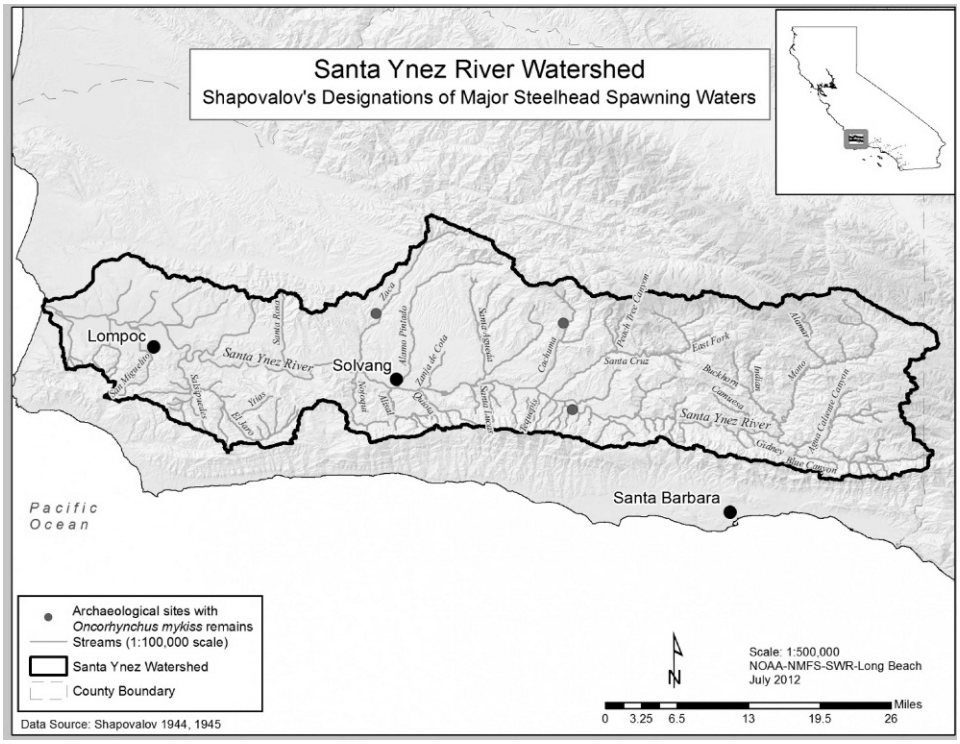

Fig. 3. Shapovalov's designations of major steelhead spawning waters within the Santa Ynez River watershed. Named blue line streams indicate streams in the Santa Ynez River watershed that Shapovalov (1944, 1945) identified as important for steelhead spawning prior to the construction of Gibraltar, Juncal, and Bradbury dams. Gray dots represent the three archaeological sites where *Oncorhynchus mykiss* remains have been found (left to right, SBA-3404, SBA-809, SBA-485).

anadromous Pacific salmon within coastal watersheds are unknown. Ecological, archaeological, and historical investigations have provided little additional evidence for the occurrence of other species of Pacific salmon in southern California rivers and streams in recent times. Early reports of salmon in southern California, such as Jordan and Gilbert (1882), Gill (1883), and Jordan (1892), may have been based on misidentifications and uncorroborated market surveys (Swift 1975; Swift et al. 1993; Gobalet and Jones 1995; Gobalet et al. 2004; Adams et al. 2007). Early reports of anglers taking other anadromous salmonid species also have not been confirmed (e.g., Henke 2003). Pacific anadromous salmonids continue to migrate in the ocean along the southern California coast but, with the exception of steelhead, only occasionally enter streams and do not currently appear to reproduce in southern California.

Researchers often assume that salmonid remains found in middens represent fish caught in nearby waters (Gobalet et al. 2004), but salmonid remains found at a site could have been caught elsewhere and then transported for storage, trade, or consumption. Tainter (1971, 1975) argued that Chumash populations exploited both marine and riverine fisheries, and that these products were exchanged through migrations and trade networks, perhaps associated with regional gatherings, which ensured that both coastal and inland populations benefited during times of scarcity or uneven resource distribution (see also Glassow 1992; Goblet 1992; Kennett 2005). Chumash using the lower Santa Ynez River Valley, for

example, may have migrated seasonally between downstream and upstream areas, whereas Chumash in the upper Valley may have been more sedentary and relied on trade (Woodman et al. 1991; Hosale 2010). The Chumash were probably migratory, occupying temporary camps, in the Early Period (6000 – 500 BC), but established permanent settlements and more complex and specialized trade, economic, political, and occupational structures through the Middle (500 BC to 1170 AD) and Late (1170 to 1782 AD) Periods, culminating in federations of villages linked by marriage (Glassow 1996; Horne 1981; Glassow et al. 2007). At least over the last 2,500 years, trade networks comprised a prominent feature of coastal and Santa Ynez River Chumash societies, resulting in the exchange of inland mammals, plants, rocks, and minerals for marine resources (shellfish, marine fish, shell beads). Existing archaeological evidence does not support the idea that anadromous fish, such as steelhead, were important, consistent components of the diets or trade of Native American cultures south of San Francisco Bay (Gobalet 1992; Gobalet and Jones 1995; Jones 2003; Gobalet et al. 2004; Armstrong 2006; Hosale 2010).

Records at the Central Coast Information Center (CCIC), in the Department of Anthropology at UCSB, list 674 known archaeological sites in the Santa Ynez River basin from approximately Bradbury Dam upstream. The 294 reports and papers dealing with these sites describe surface surveys that noted the location, extent, artifacts, and shells found at sites. Although the presence of fish bones is occasionally mentioned, these bones are not identified. According to Michael Glassow (UCSB), Jan Timbrook and John Johnson (both from the Santa Barbara Museum of Natural History), Loreen Lomax (Los Padres National Forest), and Ken Gobalet (California State University, Bakersfield) few sites in the Santa Ynez River Valley have been excavated or screened through fine mesh sufficient for capturing small fish bones identifiable to the family level. At present, the only archaeological evidence for steelhead presence comes from several theses and a museum contribution describing excavations of sites in former inland Chumash villages with associated information on the identity of fish elements (Macko 1983; McRae 1999; Hildebrandt 2004; Armstrong 2006; Hosale 2010). Steelhead remains were found at three of four excavated sites, including Xonxon'ata (SBA 3404, located on Zaca Creek 6 miles above its confluence with the Santa Ynez River, Hildebrandt 2004) and two sites above the current Bradbury Dam (SBA-809, 'Aqitsu'um, Armstrong 2006; SBA-485 He'lxman, Hosale 2010), but no steelhead remains were found at the fourth site (Soxtonokmu, SBA – 167, McRae 1999), located on Alamo Pintado Creek near Los Olivos.[4] The 6 salmonid bone elements found at Xonxon'ata constituted only 0.2% of the identifiable fish bones recovered at this site, with the rest assignable to marine species, and these bones appeared to come from immature steelhead or rainbow trout. Although rare, salmonid remains also have been found at sites along Santa Barbara County's South Coast, from Alegria Creek west of Gaviota to Goleta Slough (Gobalet et al. 2004).

[4] Glassow (1979) did report one anadromous fish vertebrate from this site. Although Tainter (1971) purported to have found anadromous fish bones at two sites, Glassow (1979) stated that the bones at one of the sites had been misidentified and those at the other had not been examined. The only museum collection of *Oncorhynchus mykiss* from the Santa Ynez River basin that we located was caught in Alamo Pintado Creek in 1969 (K. Fahy, Associate Curator, Santa Barbara Museum of Natural History). However, more recent *O. mykiss* specimens are curated with the National Marine Fisheries Services Southwest Region, Long Beach; additionally, tissue and scale samples of *O. mykiss*, including Santa Ynez River specimens, are curated at the National Marine Fisheries Science Services' Southwest Fisheries Science Center, Santa Cruz, and with the California Department of Fish Game's fish collections housed in Sacramento.

Armstrong (2006) examined data from a site on Cachuma Creek, which now flows into Cachuma Reservoir. His analysis of diagnostic artifacts indicates that this site was occupied by Chumash peoples during the Late to early Historic Periods (ca. 1200 to 1800 AD). Armstrong (2006) reported one definite and two possible anadromous fish bones from this site. These bones, however, constituted less than one percent of the fish bones found at this site, with all other identifiable bones from marine species (5107 total elements). Hosale (2010) studied a site along the Santa Ynez River near the eastern edge of the current Cachuma Reservoir. Taking samples from different vertical strata, she found four steelhead bone elements at sediment depths of between ten and one-hundred centimeters, dating from as early as 4000 BC to Late Period times. Again, salmonid bone elements constituted only a tiny fraction of the fish bone elements found at this site (around one percent), with nearly all identifiable bones coming from marine species, particularly clupeids such as sardines and anchovies.

Archaeologists and biologists have speculated about the reasons for the scarcity of salmonid bones in archaeological sites south of San Francisco Bay, despite historical and ethnographic accounts suggesting that native peoples used salmonids extensively (Gobalet et al. 2004). Part of the issue can, perhaps, be resolved by considering that salvage ethnography attempted to capture aspects of Native American culture about a century after Spanish colonization (Armstrong 2006). Many historical accounts are based on the memories of elderly residents. Native American cultures from southern California also appear to lack elaborate rituals and observances related to salmonids, which are typical of more northern groups (Harrington 1942; Swezey and Heizer 1977).

Some studies have suggested that the absence of salmonid bones may have indicated that salmonids were rare or were present in large numbers only unpredictably and inconsistently, that standard archaeological processing techniques might miss fine fish bones, that Native Americans may have consumed or pulverized fish at the sites where they were caught rather than move them intact to villages, or that salmonid bones may not have preserved as well as those of other fish species (Glassow 1979; Gobalet et al. 2004). Even in cases where fine mesh sieves have been used to screen archaeological materials, they have exposed few salmonid fish bones from sites south of San Francisco Bay compared to more northerly sites (Gobalet et al. 2004; Hildebrandt 2007; Hildebrandt and Darcangelo 2008). These observations suggest that salmonid bones are often preserved at the locations where they were used and that they can be detected with appropriate archaeological techniques. Because most archaeological digs in the Santa Ynez River watershed have not used fine mesh sieves, more research will be necessary before further conclusions can be drawn regarding the presence of salmonid bones at these sites.

Some have suggested that Chumash may not have exploited Santa Ynez River steelhead because the runs occur for short periods during and after winter high flows when fishing would be difficult due to turbid waters and occasional floods. Yet more northerly tribes capture salmon under equally arduous conditions (Hamilton et al. 2005). Fishing difficulties also do not explain the lack of immature steelhead or rainbow trout remains, since both forms would have been present year-round. Steelhead migration in southern California does, however, depend on adequate flows to breach river mouth sandbars and adequate depths for sufficient time periods to allow fish passage (Kreider 1948; Ferren et al. 1995; Fukushima and Lesh 1998; Stoecker 2002, 2004; Boughton et al. 2006; NMFS 2012; Jacobs et al. 2011). Because such conditions tend to occur only briefly, the Chumash could only harvest migrating fish opportunistically. Given the large

inter-annual fluctuations in rainfall and river flow typical of southern California, steelhead may have constituted a variable, unpredictable, and short-lived resource of less enduring value than more dependable sources of marine or terrestrial food (Glassow 1979; County of Santa Barbara Public Works Department 2012). This assessment of limited Chumash use of salmonids is consistent with an observed trend in the increasing use of salmonids by native peoples from southern to northern latitudes on the Pacific Coast, peaking in areas where hydrologic conditions enabled larger and more dependable runs (Lufkin 1991; Taylor 1999; see also regional chapters in Jones and Klar 2007; Jones and Perry 2012).

