

Steelhead Migration Barrier Inventory and Recovery Opportunities for the Santa Ynez River, Ca.



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1.0 Introduction and Project Information

1.1 Introduction

Only fifty years ago, thousands of adult steelhead (*Oncorhynchus mykiss*) made their annual spawning migrate up the Santa Ynez River. The number of adult steelhead returning to Southern California streams each year is now estimated to be less than 1% of the historical size. The National Marine Fisheries Service listed the Southern California steelhead Evolutionarily Significant Unit (ESU) as endangered in 1997 due to this dramatic decline. The endangered listing includes the steelhead population of the Santa Ynez River. The southern steelhead is currently identified as the most endangered steelhead ESU in California and many scientists believe it to be the most endangered steelhead ESU in all of North America. In the 1940's the Santa Ynez River was thought to have the largest run of steelhead south of San Francisco Bay. Prior to the completion of Cachuma Dam (1953), the steelhead run on the Santa Ynez River was estimated to be as high as 25,000 adults (Titus, et al 1994). This estimate was made decades after the completion of Gibraltar Dam (1920) blocked much of the upper watershed; the historic run size prior to any modifications on the river were likely higher.

The construction of migration barriers, intensive water extraction, and alteration of riparian and aquatic habitats has eliminated many steelhead populations in Southern California and has lead to the near extinction of the unique southern steelhead. Anthropogenic migration barriers on the Santa Ynez River prevent steelhead from accessing a majority of their habitat and has brought the steelhead run close to extinction. The upper Santa Ynez River watershed remains in a relatively natural and protected state within the Los Padres National Forest. High quality habitat also occurs on private land in the lower river and tributaries. Some habitat above complete barriers to steelhead continues to support a naturally reproducing rainbow trout population that may still retain ancestral ties to the native steelhead population. This rainbow trout population may be contributing to the persistent remnant anadromous steelhead population downstream of Bradbury Dam. Observations of *O. mykiss* that were made while surveying migration barriers are noted within the report.

This report provides information about the location of migration barriers and their impacts on steelhead and rainbow trout movement in the watershed. Upstream natural limits are identified or estimated on study streams to identify historic steelhead distribution. Individual barrier assessments within this report provide barrier locations, photographs, descriptions, fish passage diagnosis, and site-specific recommended actions. Large dams, road crossings, grade control structures, flood control channels, and water releases from dams are identified as the main migration barriers limiting steelhead within the watershed. Improving steelhead migration to available habitat and providing additional access upstream to former spawning and rearing habitat is essential to restoring a wild, self-sustainable steelhead population to the watershed. The successful restoration of wild steelhead to the Santa Ynez River could play a crucial role in delisting the southern steelhead and ensuring it's survival in the future.

1.2 Project Objectives

To identify and assess steelhead migration barriers on the Santa Ynez River and significant tributaries and to prepare and deliver a report to the California Department of Fish and Game and National Marine Fisheries.

1.3 Study Area

The study area consists of the Santa Ynez River and all major tributaries. The Santa Ynez River watershed occurs in central Santa Barbara County. The watershed is bound on the north by the Purisima Hills and San Rafael Mountains, on the east by the Ventura County boundary, and on the south by the Santa Ynez Mountains. The river drains this basin west to the Pacific Ocean at Vandenberg Air Force Base. The headwaters of the Santa Ynez River and many of its upper tributaries are protected within the Los Padres National Forest and San Rafael and Dick Smith Wilderness Areas.

1.4 Project Funding and Management

Funding for this project was made possible by the Pacific States Marine Fisheries Commission in coordination with the California Department of Fish and Game (DFG), National Marine Fisheries Service (NMFS), and California Coastal Salmon Recovery Program (CCSRP). Mary Larson acted as Project Manager for the Department of Fish and Game. Grant agreement number P0210556 awarded a total estimated budget of \$34,231.00 to the Community Environmental Council (CEC) to complete this project. Former and present Watershed Restoration Program Managers with the Community Environmental Council, Bob Thiel and Jill Komoto, acted as administrative coordinators for the project. Stoecker Ecological Consulting was retained to conduct project surveying and report writing. Fieldwork was conducted from October 16 to December 16, 2003 and the final draft was sent out for review January 9, 2004. Coordination with Mark Capelli and David Boughton of NMFS occurred for barrier document research, genetic sampling fieldwork, and report review.

1.5 Report Expansion

The original study proposal called only for data compilation of barriers into a basic Excel table with an accompanying map and barrier photographs on CD. However, reduced aerial surveying needs allowed for the extension of ground surveying efforts, particularly above Bradbury Dam, and the preparation of a more detailed report with supporting photographs, documentation, and maps.

1.6 Surveying Access

A large amount of the upper Santa Ynez River watershed occurs within the Los Padres National Forest where access to survey stream reaches was limited only in their remoteness and available time. Extended surveying expeditions into the Forest were

conducted from October to December of 2003. An administration pass was provided by the Los Padres National Forest for extended parking and access within the Forest. A significant amount of stream mileage on the lower Santa Ynez River and tributaries downstream of Cachuma Reservoir exists on privately owned land. Limitations on the project budget and timeline prevented the ability to identify, contact, and request written permission from the many hundreds of landowners to survey private stream reaches, particularly below Bradbury Dam. Private lands were not surveyed on the ground or from the air, limiting survey coverage on private land. Aerial surveying was conducted on public lands that were not ground surveyed due to time limitations. Limited barrier identification on private land was possible from adjacent public lands and roadways.