The Mission & Rancho Eras

We found no information which shed additional light on the steelhead or rainbow trout in the Santa Ynez River or its tributaries in the records we examined from the Mission and Rancho eras, which together lasted for about eighty years, from 1769 to 1849. We did, however, find relevant information from this period about the conditions of the Santa Ynez River. Captain Gaspar de Portolá led the first Spanish land expedition in California, which traveled through the central coast (Teggart 1911; Ruhge 2009). Both his engineer, Miguel Constansó and his chaplain, Fray Juan Crespí, kept journals of the trek. On August 30, 1769, the expedition reached the river and found that its outlet to the sea was "entirely closed by a sand-bank."[5] According to Constansó, the river flowed through "a very beautiful valley containing many willows, and much land capable of producing all kinds of grain. We saw bears of great size and many of their tracks" (Teggert 1911).

Crespí described the Santa Ynez as a "very full-flowing river here, whose bed close to the sea must be about a hundred yards wide" (Brown 2001). He noted that the sandbank dammed up the water in the river so that its estuary lacked a current. The Spanish saw many bear tracks, which led them to explore approximately three miles upriver. Here the scouts again reported that the Santa Ynez was a "very full-flowing river with a vast amount of water; that they tried to cross it at its bed's narrowest part, which must have been fourteen or sixteen yards, and the water came up to their saddle flaps" (Brown 2001). Jose Francisco Ortega, the expedition's chief scout, also noted a large plain and many willows along the river.

The Santa Ynez River could pose a serious obstacle to north-south passage during the winter and spring. In 1774 Juan Bautista de Anza led an expedition up the California coast, reaching the mouth of the Santa Ynez River on April 14th (Bolton 1930). "We could not cross the river because we arrived at high tide," he wrote, "and although it is true that the tide does not enter the river more than three-fourths of a league [about three miles], farther up it does not offer a passage anywhere because of the gorge and the thick growth along the river." On February 28, 1776, during de Anza's second expedition to the area, Fray Pedro Font noted that although the Santa Ynez River was not large, it was "so bushy along its banks and in the middle, and has such a bad bed, that the only way to cross it is by its mouth, and that only when the sea is at low tide" (Brown 2011). Font added that there was a dearth of firewood near the river mouth, and that the water was "brackish and turbid" (Brown 2011).

These journal entries suggest two important features of the pre-contact Santa Ynez River. First, parts of the Sana Ynez River's mainstem had braided channels and dense

[5] At the time, the Santa Ynez River was known either as the Río de San Vernardo or Río Santa Rosa.

riparian vegetation. Second, under certain flow conditions, the river's outlet sandbar may have opened and closed frequently, apparently creating a dynamic estuary with an area of several square miles. ''For when the tide rises,'' Font noted, ''it comes up the river, which swells, and a large flat or tule marsh lying along the river banks between the hills on either side becomes even fuller with water, and when the tide ebbs, it goes out with considerable speed'' (Brown 2011). Documents from the late nineteenth and early to mid-twentieth centuries offer similar observations about tidal action and dense riparian vegetation (Brewer 1930; Chase 1913; Anonymous ca. 1937; Shapovalov 1940; see photos appended to Penfield 1943a).

The Franciscans founded Mission La Purisima Concepción along the lower Santa Ynez River in December of 1787, and then established a second settlement, Mission Santa Inés, farther up the Valley near the present-day town of Solvang seventeen years later. At its peak, in the early nineteenth century, Mission La Purisima controlled about 470 square miles of land, housed more than 1,500 people, and grazed 23,500 sheep and cattle (Engelhardt 1908–1915; Engelhardt 1932a, 1932b; Hageman and Ewing 1980; Ruhge 2009). The nearby Santa Ynez River presented great opportunities and challenges for the Valley's two religious communities. In a letter dated March 11, 1813, Mariano Payeras, a resident priest who later became the mission system's Father-President, wrote that the Santa Ynez River was ''well-known since the time of the conquest for the devastation caused by its floods. During floods an immense amount of driftwood collects along its entire length, and it is impossible to cross because it grows to ¾ league in width, and because of its marshes, large holes and pits, which after the first floods become so soft that bridges are useless because there are no banks and the river is a bed of quicksand which gives way rapidly'' (Cutter 1995).

Droughts were even more problematic than the floods. ''What concerns me at the moment,'' Payeras wrote from La Purisima on January 28, 1807, ''is the lack of rain from which this mission has suffered for some years, being the one that receives perhaps the least rain of any of our missions'' (Cutter 1995). To fix this problem, he initiated a diversion, the first such project in the Santa Ynez River's history. The great earthquake of 1812 occurred after several years of low rainfall, and then was followed by a series of downpours. By the following year, Payeras had abandoned efforts to tap the unreliable river and ordered the construction of fountains and aqueducts for bringing water from nearby springs to the new, post-earthquake mission buildings ''to maintain the Mission with water independently from the river (for this runs short in summer)'' (Engelhardt 1932a).

We found no explicit records of Santa Ynez River steelhead or trout in the mission archives or other collections from that period. The closest record identified came from the writings of Pedro Fages (Priestley 1937). Fages was the maritime chief of the Portolá expedition, and after Portolá's departure in 1770 he became Alta California's second Spanish military Governor. In 1775, Fages noted that the creeks around San Luis Obispo, fifty miles north of La Purisima, contained ''trout, spinebacks…and turtles.''

We found no further evidence of steelhead or trout consumption by missionaries, settlers, or Chumash in the Santa Ynez Valley. The Spanish prized their cattle and their cultural tradition of beef consumption, which might explain their apparent lack of interest in fish. Other authors have speculated that the padres took fish when available (Holder 1908), and evidence from further north suggests that the missionaries engaged in freshwater fishing seasonally or opportunistically. In the words of Fray Junípero Serra of Monterey, ''when food was scarce the missionaries availed themselves of Indian

foodways'' (Tibesar 1956). On July 24, 1775, he reported: ''We also had our season for fresh salmon, and it was excellent.'' It remains unclear which salmonid species Serra consumed or whether capturing anadromous fish was a common practice in the rest of the Mission system.

The Early American Era

The first explicit historical records of steelhead and trout in the Santa Ynez River come from the early American era, a period we have defined as lasting from the Gold Rush of 1849 to the beginning of the Progressive era around 1880. The amateur archaeologist Reverend Stephen Bowers roamed throughout the Santa Barbara region, from the 1870s to the 1900s, studying Chumash history and culture and collecting specimens for museums (Benson 1997). In July of 1875, he traveled over the Santa Ynez Mountains from Santa Barbara, and then followed the Santa Ynez River to Lompoc. He spent his first night at a streamside camp on the Santa Ynez River above its confluence with Tequepis Creek, where he caught ''several trout.'' Two years later, on April 3, 1877, he returned and camped along Tequepis Creek, ''a beautiful little mountain stream which runs into the Santa Ynez River nearby. After pitching our tent I caught a mess of speckled trout for supper.'' Bowers reported catching more trout in the same area over the next couple of weeks.

The accounts left by Stephen Bowers are important for several reasons. They are among the first documented cases of steelhead/rainbow trout fishing on the Santa Ynez River; they predate any artificial stocking of the river with hatchery trout; and they document the presence of native trout upstream from the current Bradbury Dam. Bowers caught trout both in Tequepis Creek, which drains the northern slopes of the Santa Ynez Mountains and now empties into Cachuma Reservoir, and in the Santa Ynez River.

Additional records of native trout appeared in the Lompoc Record during this period (1875a, 1875b, 1875c, 1875d, 1875e, 1875f, 1880). On November 6, 1875, the paper reported that ''In the creek that flows through town near Mr. Hesser's were caught last week, seven speckled trout averaging a pound apiece.'' These were most likely rainbow trout. An article, from March 13, 1880, announced that ''Salmon are to be seen in the Santa Ynez River. Mr. Fabing speared one between two and three feet long, on the tines of a pitchfork, last week.'' Given the season (late winter) and the size of the fish, this note likely refers to an adult steelhead, but the author provided no additional information.

The Progressive Era

The Progressive era, which lasted from about 1880 to 1920, brought major changes in the exploitation, conservation, propagation, regulation, and scientific study of California's freshwater and anadromous fisheries. Several factors contributed to these changes. The first was the increasing size of California's commercial fishing industries, which helped facilitate the decline of some of the state's most commercially exploited species. The salmon industry began in the Sacramento-San Joaquin Bay-Delta, where several canneries appeared in the decades after the Gold Rush (Lichatowich 1999). As early as 1879, the ichthyologist David Starr Jordan lamented the decline of the Bay-Delta's anadromous fisheries, which he believed did not ''contain one-twentieth the number of fish that it did twenty years ago.'' Fishermen shifted their efforts to other species, but the industry continued to suffer and by 1882 salmon canneries in the Bay-Delta were closing (McEvoy 1986).

The increasing demands on and decline of California's salmon fishery helped initiate the state's pioneering fish conservation efforts. In 1852, just two years after statehood, the

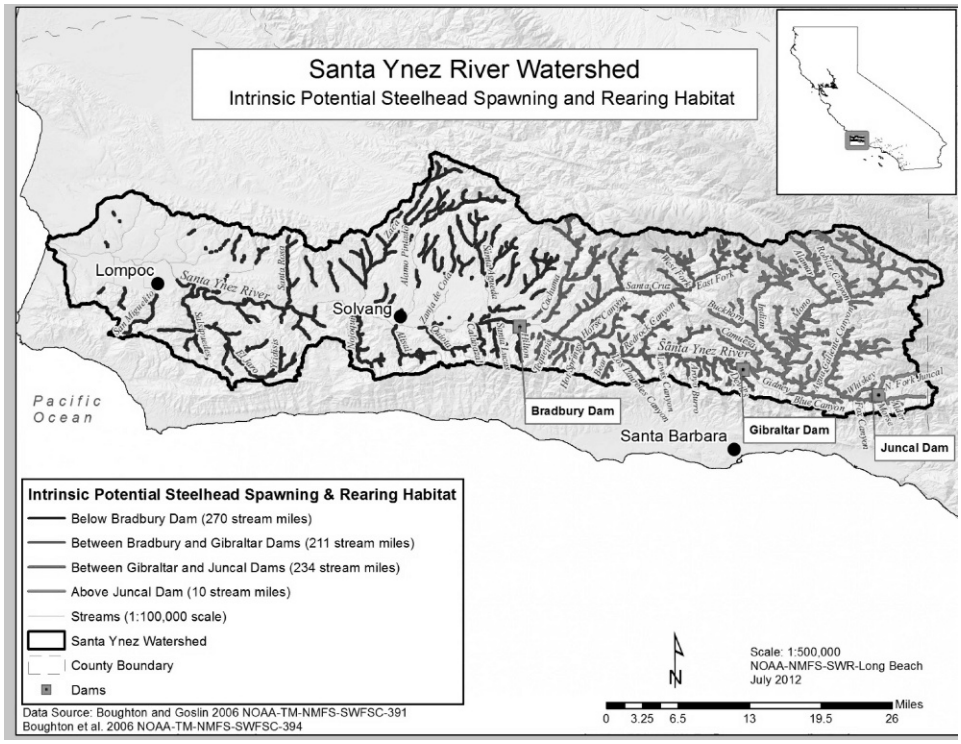

Fig. 4. Potential steelhead spawning and rearing habitat within the Santa Ynez River watershed modeled and mapped using the ''envelope method''. As part of the National Marine Fisheries Services recovery planning process for the ESA listed endangered southern California steelhead, an effort was made, using the ''envelope method'', to determine the historic location, distribution, and extent of suitable steelhead habitat (particularly over-summering rearing habitat) within the species' range (Boughton and Goslin 2006). The envelop method is based on information on observed associations between fish distributions and the values of environmental factors such as stream gradient, summer mean discharge and air temperature, valley width to mean discharge, and the presence of alluvial deposits which are essential to steelhead spawning and rearing. One major refinement of the Shapovalov depiction of historic steelhead habitat resulting from the envelope method analysis is identification of the majority of the over-summering habitat in the east (upper) half of the Santa Ynez watershed, upstream of the current site of Cachuma Reservoir.

California Legislature passed its first law regulating the salmon industry, and nine years later, it adopted its first regulations for recreational trout fishing. In 1870 California became the first state, along with New Hampshire, to establish a Board of Fish Commissioners charged with the maintenance of the state's fishery resources. Eight years later, the Board's responsibilities expanded to include terrestrial game. Over the next quarter century, the Legislature passed dozens of additional fish and game codes, including a controversial 1913 requirement that all anglers over the age of 18 purchase fishing licenses (Ventura Free Press 1878; The Ojai 1892; Los Angeles Times 1893, 1895a, 1903a, 1907, 1908, 1909b; New York Times 1895; Ventura Weekly Democrat 1897; Ventura Free Press 1907; Oxnard Courier 1919b, 1919c, 1919d, 1919e, 1919f; Leitritz 1970).

Throughout this period, the Board focused its efforts on artificial propagation, species introductions, and law enforcement; however, its principal goal was to increase the

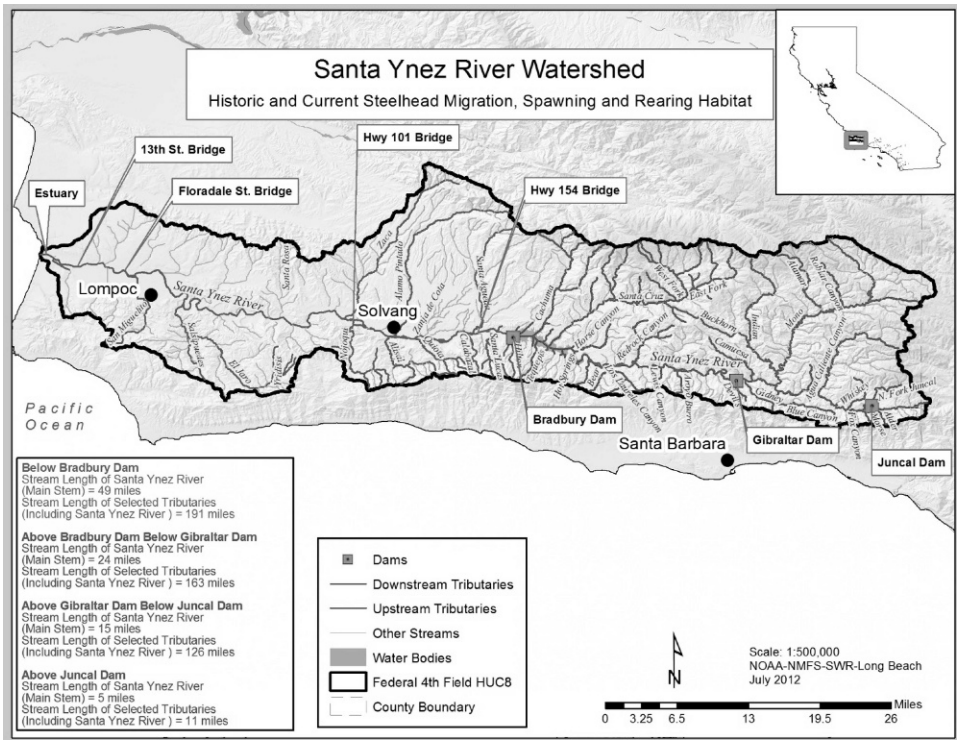

Fig. 5. Historic and current steelhead migration, spawning and rearing habitat within the Santa Ynez River watershed. These designations are based on the historical evidence examined as part of this study, as well as the evidence developed by the National Marine Fisheries Service's designation of critical habitat and steelhead recovery planning (Capelli et al. 2004; Boughton and Goslin 2006; Boughton et al. 2006; NMFS 2012).

productivity of fisheries, not to safeguard native fish populations or maintain natural ecosystems (Los Angeles Times 1914c, 1914d, 1914e, 1915a, 1919f, 1919g, 1920, 1923, 1926a, 1934d; Oxnard Courier 1922; Butler and Borgeson 1965; Dill and Cordone 1997). In 1870 the Board constructed its first hatchery, in partnership with the California Acclimatization Society, on the campus of the University of California in Berkeley. Over the next 90 years, the state operated 169 fish hatcheries and egg collecting facilities (Leitritz 1970). In November of 1914, the *Los Angeles Times* announced that "Enough trout and young salmon were planted in the streams of the State during the season which will close this month to provide every man, woman and child with nearly sixteen fish each" (Los Angeles Times 1914e). In just ten months, the state had planted 37,324,000 "young trout and steelhead and quinnant [i.e., Chinook] salmon." The state hatchery program stocked every major coastal stream in southern California, including the Santa Ynez River (Leitritz 1970; Dill and Cordone 1997; Boughton and Garza 2008). In 1915, for example, the Commission planted 25,000 Chinook salmon in the Santa Ynez River and 6,000 juvenile steelhead in both Salsipuedes and Miguelito creeks, as well as 90,000 juvenile steelhead in the mainstem of the Santa Ynez River (CFGC 1916; Los Angeles Times 1915a; see also Oxnard Courier 1922).

The Board met with some early successes in its propagation and distribution programs. By 1900 it would point to its "well-earned reputation for scientific achievement," and

"great returns" despite a "small annual expenditure," which, it boasted, may even have saved salmon from extinction in the state (quoted in McEvoy 1986). Yet these were promotional statements designed to cultivate support for the Board, and no systematic, long-term studies have reliably documented the effects of the Board's fish culture programs. According to the historian Arthur McEvoy (1986), several other factors, such as more favorable climatic and oceanographic conditions, probably facilitated the recovery of some anadromous fish runs. Some California watersheds may also have been recovering from the devastation caused by gold rush and early logging operations around this time (Summer and Smith 1940; Kelley 1959; Cordone and Kelley 1961; Mason 1978; Walters 1995; Alpers et al. 2005). It remains unclear to what extent the state's ambitious fish stocking programs have shaped the ecology and population biology of steelhead and rainbow trout in southern California streams such as the Santa Ynez River.

Recent DNA analysis has shown that there is little or no interbreeding between native and hatchery steelhead/rainbow trout genotypes, which suggests that hatchery plants probably contribute little to the population sizes or genetic pools of native stocks. At most, they constitute the basis for a put-and-take recreational fishery (Garza and Clemento 2007). Yet the potential adverse impacts of introducing hatchery-reared fish into habitats with native anadromous fish populations have become a concern of fish managers, and a number of recent studies have documented potential impacts to native stocks, including predation or competition between hatchery and native salmonids and the transmission of diseases from hatchery to native populations (Araki et al. 2007, 2008, 2009; Chilcote et al. 2011).

The first scientific studies of steelhead/rainbow trout began around 1880. The most important figure in this early scientific history was David Starr Jordan who, besides being California's preeminent ichthyologist, was a peace activist, conservationist, eugenicist, and Stanford University's first president (Jordan 1922). During the 1880s and 1890s, Jordan teamed up with Barton Evermann, of the California Academy of Sciences, and Charles H. Gilbert, also of Stanford University, to conduct the first major studies of West Coast fishes.

By the time these studies began, many steelhead streams throughout California had already been modified by mining, farming, grazing, logging, dredging, wetland drainage, water diversion, levee construction, riparian forest clearing, beaver trapping, and other activities. Yet the overall range of steelhead had not changed appreciably, with Jordan and Evermann (1896–1900, 1902) believing that steelhead occurred in "all coastwise streams from the Santa Ynez Mountains…north to British Columbia and probably Sitka."

During the late nineteenth and early twentieth centuries, natural history was evolving into the scientific discipline of biology. The boundaries between amateur naturalists and professional scientists remained fluid, with amateurs often knowing more about key biological details—such as a species' life history, habits and local geographic distribution—than the new professionals (Star and Griesemer 1989; Pauly 2000; Beidleman 2006). In 1909 the well-known amateur naturalist Charles Holder expanded Jordan and Evermann's steelhead range to include streams from Skagway to Alamitos and wrote three years later that rainbow trout were "found in all the streams of California that amount to anything down into Mexico" (Holder 1909, 1912). Steelhead, which he believed to be distinct from rainbow trout, occurred "in or at the little lagunas of every notable stream as far south as the San Gabriel."

One of the best descriptions of the geographic range of steelhead/rainbow trout in southern California during this period came from Abbott Kinney, the self-styled

Renaissance man, world traveler, tobacco magnate, entrepreneur, and visionary real estate developer of ''Venice-By-the-Sea,'' now known as Venice Beach. Kinney also served as the first Chairman of the California Board of Forestry and the President of the Southern California Academy of Sciences. In *Forest and Water* (1900), Kinney praised the myriad trout streams that rose high in southern California's Coast and Transverse Ranges (Kinney 1900). ''The largest trout of the southern portion of the [Forest] Reserves is the steel head,'' Kinney wrote, ''a magnificent creature, attaining at times a weight…of twenty pounds, and leaping when hooked four or five feet in the air. In the Santa Ynez it finds its way forty or fifty miles up into the range to spawn.''

An important question for any steelhead recovery effort is the extent to which these fish spawned and reared in high mountain stream reaches and tributaries before the construction of modern dams, which submerged or blocked access to these areas. Abbott Kinney agreed with the earlier observations of Stephen Bowers when he noted that ''the salmon-trout and rainbows find their way far south, sixty or seventy miles, to the upper range of the Santa Ynez.'' In this second passage, Kinney extended the range of steelhead (salmon-trout) and rainbow trout in the Santa Ynez River basin by ten to thirty miles beyond his previous estimate of ''forty to fifty miles'' upstream from the ocean. Charles Holder (1906, 1910) suggested that Kinney was right to include the river's upper reaches. According to Holder, by tracing southern California streams ''to the founts from which they came - the cañons of the Sierra Madre [San Gabriel Mountains], the Santa Ynez, and other ranges - the angler finds himself in another world, the home of the rainbow trout''.

By the turn of the twentieth century, the Santa Ynez River had become known for its outstanding steelhead fishing (Holder 1909; Titus et al. 2010; see also Lompoc Record 1890a, 1891a, 1891b, 1891c, 1892, 1893a, 1893b, 1893c, 1894a, 1894e, 1894f, 1894g, 1894h, 1895a, 1908a, and 1908b) (Figures 6–9). A consular report from the British Foreign Office (1893), described the Santa Ynez Valley as ''one of the most favoured spots in the state.'' The Valley had a ''noble river flowing through it from one end to the other, well stocked with salmon and mountain trout and quail to be found in almost countless numbers; it is a veritable hunter's elysium''. In this case, as in many other records from the Progressive era, the term ''stocked'' refers to wild abundance and not artificial planting activities. Abbot Kinney (1900) called the Santa Ynez and its tributary streams ''favorite haunts; where excellent sport is had in early spring, the fish coming in at this time to spawn''. A 1911 sportsmen's handbook (Cummings and Dunn 1911), published by the Southern Pacific Company, claimed that the Santa Ynez River's lagoon was ''undoubtedly one of the best places on the coast for large steelhead''. The following year, Charles Holder (1912) included the Santa Ynez in his list of California's famous trout rivers. Local and regional newspapers regularly kept their readers apprised of steelhead and trout angling conditions on the Santa Ynez River, as well as other steelhead rivers in southern California (see, for example, Santa Barbara Daily News 1896a, 1896b, 1897a, 1897b; Los Angeles Times 1903a, 1903b, 1904a, 1904b, 1908b, 1910a, 1910b, 1910c, 1910d, 1910e, 1910f, 1913b, 1914b, 1915b, 1916d, 1917b, 1918c, 1918d, 1918e, 1918f, 1919b, 1919c, 1919d, 1919e, 1922a, 1922b, 1924, 1926b, 1927, 1930a, 1930b, 1930c, 1932b, 1932c, 1933b, 1934b, 1936, 1938b, 1939b, 1940a, 1940b, 1941a, 1941b, 1941c, 1944, 1946a, 1946b, 1946c, 1947a, 1947d, 1947e, 1948, 1952a, 1953b, 1962; Oxnard Press Courier 1919a, 1919f; Santa Paula Chronicle 1942).