2.0 Steelhead Presence and Observation Results

2.1 Steelhead Discussion

Despite the substantial reduction of the Santa Ynez River steelhead population, this river system supports one of the few populations left in Southern California. Accessible downstream habitat (particularly tributaries) continues to support adult steelhead returning to spawn and juvenile rearing. The upper watershed continues to contain *O. mykiss* upstream of impassable barriers. This population is composed of both native strains and introduced strains from other southern ESU streams and sources outside the region. Observations of adult steelhead in the lower river occur on a fairly regular basis where the Cachuma Operation and Maintenance Board (COMB) conducts winter trapping surveys (pers. comm. Engblom). Natural reproduction of *O. mykiss* has continuously existed through the historical records within the watershed. The surveying effort of this study observed, naturally reproducing populations of *O. mykiss* in several mainstem locations and tributaries. The presence of *O. mykiss* was noted while surveying stream reaches and migration barriers. All observations were made from the stream banks or underwater with mask and snorkel.

2.2 Genetic Sampling and Population Survey Results- National Marine Fisheries Service

The National Marine Fisheries Services' Southwest Fisheries Science Center in Santa Cruz coordinated with project researchers to conduct genetic sampling and *O. mykiss* population surveys within the Santa Ynez River. The Salmonid Population Analysis Team (SPAT) electroshocked several stream reaches to collect tissue samples and identify the presence of *O. mykiss* above and below migration barriers. A draft table of the surveying results is summarized below. During October and November, collection of 127 tissue samples from individual *O. mykiss* were conducted at 6 different stream locations. The following streams were surveyed. The number following the stream reach indicates the total number of *O. mykiss* and tissue samples collected.

Devil's Canyon Creek- 3

Santa Cruz Creek- 26

Indian Creek- 2

Santa Ynez River (Between Gibraltar and Juncal Dams)- 2

North Fork Juncal Creek- 85

Santa Ynez River (Above Jameson Reservoir)- 9

The above tissue samples are currently being analyzed at the National Marine Fisheries Service Southwest Fisheries Science Center in Santa Cruz. Testing results and information about the genetic composition of these sampled fish is expected to be available near the end of 2004.

2.3 Observations of *Oncorhynchus mykiss* Table

The following table shows all *O. mykiss* observations made by project researchers while conducting the barrier surveys. Observations of *O. mykiss* were made from within the stream channel or banks while moving fairly quickly upstream in search of potential migration barriers. Occasional snorkel surveys were conducted where adequate water depth and quality occurred. *O. mykiss* were not observed in stream reaches that are not mentioned in the table and were surveyed for barriers (see Barrier Maps). See individual barrier write-ups for more information on stream reaches that were ground surveyed and those where private land or time restrictions prevented observation. A significant number of streams could not be ground surveyed and additional stream reaches within the watershed, but potentially support *O. mykiss*.

Santa Ynez River *O. mykiss* Observations During Oct-Dec 2004 Migration Barrier Surveying.

Stream(s)	Location	# of <i>O. mykiss</i> Observed	Fish Size- Total Length in Inches	Date of Observation (MO-DY-YR)	Observer(s)	Observation / Documentation Notes
Santa Ynez River	Pool immediately upstream of the crossing east of Live Oak Day Use Area	3	10"	11-11-03	Shaw Allen	Three <i>O. mykiss</i> were observed in this pool feeding actively on the surface.
Santa Ynez River	Upstream from crossing (SY_15) at Juncal Camp to 750 feet upstream	12	5-7"	11-6-03	Matt Stoecker and Shaw Allen	Large pool habitat occurs upstream of the Juncal Camp crossing for over 800 feet and appears to be year-round and spring-fed with Fox Creek inflows.
Salsipuedes Creek	Pool downstream of Jalama Road Bridge at Highway 101	3	6-9"	11-19-03	Shaw Allen	<i>O. mykiss</i> measuring approximately 6, 8, and 9 inches were observed in this large pool.
Cachuma Creek	LPNF boundary upstream to Lion Canyon Creek	8	7-11"	11-12-03	Shaw Allen	These <i>O. mykiss</i> were spread out in several pools with good rearing habitat and flows.
Lion Canyon Creek	First pool upstream from Cachuma Creek	1	8"	11-12-03	Shaw Allen	Only trout observed in Lion Canyon Creek up to natural limit.
Santa Cruz Creek	LPNF boundary upstream to the East and West Fork Santa Cruz Creek confluence	100's	3-13"	12-1-03	Matt Stoecker and Shaw Allen	Arguably the highest quality salmonid habitat observed in the entire watershed. The largest and deepest pool habitat in the watershed was observed in this reach with pools up to 12 feet deep and over 200 feet long. Abundant <i>O. mykiss</i> population with diverse age classes and natural reproduction.
Little Pine Spring Creek	400 feet upstream of Santa Cruz Creek	1	8"	12-1-03	Matt Stoecker and Shaw Allen	Only one observed trout in this tiny creek that had good pool habitat and perennial flow.
West Fork Santa Cruz Creek	East Fork Santa Cruz Creek confluence upstream to natural limit (SY_SC_WF_1)	92	4-13"	12-4-03	Matt Stoecker and Shaw Allen	Large bedrock pools upstream of the East Fork transform into large boulder pool-riffle habitat with high quality spawning and rearing habitat and a moderately-high density of <i>O. mykiss</i> .