Despite this increased interest and attention, the taxonomic status and life cycle of steelhead/rainbow trout remained a subject of debate (Kendall 1921). The German

Fig. 6. Santa Ynez River steelhead anglers with winter steelhead catch, 1910. Note the range of fish sizes representing different age classes and possibly different life history forms. Lompoc Historical Society.

physician and naturalist, Johann Julius Walbaum, first identified the species in 1792 using specimens from the Kamchatka Peninsula in Russia, and Sir John Richardson provided a further description in 1836. But by the early twentieth century, the key issues remained far from resolved. Abbott Kinney (1900) and Charles Holder (1906) both noted the controversy without taking sides. According to Holder, some observers considered steelhead a distinct species, whereas others, such as David Starr Jordan, believed it was merely the sea-going form of rainbow trout (Jordan 1922).

This taxonomic confusion is evident in the common names people used to refer to these fish. Salmon-trout, salmon, trout, and silver trout were widespread in the literature, but so were others, including sundowner, half-pounder, summer salmon, silverside, and hardhead (Hedderly 1910; Santa Barbara News-Press 1952; McGuane 1999). Some of these names appear to have referred to a particular life-stage or occurrence at a certain time of year. Barton Evermann (1922) attempted to clarify the issue in 1922 by stating that: 1) if the California steelhead is the same as the steelhead in the Columbia River, its scientific name is *Salmo gairdneri*, 2) if the California steelhead and rainbow trout are identical and distinct from the Columbia steelhead, their scientific name is *Salmo irideus*, and 3) the Shasta rainbow trout raised in hatcheries is quite different from the steelhead.

David Starr Jordon assigned the common name ''rainbow trout'' to the species now identified as *O. mykiss irideus*. This did little to clear up the confusion among most anglers, and the Board of Fish and Game Commissioners felt compelled to regulate both steelhead and trout fishing, at least initially, as separate activities (Jordan 1922). In the

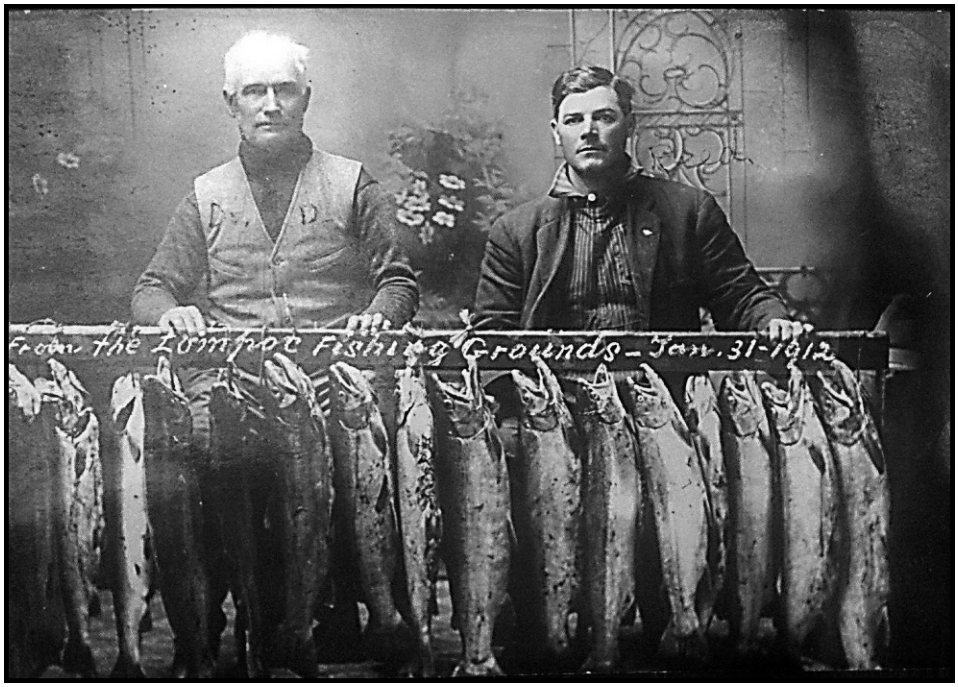

Fig. 7. Santa Ynez steelhead anglers, Dr. Dimock (L) and Charles Reed (R), with winter steelhead catch taken near the Santa Ynez River estuary, 1912. Note large size and mix of male and female fishes. Lompoc Historical Society.

Santa Ynez River, steelhead angling was generally restricted to the winter months (November through February) and to the lower reaches of the river (between the estuary and the Buellton Bridge). Trout fishing season extended from the beginning of April or May, until the opening of the steelhead season, and included upstream tributaries. The bag limits and tackle restrictions varied over the years, but generally became more restricted as angling pressure increased (California Fish and Game Commission c. 1940-present).

In 1909 a controversy developed over southern California regulations that permitted fishing for "tidewater steelhead" beginning in April, and fishing for steelhead and rainbow trout in freshwater streams starting in May (Los Angeles Times 1909a, 1909c; Ventura Free Press 1909a, 1909b, 1909c; Hedderly 1910). The problem was how to distinguish "tidewater steelhead" from stream steelhead and rainbow trout, particularly in estuaries or the lower ends of streams where there was tidal influence. The *Los Angeles Times* (1910c) mocked this policy, writing that "an angler has never found a bait which will attract one variety of trout and repulse another". Some frustrated anglers began to embrace Jordan's view that tidewater steelhead, stream steelhead, and rainbow trout were the same species, and should thus be subject to the same regulations (Los Angeles Times 1910d). Others argued that anglers were capable of telling the two types of fish apart and could avoid the capture of the out-of-season variety (Hedderly 1910). In March of 1909, the Commission's Chief Deputy, Charles A. Vogelsang, classified all of the native salmonids in southern California streams as steelhead, set the opening day of the season for April 1, and established a daily bag limit of fifty trout or fifty pounds of trout (Los

Fig. 8. Santa Ynez River winter steelhead anglers on the banks of the estuary at the mouth of the Santa Ynez River, c. 1912. Note variety of angling equipment and techniques (lagoon trolling, bank bait casting, and retrieving artificial lures). Lompoc Historical Society.

Angeles Times 1909a). Two years later, Governor Hiram Johnson signed the policy into law (Los Angeles Times 1911a; Los Angeles Times 1911b; Los Angeles Times 1911c).

Passing laws was one thing, but enforcing them was quite another. Illegal angling and capture of steelhead and rainbow trout were frequent newsworthy items in local papers, and the Santa Ynez River was no exception. On February 10, 1894, the *Lompoc Record* reported that "Salmon fishing at the mouth of the river is going on with unabated zeal notwithstanding the fact that the run is being taken in open violation of the law. Either the law should be repealed or some regard paid to its provision" (Lompoc Record 1894c; see also Lompoc Record 1894e, 1894f, 1894g, 1894h, 1895b, 1908c, and 1908d).

At the time, the legitimacy of state Fish and Game regulations was far from established, especially in rural areas which contained the best hunting and fishing sites. Fish and game managers were charged with restoring game populations that had declined to levels incapable of meeting growing recreational demands. Urbanization was imposing greater demands on fish and game for city markets and recreational hunting and fishing exerted new pressures on wild populations. Game wardens were attempting to enforce often unpopular new statutes that criminalized previously lawful activities (Los Angeles

Fig. 9. Santa Ynez River steelhead angler, Mrs. Laura Clapp, with winter steelhead catch, 1920. Lompoc Historical Society.

Times 1916a, 1916b, 1916e, 1917a, 1917c, 1917d, 1917e; 1919a, 1919h, 1922b; Oxnard Press Courier 1919b, 1919c, 1919d, 1919e; Warren 1999).[6]

The extent to which recreational angling, legal or illegal, affected fish populations in southern California streams is unclear. At least one observer, Abbot Kinney (1900), believed it was taking a considerable toll: ''The existence of [steelhead] is seriously threatened by overzealous [sic] anglers who fish for numbers alone and who take out the small fry by thousands every year.'' Some of the earliest reports of Santa Ynez River steelhead/rainbow trout, published in the Los Angeles Times (1890, 1891, 1897b), described the use of dynamite for fishing and attempts by both local residents and officials to end that destructive practice.

Fishing success in the Santa Ynez River and its tributaries varied from year to year. In 1875 the Lompoc Record reported good fishing in San Miguelito Creek, a tributary that joins the Santa Ynez River near the west end of the community of Lompoc (1875a, 1875b). Similarly, in the spring of 1890 the *Lompoc Record* (1890a) reported that ''Trout are plentiful in the river now and great sport and large catches are reported by those who have been indulging in the pleasure of angling for the finny beauties''. Later that winter, ''G.R. Meyers and four others caught Thursday night at the mouth of the river, fifteen fine salmon, some weighing twelve pounds… Schuyler, like the ancient fisherman, got this net so full that it broke'' (Lompoc Record 1890b, 1891a). In 1893 newspaper reports described poor conditions and a dearth of fish (Los Angeles Times 1893), but the following year the Lompoc Record reported that ''The salmon are moving up the Santa Ynez river in large quantities this year'' (Lompoc Record 1894a; see also 1894c 1894d, 1894e, 1894f, 1894g). The next winter brought poor conditions (Los Angeles Times 1895b). But in 1896 the river was said to be again ''swarming'' with trout, and in 1897 ''steelhead salmon and trout'' remained ''abundant'' (Los Angeles Times 1896, 1897a). The year 1899 produced disappointing fish catches in many southern California streams, but ''good sport'' was reported for the Santa Ynez River (Los Angeles Times 1899). Anglers met with considerable success on the Santa Ynez River in 1910, 1914, and 1915 (Los Angeles Times 1910a, 1910b, 1910c, 1910d; Lompoc Record 1914; Los Angeles Times 1915). The Lompoc Record reported at the beginning of the 1914 steelhead season that ''The big fish have been coming into the mouth of the river near Surf in large numbers all week…The fish are reported easy to hook taking either 'spoon' or bait…We are informed that Fred Teatsworth landed six beauties in less than two hours time yesterday morning'' (Lompoc Record 1914). Years of poor fishing success are not as common as records of good fishing years during this period, a pattern that may be due to reporting bias, and even for good years it is often difficult to draw any conclusions about steelhead numbers.

Consider the record for 1919, which regional media sources universally reported as an excellent year. On April 3, the *Los Angeles Times* (1919c) announced that ''Some of the best fishing in the history of this section is being enjoyed by anglers along the Santa Ynez River and other trout streams of [Santa Barbara] county…Along the Santa Ynez many large steelhead were caught. In fact, big trout were the order of the day''. According to all accounts, steelhead were large and numerous, and they were present throughout the

[6] California's fish and game agency has gone through several bureaucratic reorganizations and name changes since its inception in 1870. From 1870 to 1909, the organization was called the Board of Fish Commissioners. From 1909 to 1929, it was the Fish and Game Commission. From 1929 to 1951, it was called the Division of Fish and Game, and in 1951 it became the Department of Fish and Game.

watershed. According to the *Times*, most of the streams had high abundances of wild fish and ''the big trout have remained upstream…There are many isolated streams,'' the paper continued, ''which are difficult to reach, and these will furnish good fishing for months for the hardy angler who doesn't mind packing thirty miles or more over the mountain trails and fighting his way up canyons where no trails have ever been cut''. Lower down, on the mainstem, the paper reported that anglers had ''hooked forty-five steelhead measuring not under twenty inches in length'' from a pool near Chalk Rock, a onetime stagecoach stop which is now submerged under the waters of Cachuma Reservoir (SWRCB 2011a, 2011b).

What conclusions can we draw given the sources available from the Progressive era? Documents from the late nineteenth and early twentieth centuries provide important insights as to the distribution of steelhead/rainbow trout in the Santa Ynez River system. Specific data are lacking for many areas, but several sources indicate that wild fish occurred throughout the watershed, from the seaside lagoon to the uppermost reaches of the mainstem and high into the tributaries. Some of these accounts were recorded before the introduction of hatchery fish, and there is no evidence that the introduction of hatchery stock expanded or otherwise altered the basic distribution of the species in the watershed, which appears to be influenced primarily by climatically driven hydrologic conditions.

Determining the abundance of steelhead/rainbow trout poses a more difficult problem. Three factors limit our ability to provide quantitative conclusions about fish abundance for this period. First, years with large steelhead spawning runs likely resulted from favorable conditions that occurred periodically in the Santa Ynez River watershed and adjacent Pacific Ocean. The big run reported in 1919, for example, came at the end of a five-year wet cycle (SYRTAC 2000) when young-of-the-year from previous seasons were returning to spawn. It also occurred four years after the large hatchery plantings of 1915, but it is unclear how many of these fish survived, whether any of these hatchery rainbow trout exhibited anadromous behavior, or how they may have affected the wild adult steelhead run. It is important to note that the 1919 run occurred one year before the completion of Gibraltar Dam, which blocked access to approximately one-third of the upper watershed and altered downstream hydrology, sediment transport, stream habitat, water quality, and possibly the timing, frequency, and duration of river mouth sandbar breaching, affecting the size and quality of lagoon habitat (see Ferren et al. 1995; Jacobs et al. 2011 for an analysis and discussion of breaching patterns in southern California estuaries).

Second, primary source documents from the Progressive era do not include systematic surveys or numerical data (e.g., long-term time series), except when describing fish culture and rescue operations. Information about fish abundance is often fragmentary, ambiguous, and impressionistic. Most of the documentation available refers to angling success, which, for the purposes of this study serves as a proxy for fish abundance. But changes in angling effort and technology, combined with journalistic goals and inclinations, make these reports difficult to interpret. What these records do show is that steelhead abundance varied dramatically from year to year well before dams were built, even in the Santa Ynez River, which was one of the best angling locations in central and southern California.

A third factor that limits our ability to draw more specific conclusions about steelhead abundance is that, by the beginning of the twentieth century, the lower reaches of the mainstem Santa Ynez River already had been extensively altered from their pre-European contact condition. Riparian vegetation clearing, water diversions, groundwater

pumping, overgrazing, land use changes, and other human activities probably made the River warmer, drier, more turbid, and generally less hospitable to steelhead/rainbow trout (Capelli and Stanley 1984; Boughton et al. 2006). It is possible that such alterations would have led to greater runoff pulses and more frequent sandbar breaching, with positive effects on the migratory phase of the steelhead's life-cycle and negative effects on rearing conditions in the mainstem; however, this scenario requires further investigation. As early as 1899, the *Los Angeles Times* speculated that development in southern California was affecting freshwater and anadromous fisheries (Los Angeles Times 1899). The Santa Ynez River escaped the intensive urbanization of other rivers such as the Los Angeles, Santa Ana, and San Gabriel (Stein et al. 2007), but population growth and land use changes, particularly agricultural development (Dittmer 1998), altered the lower Santa Ynez River well before the era of big water projects.

The Era of Big Water Projects

The era of big water projects in California lasted for about a century. It began with the construction of Chabot Dam, in Alameda County, in 1875, and appears to have ended with the completion of New Melones Dam on the Stanislaus River, in Calaveras and Tuolumne Counties, in 1979 (Hundley 1992; Fink 2002). Investigations to identify future dam sites began in the Santa Ynez Valley shortly after the turn of the twentieth century. The City of Santa Barbara acquired the land and rights-of-way for a dam on the river in 1904, completed the 3.7-mile Mission Tunnel through the Santa Ynez Mountains in 1912, and closed Gibraltar Dam on the mainstem of the Santa Ynez River in 1920. Gibraltar Reservoir was the first major impoundment on the River and blocked access by anadromous fish to the upper third of the watershed (Garza and Clemento 2007; Titus et al. 2010). The next year, the Montecito Water District began the construction of Juncal Dam, about fifteen miles upstream from Gibraltar Dam, which it completed in 1930.[7]

Other, smaller water projects soon followed. A diversion dam was placed on Alder Creek to divert water into Jameson Reservoir behind Juncal Dam, and the twenty-eight-foot-tall Alisal Dam was built on the Alisal Creek tributary. The Mono and Agua Caliente debris dams were completed in 1935 and 1937, respectively. These two structures, located on tributary streams above Gibraltar Dam, sought to reduce sedimentation in Gibraltar Reservoir (U.S. Bureau of Reclamation 1947). In 1942 engineers from Camp Cooke Military Reserve constructed a wood-and-concrete barrier near the mouth of the Santa Ynez River to limit saltwater intrusion and the contamination of subsurface freshwater during years of low rainfall (Shapovalov 1944; Titus et al. 2010).

Physical, chemical, and biological conditions in the Santa Ynez River also changed when a series of large fires swept through the Santa Barbara backcountry. In 1932, fires burned about thirty-seven percent of the river's 216 square mile watershed above Gibraltar Dam and by 1940 only one percent of this part of the basin had "escaped the scourge of fire" (Shapovalov 1944). Post-wildfire erosion aggraded tributary streams,

[7] Construction of these dams was facilitated when the California Supreme court ruled against a downstream landowner (Gin Chow), holding that he had no claim to the "extraordinary storm waters of the river" captured by the City of Santa Barbara "where no use is made of such waters on the riparian land and no benefit accrues to riparian land from their passage over the bed of the stream, and no damage is caused to the riparian land from the proposed diversion" Gin S. Chow v. City of Santa Barbara (217 Cal 673, 22 Pac. 5). More recent challenges regarding the downstream effects of the large dams on the Santa Ynez River have been similarly unsuccessful; see Jordan v. City of Santa Barbara (46 Cal. App. 4th 1245).

clouded and filled some of the reservoirs with sediment and aggravated flooding in the lower river, reducing fishing success to near zero for a few years. Increased groundwater pumping also altered the river's ecology and surface flows, particularly in its lower reaches. Expanding agricultural development (Dittmer 1998), followed by several years of low rainfall between 1928 and 1932 (SYRTAC 2000; County of Santa Barbara Public Works Department 2012), led to increased groundwater pumping, which lowered the water table and dried the lower riverbed earlier in the season (Shapovalov 1944). Agricultural development on the floodplain also spurred calls for increased flood protection, and led to the first major publically conducted clearing of riparian vegetation along the lower Santa Ynez River (Penfield 1943a, 1943b, 1944a, 1944b).

Fisheries managers tried to mitigate the impacts of development projects from the very beginning. In 1916 the Fish and Game Commission conducted surveys for fish ladders at new or proposed dams throughout the state, including at Gibraltar Dam (CFGC 1916; see also Los Angeles Times 1916c, 1922c). The Gibraltar ladder was never installed, but the Commission recognized the need for a fish passage facility and even studied its feasibility, suggesting that officials knew that the area above Gibraltar Dam was important for steelhead spawning and rearing. The lagoon's saltwater barrier included a fishway and Shapovalov (1945) believed that it was "operating satisfactorily", although it is not clear to what extent he examined its operation. The barrier disappeared during the flood of 1969, when water and debris ripped it from its foundation and swept it out to sea (ESA-PWA 2010).

Throughout the 1930s and 1940s, the Division of Fish and Game conducted rearing, relocation, and stocking programs designed to improve the Santa Ynez River fishery, as well as other fisheries in southern California watersheds. The philosophy behind this extensive program of artificial propagation, relocation and stocking was clearly articulated by Hedderly in the Fish and Came Commission's 27th Biennial report in which Hedderly wrote, "Favored none too bountifully by Nature in the way of natural waters, the very scarcity of streams and lakes has brought by artificial means its own remedy. … Too much water, or too little, is the ever present nuisance" (CFGC 1921a). From 1932 to 1936, the Division planted 232,000 hatchery steelhead in the Santa Ynez River system, including the mainstem, Gibraltar Reservoir, and Santa Cruz Creek (Curtis 1937; Los Angeles Times 1940c; Titus et al. 2010).[8] The Division also stocked 10,000 hatchery rainbow trout in 1932. Between 1937 and 1944, the Division did not stock any non-native steelhead/rainbow trout in the Santa Ynez River watershed (Shapovalov 1944).

No records are available for fish capture and relocation operations before 1939. That year, however, the Division of Fish and Game began an ambitious relocation effort. During the months of May and June from 1939 to 1944, the Division captured about 2.85 million mostly juvenile steelhead from the drying bed of the Santa Ynez River, including 1,036,980 steelhead (ca. thirty-six percent of the total fish captured during the five year period) in 1944 alone. According to Shapovalov (1945), "These fish probably represented only a small fraction of the young steelhead produced, since large numbers migrated downstream prior to the start of rescue operations or remained in localities inaccessible to the rescue crews". All of the fish captured in 1944 were obtained upstream from the site of the current Bradbury Dam.

[8] Shapovalov (1945) reported only 182,000 steelhead stocked from 1932 to 1936 because he failed to include the 50,000 planted in Gibraltar Reservoir in 1935 (Curtis 1937).

The Santa Ynez River became the source of most of the steelhead stocked in the streams of Santa Barbara, San Luis Obispo, and Ventura counties (Shapovalov 1944). Some 252,640 Santa Ynez River juvenile steelhead, for example, were planted in the Santa Maria River (Shapovalov 1944). In 1940 some of the captured fish that had been reared in the Fillmore Hatchery were marked and released into the Santa Ynez River's lagoon as part of an experiment to determine the survival success of fish moved there from further upstream. About seventy-one percent of the approximately 2.85 million juvenile fish captured between 1939 and 1944 were returned to the Santa Ynez River system, with at least 491,300 being placed directly into the lagoon from 1940 through 1942 (Entrix 1995; see also Los Angeles Times 1940c).

It is unclear to what extent, if any, these costly rearing, capture, relocation, and stocking operations actually affected the steelhead/rainbow trout population or fishing success in the Santa Ynez River system (Titus 1995a). No systematic studies were conducted. However, Shapovalov (1945) observed that stocked rainbow trout often died shortly after planting. Some of the captured fish may have survived in isolated pools without these operations, and it is unclear how the dams affected the persistence of the small perennial pools that provided dry season habitat. The hatchery introductions that occurred from 1932 to 1936 also coincided with wildfires that killed thousands of fish above Gibraltar Dam, where most of the stocking occurred, and ruined fishing there for several years (Shapovalov 1944).

The size of the Santa Ynez River's steelhead run during this period depended, in part, on multi-year precipitation patterns and downstream water releases or spills from dams. Some of the largest reported runs occurred during years of moderate precipitation preceded by high precipitation two to three years earlier. Years of high flows may have resulted in increased spawning and rearing habitat availability, improved lagoon conditions, and larger numbers of smolts reaching the ocean, which then returned to spawn two to three years later (Shapovalov 1944, 1945). The smallest reported runs occurred when flows remained low into January and the river failed to breach its sandbar. Early winter filling of Gibraltar and Jameson Reservoirs would have reduced the downstream flows and sandbar breaching that enabled steelhead to enter the river system, and prevented successful migration to upstream spawning and rearing habitats (Shapovalov 1944, 1945; see also Los Angeles Times 1947b).