Coche Creek	Upstream of first northern tributary to upstream limit	80	2-13"	12-5-03	Matt Stoecker and Shaw Allen	Excellent habitat and abundant <i>O. mykiss</i> population with diverse age classes and high numbers of young-of-year (YOY).
Bear Creek	Upstream from Highway 154	2	5-8"	11-21-03	Shaw Allen	Observed in good spawning and rearing habitat, pools, and perennial flow.
Indian Creek	1.0 mile upstream from weir barrier (SY_MO_IN_4) to upstream waterfall barrier (SY_MO_IN_5)	100+	3-13"	10-18/19/20-03	Matt Stoecker and Shaw Allen	Drier habitat transforms into excellent, deep-pool habitat and an abundant <i>O. mykiss</i> population further upstream.
Buckhorn Creek	Lower Buckhorn Campsite upstream to 0.2 mile downstream of second upstream northern tributary	100+	2-11"	10-21-03	Matt Stoecker and Shaw Allen	Isolated pools without flow in the lower reach turn into excellent perennial pool habitat with abundant <i>O. mykiss</i> and natural reproduction.
Blue Creek	500 feet downstream of Escondido Creek	2	2-12"	12-12-03	Matt Stoecker and Shaw Allen	High quality habitat and perennial stream flow occur in this reach.
Escondido Creek	500 feet upstream of Blue Creek	1	4"	12-12-03	Matt Stoecker and Shaw Allen	High quality habitat and perennial flow occurs from Blue Creek to the upstream waterfall limit.
Fox Creek	Upstream of Santa Ynez River to diversion dam (SY_FX_2)	4	4-7"	11-6-03	Matt Stoecker and Shaw Allen	Excellent habitat and small <i>O. mykiss</i> population. No trout were observed upstream of the diversion dam.
Alder Creek	Upstream of Morse Creek to 700 feet upstream of diversion dam (SY_AR_3)	16	2-6"	11-6-03	Matt Stoecker and Shaw Allen	Excellent habitat upstream of Morse Creek and young-of-year. (9 and 11 inch <i>O. mykiss</i> observed spawning in this tributary in 1999. Stoecker and Allen)
North Fork Juncal Creek	Approximately 0.2 mile upstream from Jameson Res. To upstream waterfall barrier (SY_JL_NF_1)	17	4-9"	11-5-03	Matt Stoecker, Shaw Allen, NMFS (SPAT team)	<i>O. mykiss</i> were observed from topside while quickly surveying up to waterfall. NMFS team electroshocked many <i>O. mykiss</i> (see NMFS survey results). No trout observed upstream of waterfall for approximately 500 feet to tributary confluence.
Steelhead Creek	Upstream of road crossing at Santa Ynez Campsite (SY_SD_1) to natural upstream limit (SY_SD_2)	10	2-5"	12-11-03	Matt Stoecker and Shaw Allen	High quality habitat and perennial stream flow provide spawning and rearing habitat in this reach.

3.0 Migration Barrier Discussion and Results-

3.1 Migration Barrier Impacts on Steelhead

Rainbow trout and steelhead are highly migratory within their watershed; inhabiting different stream reaches as aquatic habitat conditions change throughout the season and from year to year. See Appendix A for more information regarding the ecology and life history behavior of steelhead. Steelhead utilize most accessible stream reaches within a watershed from the headwaters to the estuary for migration, spawning, and rearing habitat and acclimation in moving between marine and freshwater habitat. Barriers to migration between these reaches cause the fragmentation and loss of access to such steelhead habitat and may completely eliminate adult steelhead from accessing a critical stream reaches necessary to reproduce. Types of barriers include dams, culverts, diversions, flood control channels, flow releases, water quality, and natural features such as waterfalls. The presence of multiple partial barriers occurring on a stream reach can have a cumulative adverse impact on upstream migration due to the delays caused at each barrier.

Fragmentation of habitat reduces the amount of total available habitat and increases genetic isolation. The reduction of available habitat correlates directly to the reduction in population size of the species that uses that habitat. The lower mainstem of most streams is utilized as a migration corridor between the critical spawning and rearing habitat found in the headwaters and the ocean. The majority of the steelhead's freshwater life is typically spent in the upper reaches of a stream or tributary where suitable habitat exists for spawning and rearing. Maintenance of access to these habitats is therefore critical to the completion of the life-cycle of steelhead, and the perpetuation of anadromous runs.

3.2 Steelhead Migration Capabilities and Limitations

Steelhead have physiological limitations that impede or prevent them from being able to migrate past certain natural and anthropogenic features and hydraulic conditions. It has been reported that 7 inches is the minimum water depth required for successful migration of adult steelhead (Thompson 1972, as cited in McEwan 2001), though the depth may vary with the size of fish and the nature of the substrate over which fish migrate. The distance fish must travel through shallow water areas is also critical. Water depth can be a significant barrier in streams that have been altered for flood control purposes (McEwan 2001). The CDFG Habitat Restoration Manual reports that an adult steelhead can maintain a maximum swim speed of 6.0 feet per second for 30 minutes until exhaustion and can exhibit a maximum burst speed of 10.0 feet per second for 5 seconds until exhaustion. The maximum jump speed is listed as 12 feet per second. Jumping upstream of a structure is reported to become extremely difficult or impossible when the jump pool depth becomes less than 1.25 times the jump height of the structure (measured from the pool surface to the top of the feature). For example, a barrier that has a vertical jump height of 4 feet above the surface of the downstream pool and has a jump pool depth of 5 feet, will be near the maximum jumping capability of an adult steelhead. Should the pool become shallower, the jump depth would decrease and the jump height would increase, likely resulting in an impassable structure.