Flows always fluctuated most radically in the lower portions of the Santa Ynez River, with some reaches drying by mid-summer. Yet, from 1928 to 1944, only two years, 1928 and 1932, did not have sufficient winter rainfall, dam releases or spills, and associated discharge to breach the sandbar across the mouth of the lagoon (Moffett and Neilson 1945; Santa Barbara News-Press 1930). According to a promotional brochure published around 1937, large tidal fluctuations enabled fish to enter the lagoon: ''late in January, almost every high ocean tide brings more of these excellent fish into the lagoon and river spawning grounds'' (Anonymous ca. 1937). When the sandbar remained closed into the winter, beachgoers reported seeing steelhead in the coastal shallows, presumably waiting to enter the lagoon (Los Angeles Times 1910a, 1914a, 1918a, 1918f, 1926b, 1927, 1931b, 1932a, 1934a, 1934c; Lompoc Record 1939a, 1939b). Some years, when the sandbar failed to open into January, sportsmen, county officials, or even the Southern Pacific Railroad Company would dredge a channel through the sandbar (Los Angeles Times 1931a). Intentional breaching occurred during several winters of low or late rainfall, including 1938 and 1940 (Entrix 1995; Lompoc Record 1940a). Artificially breaching the estuary's sand bar during low flow periods would not facilitate the upstream migration of

fish to their spawning and rearing habitats, but could induce fish to move into the enclosed estuary where they would be more susceptible to successful angling efforts (for early journalistic references to angling in the surf and lagoon, see also Lompoc Record 1891a, 1891c, 1894c, 1894d, 1894f, 1908a, 1908b, 1908cb, 1939b; Los Angeles Times 1918, 1924, 1931a, 1931b, 1938a. 1939a).

Intentional breaching of the Santa Ynez River estuary sandbar began occurring once steelhead fishing became an important part of the Santa Ynez Valley's culture, identity, and economy (Los Angeles Times 1918, 1924, 1938a). As early as 1910, one local resident remarked that his community had "one thing besides mustard, and that's trout" (Holder 1910).[9] Most local families fished, and some capitalized on the influx of tourists that arrived with the steelhead fishing season (generally from November through February) and the trout fishing season (from April or May through November). Significantly, the Santa Ynez River (along with other major southern California rivers such as the Ventura and Santa Clara) were managed specifically to perpetuate the steelhead fishery, and the angling regulations varied during these years in response to changing conditions, including environmental and political conditions, and the evolving scientific understanding of the species (Los Angeles Times 1917c, 1917d, 1917e, 1918, 1919a, 1919b, 1922b, 1933a, 1939a, 1946a, 1946d, 1946e, 1954, 1958; Santa Paula Chronicle 1946, 1947, 1948). In Lompoc, near the Santa Ynez River's seaside lagoon, motels, cafes, and sporting goods stores advertised their services to fishermen. Lompoc resident Charles Walker recalled in 2005 at the age of 74 that "People would come up in the night from Los Angeles and various places to fish, and when they did they ran Jasper and the Owl Café all night long" to accommodate anglers (Lompoc Record 2005) (Figures 10–12). In 1948 the Fish and Wildlife Service estimated the annual economic value of this fishery at $200,000 (U.S. Department of the Interior 1948); adjusted for inflation based on Consumer Price Index data this would be approximately $2,000,000 in 2012 dollars (Cogley 2002). According to one marketing brochure published during the 1930s Depression, Santa Ynez steelhead attracted hundreds of anglers each year. "Thousands of these large steelhead have already been caught …. ten-pound, thirty-inch steelhead are common, and scores of limit catches have been reported" (Anonymous ca. 1937). Shapovalov (1945) reported that, by 1941, "4,375 anglers caught 262,000 trout in Santa Barbara County", with the Santa Ynez River serving as the hub of this recreational fishing economy. The U.S. Department of Interior's report on the Cachuma Project noted that "Not all of the fish taken [in Santa Barbara County] were supplied by [the] Santa Ynez River and its tributaries. But since it is the major stream in the county, it can be safely assumed that the majority of the catch came from that stream" (U.S. Department of Interior 1948). By the late 1930s, businesses in Lompoc were promoting their city as a "sportsman's paradise" (see Appendix A).

By 1939 the Santa Ynez steelhead population, which had declined during the droughts and fires of the late 1920s and early 1930s (Entrix 1995a; Lompoc Record 1939a, 1939b; Santa Paula Chronicle 1932), was beginning to rebound. Precipitation was moderate to above average from 1935 through 1938, and anglers who came to the Santa Ynez River reported "heavy runs" in 1939 (*Motorland* 1939). California Division of Fish and Game officials reduced the bag limit for fishermen from ten to three fish per day, presumably to accommodate the increasing number of recreational anglers and to discourage the

[9] In the early 1900s, one of the Valley's main cash crops was mustard; for a time, Lompoc was known as "Mustard City" (Santa Barbara News-Press 1943d).

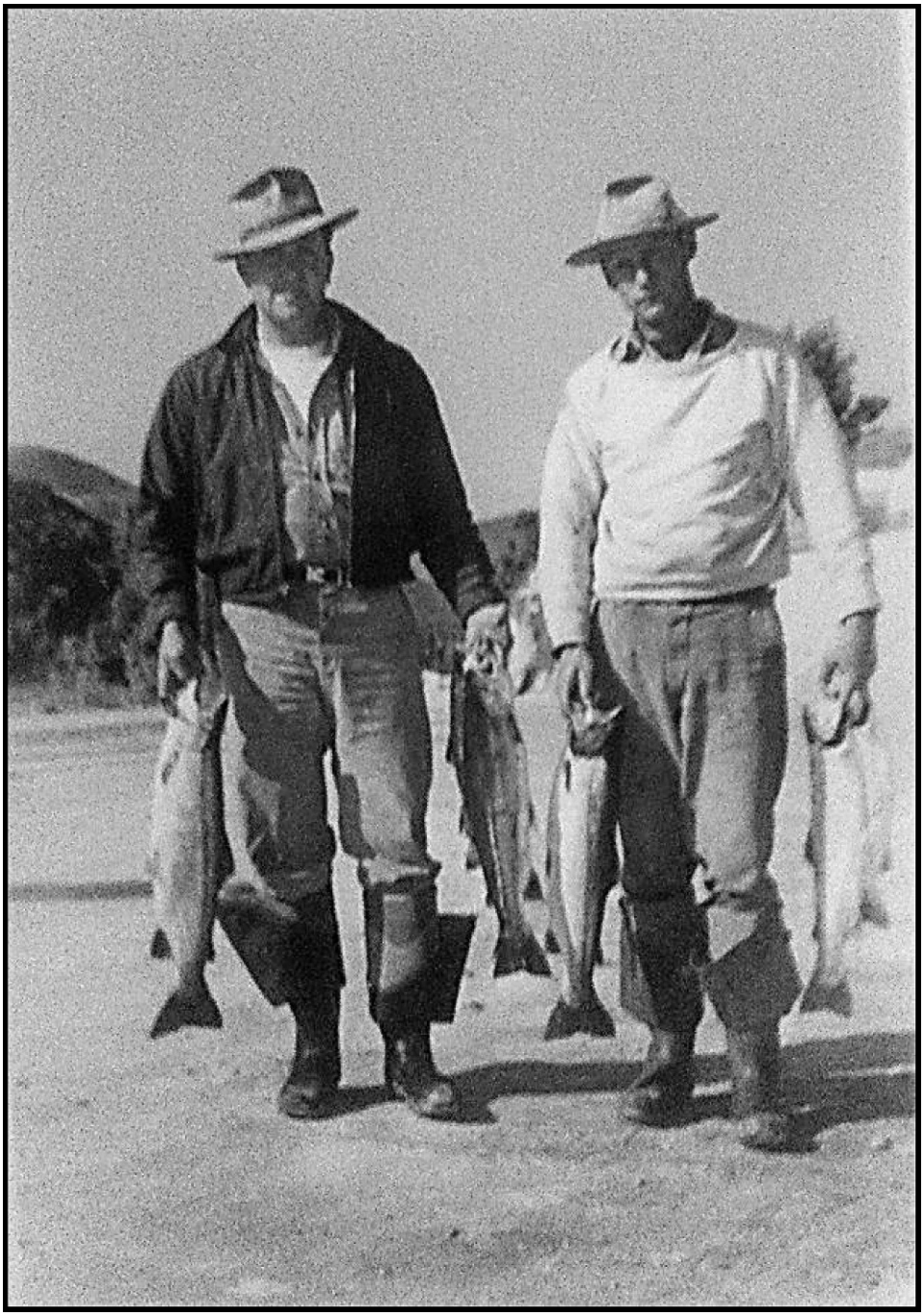

Fig. 10. Santa Ynez River steelhead anglers, Louie Anliker (L) and Harry Paaske (R), with winter steelhead catch, 1942. Note generally smaller size of fish, and bright silver sides below the lateral line indicative of fish having recently entered freshwater from the ocean. Lompoc Historical Society.

Fig. 11. Santa Ynez River steelhead anglers casting for winter steelhead in the mouth of the Santa Ynez River estuary, c. 1948. Claude M. Kreider.

considerable and continuing amount of illegal fishing above Buellton Bridge (Shapovalov 1944). The following year, the Lompoc Record (1940d) informed its readers that ''Experienced observers report that thousands of steelhead have been going up the river this week, and the run in from the ocean still continues''. The Lompoc Record (1940b) also reported ''An estimated 900 anglers were at Ocean Park Sunday, and hundreds fished along the river'' (see also Lompoc Record 1940a, 1940b, 1940c, 1940e, 1940f, 1940g, 1940h). According to the *California Conservationist*, 1940 represented the largest steelhead run on the Santa Ynez River in 15 years: ''more than 3,000 adult steelhead have been taken by some 10,000 fisherman on the upper section of the river below Buellton''.

Steelhead fishing was not as successful in 1941 as in the previous two years, but moderately high flows (including >1,000 cubic feet per second [cfs] on several days between January and April) allowed the sandbar to stay open for months. Water remained in the mainstem of the lower river during the summer of 1941, which extended the fishing season and led to the Division of Fish and Game's decision not to pursue fish relocation operations (Entrix 1995). Statewide, in 1941, some 453,159 anglers caught a total of 15.7 million trout, an all-time record, indicating burgeoning recreational fishing throughout California (Santa Barbara News-Press 1943a). The following year (1942) was characterized by low rainfall and little fishing success. It was a poor season overall, but

Fig. 12. Flood control operations between the Alisal Bridge and the Santa Rosa ranch conducted by the County of Santa Barbara, Public Works Department, November 1944. Note mature riparian vegetation along the lower mainstem of the Santa Ynez River, in the vicinity of Hollister's ranch. Mark H. Capelli Southern California Steelhead Watershed Archive, UCSB Donald C. Davidson Library.

conditions improved somewhat later in the spring (Santa Barbara News-Press 1941; County of Santa Barbara Public Works Department 2012).

Rain in the winter of 1943 began late, but the Santa Ynez River had some of the largest steelhead runs and highest fishing success in modern memory (Santa Barbara News-Press 1943d). During World War II, military officials from Camp Cooke restricted access to the lagoon (Los Angeles Times 1941d), but later opened the area to angling with a permit from the base's provost marshal (Los Angeles Times 1945a, 1945b, 1947c, 1952b). However, in early winter beachgoers reported seeing steelhead in the ocean outside the sandbar in ''immense numbers'' and the lagoon became ''alive with steelhead'' by late January, after rains had begun and the lagoon sandbar had breached (Santa Barbara News-Press 1943b, 1943c). During the second half of February, after peak flows diminished and turbidity declined, fishing success improved and several large catches were reported, including fish up to thirty inches in length. On February 27, one fisherman reported ''thousands of fish in the stream'' (Santa Barbara News-Press 1943e).

Shapovalov observed steelhead conditions in the Santa Ynez River during the 1930s and 1940s. He witnessed years of varying steelhead abundance, and by the mid-1940s he was in a position to assess the Santa Ynez River's fishery. In a series of reports, he concluded that, before the construction of Gibraltar Dam in 1920, steelhead had spawned wherever they had access to flowing water in the upper watershed, including tributaries upstream of Gibraltar Dam such as Alamar, Indian, and Mono Creeks (Shapovalov 1944; see Figure 3 above). He also reported that steelhead spawned ''in the mainstem and in practically all tributaries'' below Gibraltar Dam, ''with the heaviest spawning taking

place in the portions above the proposed Cachuma Dam''. Key streams included Alisal, Zanja de Cota, Cachuma, Tequepis, Santa Cruz, and Salsipuedes Creeks, but according to Shapovalov, steelhead once spawned in every significant tributary of the Santa Ynez River (Shapovalov 1944; Titus et al. 2010).