3.3 Barrier Identification and Locations

The principle objective of this project was to identify migration barriers to steelhead throughout their historic Santa Ynez River range. In addition to anthropogenic barriers, natural upstream limits to migration were identified in order to determine the historic distribution and quantity of habitat available to steelhead. The term “barrier” in this report refers to any structure in the stream channel that impedes, with varying degrees of difficulty, or completely blocks upstream adult steelhead migration. Field surveys were conducted in an upstream manner and all barriers were given a unique Barrier ID. This unique Barrier ID describes, in code, the stream location of the barrier and order in which it is encountered moving upstream on the Santa Ynez River and tributaries. The Barrier ID is coded so that the stream location can be determined by the stream codes within the ID. When study streams were unnamed on the USGS 7.5 minute quad maps, a name was given based on nearby features and/or observed characteristics. These named creeks are listed “unnamed on USGS” following the name. Stream names were needed to give each barrier a unique, name based ID. For example, SY_1 is the first migration barrier identified on the Santa Ynez River (SY). Barrier SY_SS_EJ_1 is the first upstream barrier identified on El Jaro Creek (EJ), a tributary of Salspuedes Creek (SS), which is a tributary to the Santa Ynez River.

The location of many of these barriers was recorded in the field using a Global Positioning System (GPS). A GPS signal could not be acquired at certain locations due to signal interference with dense riparian canopy cover, confined canyon walls, or overcast conditions. Where private land was not accessible, barriers were identified from adjacent private lands and roadway, through document research, and interviews. Upstream natural limits on private land or inaccessible reaches were estimated by locating a 10% to 15% sustained stream slope using DFG barrier estimation methods. Stream slope identification was made by analyzing elevation line intersections with blue-line streams on USGS topographical maps. For barrier locations that were not identified with the GPS, description of their physical location is given by approximate elevations or distances from known and recognizable points. GPS coordinates acquired in the field are listed on one comprehensive barrier assessment. All estimated natural limits are identified on one comprehensive barrier assessment within this report following other barrier assessments.

3.4 Barrier Ownership/Interest

Any entity that was identified as having legal interest in a certain barrier was identified. In some cases, multiple owners and interests are associated with an identified barrier, adjacent land, or easements and maintenance agreements.

3.5 Barrier Status

For this project, previously developed barrier status values were used, as defined in the Pacific States Marine Fisheries Commission Fish Passage Assessment Database. Barriers were given a status of Complete, Partial, Not a Barrier, or Unknown. The status was determined by measuring essential characteristics of both the structure and the adjacent stream configuration. An evaluation of steelhead migration capabilities along potential upstream migration routes past the structure was made based on these

measurements and projected migration flows. Salmonid migration limitations are described and discussed in the diagnosis section of each migration barrier assessment.

Complete Barrier

Structures that exceed the upstream migration capabilities of steelhead were given a barrier status of complete.

Partial Barrier

Structures that would limit upstream migration to some degree, during various flows, were given this status. Due to the limited snapshot observation of barriers, high severity barriers that may be “complete” barriers were given partial status if conditions could not be accurately estimated during migration flows or only limited surveying access occurred. The cumulative impact of multiple partial barriers with variable flow passage windows can prevent upstream passage on that stream.

Not a barrier

These structures were observed to present no significant impediment to steelhead and/or smaller rainbow trout in their current state. Stream conditions change and these structures may become impediments to fish passage in the future.

Unknown

Limited information about these structures was obtained and additional assessment is needed to determine impacts to fish passage.

3.6 Barrier Diagnosis-

Measurements of barrier and stream channel characteristics change over time due to the dynamic nature of streams. Each barrier was identified and briefly observed at a snapshot in time during the lowest base flow, or during dry conditions. Additional measurements during moderate to high stream flow conditions can provide additional insight for assessing barrier severity and appropriate recommended actions.

3.7 Recommended Actions Discussion and Limitations

Recommended actions were made using DFG and NMFS “Preferred Treatment Options” for road crossings. The listed recommended actions provide the most effective fish passage for all salmonid life stages and also provide the best option for stream and sediment conveyance, transportation safety, and stream health. Most complex restoration actions will need additional surveying by qualified professionals in fields such as, hydrology, geomorphology and structural engineering. Additional habitat assessment upstream of certain barriers may be needed to determine if adequate salmonid habitat occurs and fish passage improvement is warranted. Many recommended actions listed in the report may not be warranted until downstream fish passage has been provided.

3.8 Preferred DFG and NMFS Treatment Options for Migration Barriers

Recommended actions for fish passage improvement projects at migration barriers were formulated on a site-specific basis using “Preferred Treatment Options for Unimpeded Fish Passage” identified in the California Department of Fish and Game *California Salmonid Stream Habitat Restoration Manual* and the National Marine Fisheries Service *Guidelines for Salmonid Passage at Stream Crossings*. While both of these guidelines focus on road crossings, the preference for eliminating “encroachment into the 100-year flood plain” can be applied to other structures within the stream channel that are impeding steelhead migration. The following top recommendations for fish passage improvements at stream crossings are from the NMFS guidelines (Final Draft: March 22, 2000) and are listed in order of preference.

- 1) Bridge- with no encroachment into the channels 100-year flood plain.
- 2) Streambed alteration strategies- bottomless arch culvert, embedded culvert, or ford.