Shapovalov did not publish estimates of the size of the steelhead run in the Santa Ynez River. In 1944, however, his colleague, Carl Tegan, offered an estimate that Shapovalov accepted and later repeated. Tegan was a Division of Fish and Game employee who had counted steelhead and salmon at Benbow Dam on the South Fork of the Eel River from 1938 to 1940 and was now working as a trapper in the Santa Ynez Valley. According to Tegan, the 1944 steelhead run on the Santa Ynez River ''at least equaled the runs at Benbow Dam,'' which had varied from 12,995 to 25,032 during the previous six seasons (Shapovalov 1944).

Much has been made of Tegan's estimate, which is often cited in both the popular and technical literature and which has served as the basis for a series of subsequent estimates of ''historical'' steelhead population sizes for the Santa Ynez River (Busby et al. 1996; NMFS 2003). In 1995 the Entrix consulting firm argued that the 20,000 to 30,000 figure that many authors have derived from Tegan's estimate was too high (Entrix, Inc. 1995; Good et al. 2005). During the two seasons that Tegan worked on the Eel River, population estimates for the run at Benbow Dam were 12,995 and 14,476. As Entrix pointed out, there is also reason to believe that 1944 was a year of particularly large steelhead runs in the Santa Ynez River (Santa Barbara News-Press 1944a, 1944b). The 1944 run came three years after the wet season of 1941, when large numbers of smolts likely reached the ocean, and followed several years of intensive capture and relocation efforts. At the end of the 1944 steelhead angling season the Lompoc Record noted that ''The Steelhead fishing season closed in the Santa Ynez River Monday in the flourish of big catches that has seldom been equaled during the past decade…. The heavy storm which immediately preceded the closing day of the season opened the sandbar at Surf and allowed thousands of the big fish to swim up the river'' (Lompoc Record 1944).

The other side of this debate postulates that the 1944 run was more typical of historic runs in the Santa Ynez River. Rainfall and flow during this year were not unusual and, of the previous eight years, half had above average and half below average rainfall (SYRTAC 2000; County of Santa Barbara Public Works Department 2012). The *Santa Barbara News-Press* (1944c) offered conflicting accounts of fishing success. It is also unclear to what extent capture and relocation efforts or planting operations affected the population. Moreover, the 1944 run came twenty-four years after the completion of Gibraltar Dam blocked steelhead access to almost one third of the watershed and followed several decades of adverse habitat modification, including major flood control activities in the lower river (Penfield 1943a, 1943b, 1944a, 1944b). By 1944 steelhead had less habitat and surface flow compared to a half-century earlier. Ultimately, it is impossible to know whether 1944 was a particularly favorable or a merely typical year for steelhead in the Santa Ynez River.

Tegan's estimate represented the opinion of an experienced and knowledgeable steelhead observer. Yet it offers only an approximation of the steelhead run in the Santa Ynez River based on only a few years of observation and without the benefit of quantitative monitoring. It does not provide a baseline for the spawning steelhead population size, which may have changed due to human activities during the nineteenth and twentieth centuries and may have varied by at least two orders of magnitude due to natural factors alone (Titus 1995a; Titus et al. 2010). Tegan's estimate provides a useful

Fig. 13. Adult steelhead stranded in lower Santa Ynez River due to low flows, March 12, 1946. Steelhead mortality was estimated at 100 fish per mile for seven miles in the Lompoc area by California Department of Fish and Game personnel. D.A. Clanton, California Department of Fish and Game. Mark H. Capelli Southern California Steelhead Watershed Archive, UCSB, Donald C. Davidson Library.

data point but, taken on its own and out of context, it constitutes an incomplete account of the history, scope, and variability of the Santa Ynez River's steelhead run.

The fishing on the Santa Ynez River remained good into 1945. On February 9 of that year, the *News-Press* (1945) reported ''good news'' for fishermen, with hundreds of steelhead making their way upstream and the water gradually clearing. It was also another big year for fish capture and relocation operations with Beeman (1945) reporting the rescue of 1,010,300 juvenile steelhead, 485,540 of which were relocated to the lagoon.

In March of 1946, a group of state and federal fisheries biologists conducted a visual survey of the Santa Ynez River. Despite low flows and poor conditions for steelhead migration, they documented steelhead moving upstream and even spawning at four locations from Alisal Creek to Oso Canyon (Figure 13). The group saw no fish in the lowest sections of the river. They concluded that spawning habitat was very poor below Salsipuedes Creek, of dubious quality from Salsipuedes Creek to Solvang, and excellent from Solvang to Gibraltar Dam, including the area upstream of present-day Bradbury Dam (Titus et al. 2010). The *Lompoc Record* (1946) reported that ''Fishermen by the droves have been seen along the Santa Ynez River since the Big Steelhead started their annual run''. Yet fishing success that year was minimal. Another 437,592 juvenile steelhead were captured and relocated that year, approximately 328,000 of which were placed in the lagoon (Beeman 1946).

The following winter, steelhead appeared again offshore in large numbers. The sandbar at the mouth of the Santa Ynez River opened for short periods in December of 1946 and January of 1947. Some steelhead passed into the lagoon at each of these times, but low

flows continued throughout the remainder of the season and no significant run occurred (CDFG 1946–1953; Santa Barbara News-Press 1947a, 1947e), though a few fish continued to be caught. Locals began to debate why the Santa Ynez River's steelhead seemed to be diminishing and what to do about it (Santa Barbara News-Press 1947b), but fishermen continued to take steelhead from the surf during the late 1940s and early 1950s, and descriptions of angling success on the Santa Ynez River continued to appear until around 1948 (Mears 1947, Kreider 1948). The California Division of Fish and Game continued to place juvenile steelhead in the lagoon to try to revive the population, but steelhead sightings declined.

From 1947 to 1951, the Santa Ynez Valley experienced a drought. According to the United States Geological Survey, gauges at ''the Narrows'', just upstream from the City of Lompoc, did not record measureable flow at any time during the winter of 1948 (Entrix 1995). The dry period of the late 1940s and early 1950s was one of the most intense and prolonged in Santa Barbara County since rainfall records began in 1868. Yet many periods of low rainfall had occurred over the previous centuries—including from 1850 to 1851, 1862 to 1864, 1924 to 1925, and 1929 to 1931—and in that context the 1945 to 1951 drought was not out of the ordinary (Michaelsen et al. 1987; County of Santa Barbara Public Works Department 2012). Unlike the 1924 to 1925 and 1929 to 1931 droughts, however, the 1947 to 1951 dry period occurred at a time when upstream dam diversions and groundwater pumping were more significantly modifying the river's hydrology and reducing flows.

As the dry period persisted, local residents and anglers expressed increasing concern about the drought's effects on steelhead/rainbow trout populations. In 1948 the Lompoc Record reported that the ''gamey steelhead trout, unable to make their annual journey up the Santa Ynez River to their spawning grounds, are attempting to lay their eggs on gravel ledges and banks along the nearby surf''. In January of the following year, the paper announced that ''Time [is] running Out on Steelhead Fishermen as Santa Ynez Stays Dry'' (Lompoc Record 1948). In March of 1952, the *Santa Barbara News-Press* cited four local authorities who believed that the Santa Ynez River's steelhead would disappear without the benefits of stocking. California Department of Fish and Game warden R.E. Bedwell captured this sentiment when he alleged that, after five years of reproductive failure, ''the cycle of their return has been broken. The fish which used to go up the stream are either dead or out of the habit of using the Santa Ynez for spawning'' (Santa Barbara News Press 1952; Entrix 1995; see also Los Angeles Times 1948, 1953b; Santa Paula Chronicle 1953).

Bedwell's statement says more about ideas regarding steelhead at the time than about the actual persistence of steelhead populations. The notion that steelhead always return to spawn in their natal streams, with almost no dispersal among watersheds, supported the belief that if a natural population went extinct it could not be regenerated by migrants from other systems (Taft and Shapovalov 1938; Shapovalov and Taft 1954). Many observers at the time failed to recognize that steelhead had endured far worse droughts in the past and, given the flexibility of its life history and behavior, they were well adapted for surviving climatic vagaries. Officials from the California Department of Fish and Game at that time also tended to view artificial propagation as a panacea for diverse fishery problems, and they promoted hatcheries as the only viable solution to the degradation or loss of habitat resulting from human activities (Lichatowich 1999; Taylor 1999; Montgomery 2003).

The steelhead/rainbow trout species complex is particularly well-adapted to frequent periods of poor habitat conditions typical of streams in southern and central California

(Moyle et al. 2008). By employing diverse and flexible life history strategies, species such as steelhead/rainbow trout are able to hedge against adverse conditions such as extended droughts (Sultan and Spencer 2002). During dry periods, perennial pools, tributaries, and lagoons may serve as refugia for rainbow trout that will supplement or re-establish anadromous steelhead runs when more conducive hydrologic conditions return (Moyle et al. 2008). Steelhead and rainbow trout in the Santa Ynez River watershed – with its extensive area, diverse habitats, large lagoon, perennial pools, and many tributaries – probably never went extinct. Natural source populations of rainbow trout within the watershed would have provided both founding stock for future steelhead runs and occasional migrants to other watersheds.

It is unlikely that the drought of the 1940s and 1950s could have extirpated the steelhead population within the Santa Ynez watershed. However, the effects of the drought were undoubtedly exacerbated by decades of streambed and streamside habitat modification in the mainstem that reduced flows in the lower watershed and blocked access to high quality habitat in the upper watershed. These changes would have made it more difficult for steelhead/rainbow trout to exploit their customary survival strategies. The biggest problem for fish created by drought, however, was not the lack of streamflow but rather increased public support for more water storage in new reservoirs.

The story behind the proposal and development of new federal water projects on the Santa Ynez River is more complicated than most project proponents have portrayed. In 1944 the Bureau of Reclamation reported that ''The present irrigation supply in the Santa Ynez Basin is secured entirely from ground water, and is ample for existing development''. The following year, the Bureau changed course and proposed a massive, multi-part project that included three new dams on the river's mainstem. Santa Rosa Dam would be built about 25 miles above the river mouth and have a storage capacity of 150,000 acre-feet. Cachuma Dam would be built 47 miles from the river mouth and hold a maximum of around 200,000 acre-feet. Finally, Camuesa Dam would be built 74 miles from the river mouth, about 2 miles above Gibraltar Dam. The Bureau's proposal included a fourth dam on Salsipuedes Creek, and another diversion tunnel that would deliver additional water through the Santa Ynez Mountains to Santa Barbara and the South Coast (U.S. Department of the Interior 1945; Douglas 1955; Shapovalov 1945).

In 1948 the Secretary of the Interior, Julius A. Krug, who oversaw the Bureau, recommended immediate approval of the Cachuma Unit, which comprised a major component of the earlier proposal. ''The Cachuma Unit, consisting of Cachuma Reservoir, Tecolote trans-mountain diversion tunnel, and appurtenant works, is urgently needed to supply water for the irrigation lands and for municipal use in the south coast area of Santa Barbara County'' (U.S. Department of the Interior 1948). The purpose of this project would be to ''alleviate to some extent the critical water shortage deriving from the current drought in California'', and offer ''ample protection against future droughts for many years to come''. It would accomplish these objectives by capturing ''flood flows which now escape unused to the ocean'' and storing them for later redistribution.