The California Department of Fish and Game guidelines also states that:

- 1) Entry jumps (into a culvert or onto a structure) should never exceed 1.0 foot for upstream adult steelhead passage.

Recommended actions for fish passage improvement projects were formulated to ensure effective passage over a wide range of flows and to be sustainable over the long term, with minimal maintenance. NMFS and CDFG guidelines also state that upstream juvenile steelhead and rainbow trout passage must be included in fish passage improvement projects; recommended actions for barriers in this report are consistent with these guidelines.

3.9 Replacing Road Crossings Barriers with Bridges

Replacing road crossing barriers with bridges meets all CDFG and NMFS objectives for fish passage while allowing unimpeded migration during the widest range of stream flows for all salmonid life stages. There are many potential advantages to removing the in-stream crossings and replacing them with a bridge including:

- Unimpeded migration for steelhead and other aquatic species
- Restored streambed and aquatic habitat
- Improved wildlife and riparian connectivity
- Improved traffic safety and flood conveyance capacity
- Last longer and require less maintenance
- Can be more cost effective over time
- Esthetically compatible with setting
- Elimination of public hazards (swimming and recreation)
- Improvement of a private landowners property value

3.10 Avoiding Ineffective Fish Passage Projects

The modification of existing road crossing barriers with baffles, fishways, or other artificial intrusions into the stream environment should be avoided where possible for the following reasons:

Ineffectiveness

The effectiveness of baffles and fishways is limited to a narrow window of tolerable stream flows and is highly dependant on continual human maintenance and clearing of debris. With the flashy stream flows encountered in Southern California streams, steelhead have a short window of opportunity to migrate upstream to adequate spawning and rearing habitat. Streams within the study area do not have the consistent flows needed to provide adequate fish passage over a long duration of time. Even the most ideal modification design will continue to impose some degree of difficulty to upstream passage and delay or prevent upstream migration. Delays at one or more barriers may prevent passage at upstream barriers that are only passable during high flows.

Safety and Structural Integrity

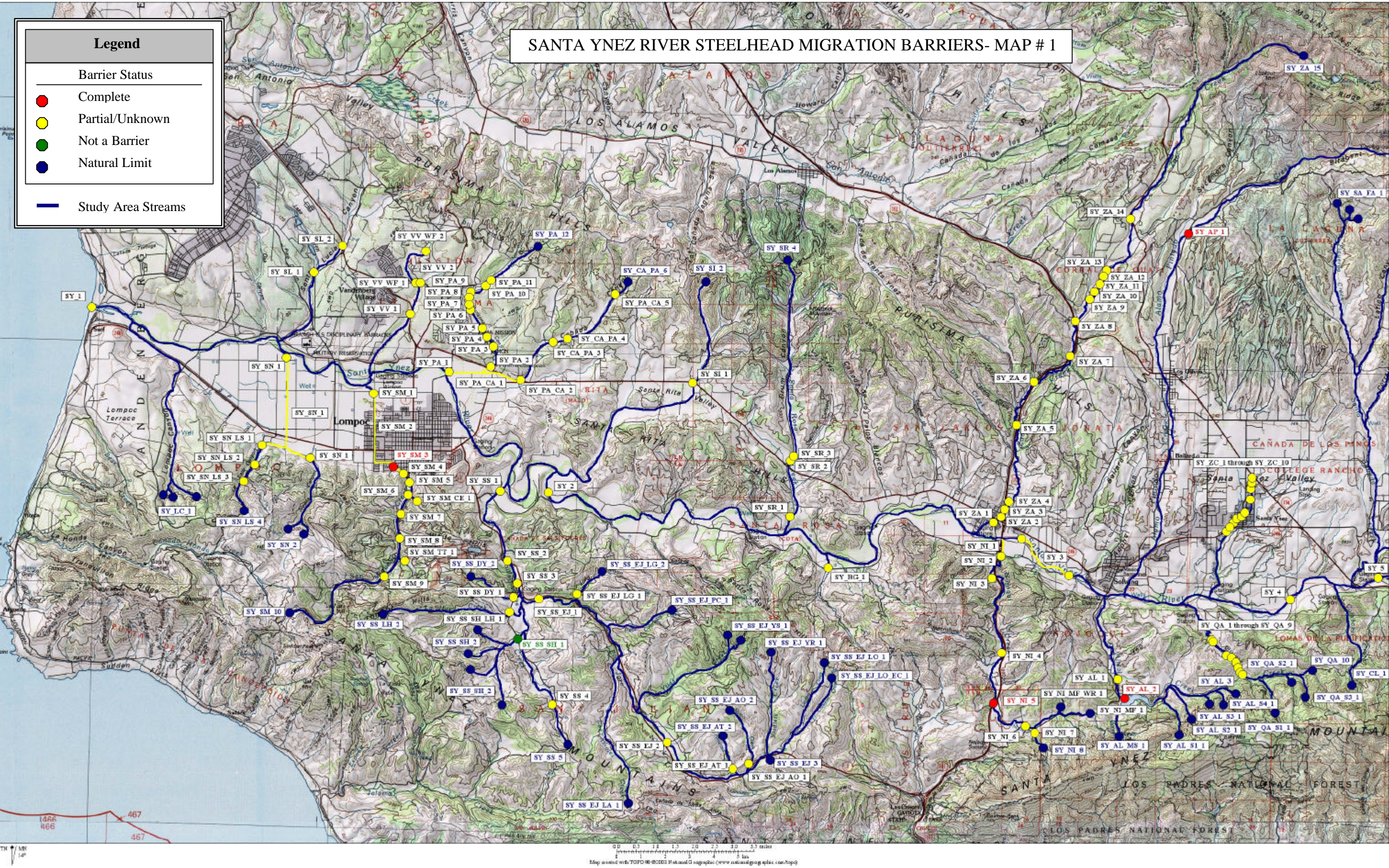
Installing fish passage measures inside of a culvert causes damage to the culvert and can reduce its life and increase safety hazards. Fishways, baffles, and weirs can reduce the flow capacity of a stream channel or culvert and increase the likelihood of debris blockage that could cause failure of the crossing.

Ongoing Maintenance and Cost

In order to be effective, baffles and artificial fishways require continual maintenance, monitoring during the migration season, and can require substantial replacement costs. Fishways experience similar failures and also require constant maintenance and debris removal to be effective. During high stream flows, baffles or other internal culvert modification are prone to blowing out. This failure prevents upstream steelhead passage during the migration season and causes structural damage to the culvert. Baffles can often only be replaced after the steelhead migration season has ended, when flows have subsided and maintenance crews can reinstall them.

3.11 Barrier Results

3.11.1 Barrier Maps



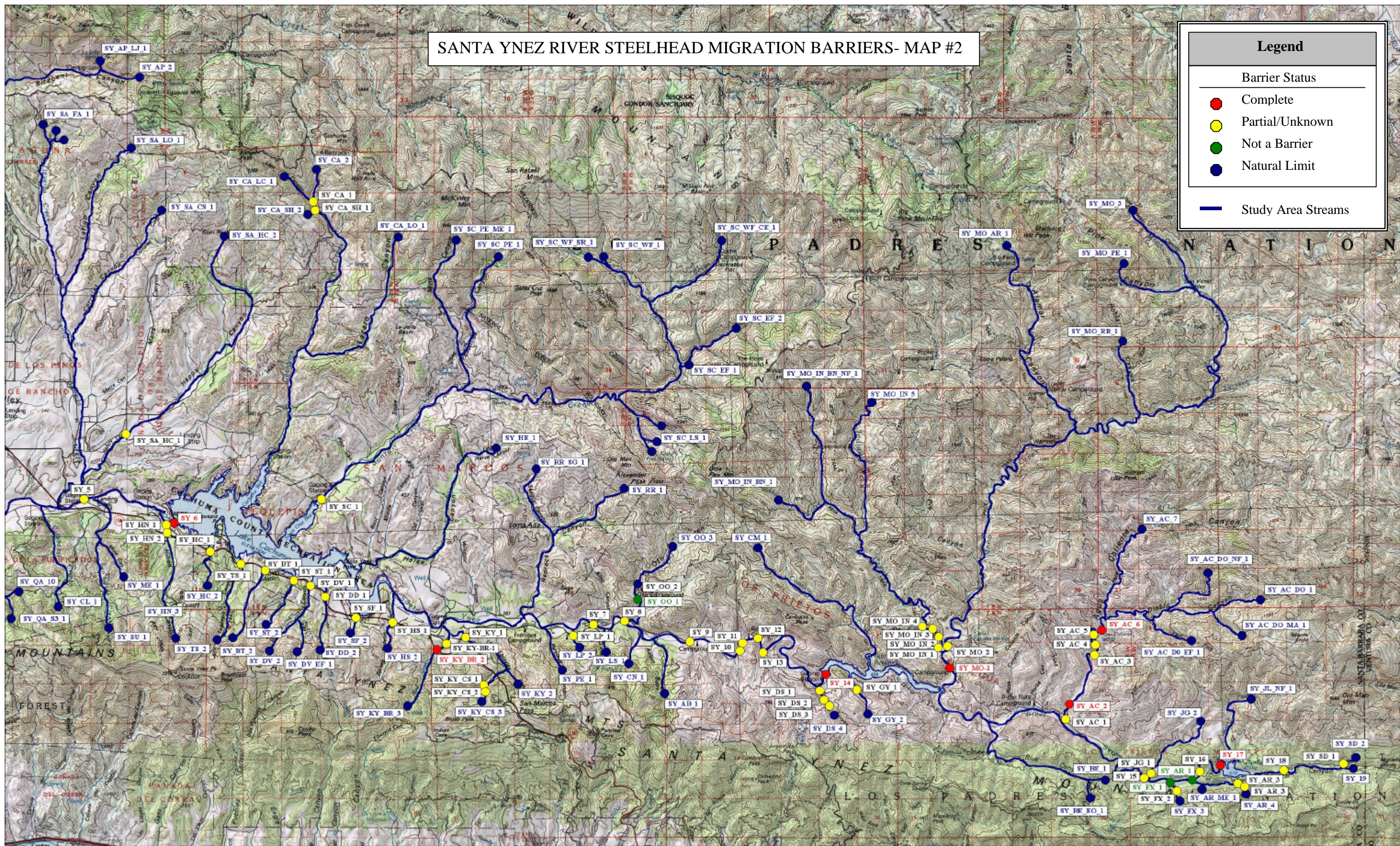
SANTA YNEZ RIVER STEELHEAD MIGRATION BARRIERS- MAP #2

Legend

Barrier Status

- Complete
- Partial/Unknown
- Not a Barrier
- Natural Limit

Study Area Streams



TH 147

0 0.5 1.0 1.5 2.0 2.5 3.0 miles
0 0.5 1.0 1.5 2.0 2.5 3.0 km
Map created with TOPO 98 ©2023 if used G. S. Graphics (www.gisandgraphics.com/topo)

3.11.2 Barrier Assessments

Barrier ID: SY_1

Stream: Santa Ynez River

Barrier Type: Sandbar and Bradbury Dam water releases.