What caused the Bureau of Reclamation's shift in its Santa Barbara County water policy? Drought and population growth, in the late 1940s and early 1950s, provided rationales for the Bureau and other local and state water agencies. According to this version of the story, the dry period that began in 1948 increased already unsustainable groundwater pumping in the Santa Ynez Valley, reduced South Coast water supplies to dangerously low levels, and led to water rationing and calls for a long-term solution (Fink 2002; Miller

2011). The Bureau of Reclamation described, and Congress authorized, the Cachuma Project as an ''emergency measure'' (Horton 1975; McEwan and Jackson 2003).

This account is problematic for two reasons. First, discussions about another big water project on the Santa Ynez River began long before the drought of the late 1940s and early 1950s (Dittmer 1998). A 1925 proposal, dubbed the Santa Ynez Valley Irrigation Project, generated controversy in the area when it called for an impoundment in about the same location as present-day Cachuma Reservoir. Prohibitive costs, as well as doubts about the capacity of the Santa Ynez Valley's soils to support irrigated agriculture, derailed the scheme.

Discussions resumed in the 1930s (U.S. Department of Interior 1945; SWRCB 2011a, 2011b), and planning for the Cachuma Project started in earnest in 1941. Coincidentally, 1941 was the wettest year on record up to that point, with a total rainfall of 45.2 inches recorded at the El Estero Water Treatment Plant in Santa Barbara, over twice the long-term annual average rainfall (Entrix 1995; County of Santa Barbara Public Works Department 2012). This was also the year that the United States entered World War II, and was not a time of great population growth. In 1945 the State of California established the Santa Barbara County Water Agency, which entered into contracts with South Coast municipalities and the Bureau of Reclamation to develop a new Comprehensive Basin Plan (U.S. Department of the Interior 1945). By 1947, when the Bureau officially introduced its ambitious new proposal for the Santa Ynez River, the next drought had barely begun. The Bureau's plan was a long-anticipated solution to an intermittent problem, not an emergency measure for an acute water shortage.

The other problem with the standard account of the Cachuma Project involves its larger historical context. In 1948 the United States reached the low point of a post-War economic downturn. Many politicians feared that the decline of military spending and lack of jobs for returning veterans would lead to another depression like the one in the 1930s. What occurred instead was a severe but short recession, followed by a longer period of increased government spending, private sector expansion, and population growth, especially in Sunbelt and Western states such as California. The federal government had great incentive to support social programs, such as the GI Bill, and to fund ''shovel ready'' infrastructure projects, from dams to interstate highways. The Cachuma Project also fit well into a renewed political consensus about the need to develop crucial natural resources for economic growth. The Bureau of Reclamation, like other agencies responsible for such resources, emerged from the War reinvigorated and ready to pursue an ambitious agenda (Karl 1982; Hundley 1992; Pisani 1992; see also Kelley 1998).

Most South Coast residents welcomed the Cachuma Project. The Project received endorsements from the City of Santa Barbara and from water districts in the nearby towns of Montecito, Carpinteria, and Goleta (Department of the Interior 1948). Thomas R. Storke, owner and Editor of the *Santa Barbara News-Press*, emerged as a major proponent of the Project (Storke 1958). The Santa Ynez Water Conservation District backed the plan, as did many Valley residents who believed it would bring a range of benefits. According to the Bureau of Reclamation, the Project would capture storm water, maintain pre-existing water rights, improve flood control, and provide new recreational opportunities. It may not have mattered if local Santa Ynez Valley residents had resisted the plan. In the words of one editorial, ''From the point of view of Lompoc, the question of whether or not there is a Cachuma Dam becomes purely academic because it is not within our power to decide the question. That will have to be decided by the people of Santa Barbara and the South Coast who will be called upon to pay the

major share of the cost. Our concern is that once the dam is erected, all the water to which we are entitled is available'' (Anonymous 1949).

The only significant resistance to the plan came from fisheries managers who recognized that the Cachuma Project would have serious consequences for the Santa Ynez River's steelhead run and recreational fishery. In a statement submitted to the Secretary of the Interior, and included in his ''Report and Findings on the Cachuma Unit of the Santa Barbara County Project, California,'' the U.S. Fish and Wildlife Service offered a bleak assessment of the proposed project (U.S. Department of the Interior 1948). ''The greatest problem on the Santa Ynez River,'' the statement concluded, ''is the protection of the sea-run steelhead''. Runs that spawned above the proposed Cachuma Dam, ''and formerly ascending above the Gibraltar Dam…will be harmed to a considerable extent unless some provision can be made to provide for their reproduction after the flows in the main river have been curtailed''.

The U.S. Bureau of Reclamation did not dispute this assessment. It estimated that the construction of Cachuma Dam would result in the loss of about fifty percent of the Santa Ynez River's steelhead run (U.S. Department of the Interior 1948; Lompoc Record 1947). The question was what to do about this loss. The FWS offered eight recommendations for mitigation. Three of these recommendations applied, at least in part, to Cachuma Dam, whereas the others pertained to different aspects of the Bureau's larger proposal, including the Service's concerns about the effects of Santa Rosa Dam, which would ''undoubtedly destroy the steelhead runs unless proper provisions are made for their up and down-stream passage''. With respect to the Cachuma Project, the FWS recommended studies into the possibility of hatchery augmentation, the construction of a fish ladder, and dam water releases of 15 cfs throughout the year. The Service viewed its recommendations as provisional because officials did not yet know which aspects of the Comprehensive Basin Plan would receive Congressional approval.

The CDFG endorsed the FWS's flow recommendations (CDFG 1993) and even provided a simple cost-benefit calculation, using the U.S. Bureau of Reclamation's figures, which argued that the value of the water required to maintain the fishery was roughly equal to the value of the fishery itself (CDFG 1950). This calculation was intended to question the contention that water diverted to other uses was being appropriated more rationally than water used to maintain the Santa Ynez River's steelhead fishery. By 1950 the CDFG had lowered its dam release request to 15 cfs from December 16 to February 28, 10 cfs from March 1 to May 31, and 5 cfs from June 1 to December 15 (CDFG 1950). The State Division of Water Resources, however, objected to any water allocation for the Santa Ynez fishery, recommending approval of the Bureau of Reclamation's unaltered plan while arguing that the ''water-supply situation in the south-coast area of Santa Barbara County, Calif., is critical and steps should be taken immediately'' (Evans 1952; U.S. Department of the Interior 1948).[10]

Given federal and state policies, the political climate, and public perceptions of the value of dams, the state and federal fish and wildlife agencies were bound to lose this policy debate. These agencies had grown and developed considerably since 1930 and cultivated constituencies of dedicated sportsmen. Yet new state and federal laws would not begin to ensure the consideration of public trust values other than water in water

[10] In 1956 the State Legislature combined the Division of Water Resources with the State Engineer's Office, State Water Resources Board, Department of Public Works, and Water Project Authority to create a new administrative unit called the Department of Water Resources (Zobel et al.1999).

conservation projects until the 1970s (Fullerton 1975). The Bureau of Reclamation, State Division of Water Resources, and County Water Agency all argued that the allocation of 33,000 acre-feet, or eighteen percent, of the river's annual total minimum runoff for fishery purposes would render the project unfeasible.

In July of 1950, Alan Taft, of the CDFG, met with representatives from the Bureau of Reclamation in Santa Barbara (CDFG 1951). The Bureau officials told Taft that it might be possible at some point to release around 1 cfs year-round from Cachuma Dam in part for the benefit of the river's fish. The following year, fisheries biologist P.A. Douglas took a "dim view" of the future for southern steelhead. "I would be in favor of forgetting the SH fishery," he wrote, "as I believe it is already a lost cause below San Luis Obispo County" (Douglas 1953a). He continued in a subsequent letter: "As in the case of the Cachuma Reservoir, Santa Barbara County, we may as well consider the steelhead fishing in the lower Santa Ynez River as a thing of the past" (Douglas 1953b).

The Cachuma Project received authorization from Congress on March 4, 1948; construction began in 1950 and the dam was completed in 1953. Cachuma Dam, which was renamed Bradbury Dam in 1971, blocked migrating adult steelhead from reaching about two-thirds of the most reliable and productive spawning and rearing habitat in the Santa Ynez River system (CDFG 1975; see also Figures 4 and 5). Although one estimate indicated that eleven miles of mainstem habitat remained below the dam, water releases were usually too low to facilitate spawning or rearing (Becker & Reining 2008). Throughout the 1950s, fisheries managers continued to conduct stocking programs that they hoped would revive the steelhead population, but also pursued a program of stocking Cachuma Reservoir with non-native warm-water species of game fish such as bass and crappie as well as trout (Los Angeles Times 1952c, 1953a). In 1952 they stocked rainbow trout in Salsipuedes Creek, but few apparently survived and biologists concluded that no natural reproduction was occurring (CDFG 1953). In 1957 the CDFG experimented with a fingerling stocking program in the lagoon to determine whether young fish could be reared there during times of low or no flow in the rest of the river, but this program was unsuccessful (Huddle 1957). Steelhead never disappeared entirely from the Santa Ynez, but by the late 1950s they were considered virtually extinct (Los Angeles Times 1953, 1958, 1962).

In a 1975 letter, written to the longtime southern steelhead enthusiast and independent researcher Edgar Henke, E. Charles Fullerton, Director of the California Department of Fish and Game, summarized his agency's sentiments when he wrote: "I think it is safe to say that if the Cachuma Project were being proposed today, consideration would be given to resources which in the past were either overlooked or considered insignificant. I also believe that the losses incurred on the Santa Ynez and the Ventura have served to alert us to how easily something very precious can be lost" (Fullerton 1975).

It would not be until the 1990s that local citizens, scientists, and public agency officials would begin to discuss the possibilities for recovery of the Santa Ynez River and its steelhead fishery (Pietro et al. 1993; Fusaro 1995; SWRCB 2003b, 2003c, 2012; NMFS 2012). That discussion continues to this day.

Acknowledgments

The authors thank Drs. Michael A. Glassow (Department of Anthropology, UCSB), Jan F. Timbrook and John R. Johnson (Santa Barbara Museum of Natural History), Kenneth W. Gobalet (Department of Biology, California State University, Bakersfield), and Loreen Lomax (USFS, Los Padres National Forest) for assistance with obtaining

information on Chumash culture and the use of steelhead by the Chumash. We also thank Kristina Gill and Amy Gusick (Central Coast Information Center, UCSB) for their assistance with locating archival archaeological information. We thank David Catania (California Academy of Sciences) and Krista Fahy (Santa Barbara Museum of Natural History) for museum records of *Oncorhynchus mykiss* (*Salmo gairdneri*) distributions in California. Gordon Becker (Center for Ecosystem Management and Restoration) offered helpful comments and resources. We also thank the staffs of the various archives and collections we visited for their enthusiasm, assistance, and expert guidance, especially Karen Paaske (Lompoc Historical Society) who located and provided a number of key documents. Laura Ryley (Pacific Marine Fisheries Commission), Richard Morse, Eric J. Chavez, and Charleen A. Gavette (National Marine Fisheries Service, Southwest Region) assisted in the preparation of the maps. Two anonymous reviewers provided helpful comments, as did Drs. Craig A. Fusaro (Joint Oil-Fisheries Liaison, South-Central California), David Jacobs (Department of Biology and Evolutionary Biology, UCLA), and Anthony Spina (National Marine Fisheries Service, Southwest Region). Dr. Camm C. Swift provided insightful suggestions as well as the results of his research in the early issues of the *Lompoc Record*. Finally, we thank Matthew Emery, our UCSB undergraduate assistant, who spent many weeks tracking down the documents that comprise many of the original sources used in this report. This study was supported, in part, by the National Marine Fisheries Service, Southwest Region, Protected Resources Division.

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Santa Barbara Mission Archive-Library, Santa Barbara, California

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Water Resources Center Archives, University of California, Berkeley (now at the University of California, Riverside)

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Appendix A

Cover (R) and back panel (L) of pamphlet produced around 1937, promoting steelhead angling along the lower Santa Ynez River. The inside panel (not shown) provided a map of the lower Santa Ynez River, identifying accessible fishing locations and public parks. Lompoc Historical Society.