Physical Location: Mouth of Santa Ynez River at beach

GPS Location: N/A

Ownership/Interest: Vandenberg Air Force Base/COMB

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Partial



Description: For most (or all) of a given year, a sandbar occurs at the mouth of the Santa Ynez River preventing salmonid migration to and from the ocean. This sandbar creates important estuarine habitat for a variety of species, including various life stages of steelhead trout. The configuration and location of the sandbar change from year to year depending on river flows, dam releases, and ocean processes. The permeable sandbar allows both fresh and saline water to move between the estuary and ocean, but typically the absence of surface flows across the sandbar prevents steelhead from migrating across the sandbar. During high stream flows and/or favorable ocean and tidal activity, the sandbar will be breached, creating a channel of surface water through the sandbar that allows steelhead migration between the river and sea. Sandbars typically breach following sizable early-winter rain events that produce sizable stream flows, sometimes in conjunction with large surf and high tides.

Diagnosis: While sandbar formation and occurrence in Southern California streams is a natural process, anthropogenic factors impact the sandbars' breaching frequency and duration. In particular, the amount and duration of water releases from upstream dams and groundwater pumping dramatically impact the sandbar and affect steelhead migration to and from the Santa Ynez River. In particular, large early-winter stream flow events are likely reduced at the mouth due to the timing of water storage at Bradbury Dam/Cachuma

Reservoir and reduced downstream water releases. This water storage limits the duration and magnitude of downstream peak flows and reduces the likelihood that the sandbar will be breached. Water supply reservoirs typically retain most/all of early winter flows to recharge the reservoir and then gradually release or divert water following the rainy season. Gradual downstream water releases in the summer and fall are usually not sufficient to breach the sandbar. The effect this type of operation has on sandbar breaching and steelhead migration can be dramatic.

Recommended Action: Adequate fish passage at the sandbar is essential to all steelhead recovery efforts on the Santa Ynez River and significant for southern steelhead recovery as a whole. Understanding the complex interplay between stream flow, dam releases, oceanic processes, and sandbar breaching is beyond the scope of this project and needs to be further studied to identify the most optimal management options. One alternative that should be further studied is the establishment of a water release schedule from Bradbury Dam that provides the optimal amount and duration of stream flow for sandbar breaching and stream connectivity to available tributaries. Utilizing rain and tributary gage information it should be possible to develop operational protocols for optimal water release amounts and timing. It is likely that along with the established (and adaptively managed) water release schedule an early peak-flow release may be needed to initially break the sandbar preceding “steelhead migration flow releases”. It is critical that flow releases provide adequate water depth and connectivity to the base of Bradbury Dam and the furthest accessible upstream tributaries in conjunction with sandbar breaching. Downstream migrating smolts also require stream connectivity to the ocean across the sandbar during their late winter to early summer downstream migration.

Unnatural mechanical breaching of the sandbar is not recommended as a viable option for several reasons. Human breaching of the sandbar may negatively impact estuarine habitat conditions for steelhead and other dependant species. The sandbar should be breached by stream flows only so that upstream migrating adults are ensured to have adequate stream depth and connectivity to upper tributaries and are not stranded in unfavorable conditions. Following sandbar breaching, adequate flows need to be maintained for several days/weeks in order to maintain connectivity to upstream tributaries.

Barrier ID: SY_2

Stream: Santa Ynez River

Barrier Type: Earthen culvert crossing

Physical Location: Approximately 3.5 miles upstream from Salsipuedes Creek

GPS Location: N/A

Ownership/Interest: Private

Barrier Status: Partial

Description: Permission to access this structure was not obtained and limited observation occurred from Santa Rosa Road. This road crossing appears to be an earthen fill crossing with one or more culvert pipes passing low-flows under/through it. The characteristics of this crossing could not be determined.

Diagnosis: Additional detail about this structure is needed to assess fish passage severity. This crossing may blow out during high river flows allowing successful fish migration. Although, during dry years, or years without significant water releases from Cachuma Dam, in which the water flow is minimal, this structure will likely remain intact, impeding or completely preventing fish passage. Structural support measures may leave this crossing intact during drier years or years without significant releases from Cachuma Dam.

Recommended Action: Seek landowner permission to survey the crossing to determine both the impacts on fish passage and how temporary/permanent the crossing is. If the crossing significantly impedes salmonid migration, fish passage improvement options should be discussed with the owner. Alternative vehicle routes may provide adequate access from the other side of the river and eliminate the need for this crossing. Considering the condition of the Santa Ynez River steelhead population, any mainstem structure that limits steelhead passage should be eliminated to ensure unimpeded migration.

Barrier ID: SY_3

Stream: Santa Ynez River

Barrier Type: Channelization/Gravel Operation/Road Crossing

Physical Location: Downstream from Solvang for approximately 1.25 miles

GPS Location: N/A

Ownership/Interest: Unknown

Surveyor(s) and Date: Matt Stoecker 11/03

Barrier Status: Unknown

Description: Permission to ground survey this extensive channelization was not obtained and limited observations were made from public roads west of Solvang. Heavy equipment was observed moving large amounts of substrate in the river channel. It appears that extensive gravel extraction is taking place. A long and constricted channelized reach that straightens and confines the Santa Ynez River has been created to allow expansion of development/gravel extraction into the river's flood plain. Due to serious manipulation of this river reach, the stream course has been significantly altered. Downstream of the gravel extraction a private road crossing has been constructed using gravel fill and a large culvert. This crossing was observed by NMFS warden and the owner has been instructed to remove this none permitted structure (pers. comm. Capelli). The crossing is shown below.



Diagnosis: The full extent of channelization could not be observed from public roads and fish passage severity could not be adequately determined. It is likely that significant modifications, check dams, and equipment crossings are impeding or preventing fish passage in this reach. The river's aquatic habitat and riparian vegetation has been significantly altered in this reach. Reportedly, the crossing is currently being removed.

Recommended Action: This channelization/gravel extraction project needs to be assessed by the authorizing agencies and checked for potential fish migration barriers and habitat degradation. In addition, the long-term objectives/operations need to be assessed to determine the impacts to the overall stream channel, impacts to surface flows and migratory connectivity, reduction of the river floodplain and carrying capacity, and associated impacts to aquatic resources. Ensure adequate removal of the crossing.

Barrier ID: SY_4

Stream: Santa Ynez River

Barrier Type: Earthen culvert crossing

Physical Location: Approximately 1.5 miles downstream from Highway 154 crossing

GPS Location: N/A

Ownership/Interest: Private

Barrier Status: Unknown

Description: Permission to access this structure was not obtained, but an earthen crossing with several culvert pipes is reported to cross the river at this private crossing. The crossing location can be seen on the USGS 7.5 minute quad map.

Diagnosis: Additional detail about this structure is needed to assess fish passage severity. This crossing may blow out during high river flows allowing successful fish migration. Although, during dry years, or years without significant water releases from Cachuma Dam, in which the water flow is minimal, this structure will likely remain intact, impeding or completely preventing fish passage.

Recommended Action: Seek landowner permission to survey the crossing to determine its impacts on fish passage. If the crossing significantly impedes salmonid migration, fish passage improvement options should be discussed with the owner. Alternative vehicle routes may provide adequate access from the other side of the river and eliminate the need for this crossing. Considering the condition of the Santa Ynez River steelhead population, any mainstem structure that limits steelhead passage should be eliminated to ensure unimpeded mainstem migration.

Barrier ID: SY_5

Stream: Santa Ynez River

Barrier Type: Utility crossing(s)

Physical Location: Approximately 0.5 mile upstream from Highway 154 bridge

GPS Location: N/A

Ownership/Interest: Unknown

Surveyor(s) and Date: Matt Stoecker 12/17/03

Barrier Status: Unknown

Description: Permission to ground survey this structure was not obtained and limited observations were made from Highway 154. A concrete encased utility pipeline occurs at this location and crosses the mainstem of the Santa Ynez River. The crossing is partially buried in substrate, but the upper half crosses the stream and may impede salmonid migration during certain stream flows. The structure appears to follow the river channel and likely crosses the stream again upstream and/or downstream. Scott Engblom (COMB) reported that this pipeline is most likely part of the abandoned chlorination plant that used to be located below Bradbury Dam. The pipeline may be currently used to convey State Water to Cachuma Reservoir (pers. comm. Engblom).

Diagnosis: The extent of the utility crossing upstream and downstream is unknown. Additional detail about this structure is needed to assess fish passage severity. The utility crossing may impede/prevent fish passage during certain flows and is likely a safety/utility hazard being exposed in the active stream channel.

Recommended Action: Seek landowner permission to survey the utility crossing(s) and determine impacts on fish passage. If the crossing(s) significantly impede salmonid migration, fish passage improvement options should be discussed with the owner/operator. It is likely that this utility crossing needs to be removed from the stream channel and rerouted across the river aerially or in association with the Highway 154 Bridge downstream regardless of it's impact on fish passage. See barrier write-up SY_AR_1 for an example of a pipeline barrier that was replaced with an aerial pipeline crossing.

Barrier ID: SY_6

Stream: Santa Ynez River

Barrier Type: Earth and Rock Fill Dam (Bradbury Dam)

Physical Location: Upstream from Hilton Creek

GPS Location: N/A

Ownership/Interest: U.S. Bureau of Reclamation/COMB

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/03

Barrier Status: Complete



Description: Information about this dam was obtained from the Santa Barbara County Public Works Department- Water Resources Division and U.S. Bureau of Reclamation websites. Bradbury Dam was built between 1950 and 1953 at a cost of \$6,722,520 and is owned by the U.S. Bureau of Reclamation. The dam is constructed of earth and rock and has a concrete spillway. The dam's watershed is reportedly 421 square miles. The structural height is listed as 279 feet (and an effective hydraulic height of 160 feet) with a crest length of 3350 feet. The dam is composed of 6,695,273 cubic yards of material. The reservoir capacity in 1956 is listed as 205,000 acre-feet. Sediment deposition has reduced the capacity to less than 190,400 acre-feet (1989 estimate). Using these numbers, the reservoir accumulates approximately 442.4 acre-feet of sediment per year, effectively reducing the water storage capacity by the same amount. In 1997, the 42-mile Santa Ynez Extension of the State Water Project's Coastal Branch brought state water to Cachuma Reservoir thus tapping the watershed into one of the world's most complex water diversion networks.

Diagnosis: This dam is the primary factor for the near elimination of the Santa Ynez River steelhead run. It was not constructed with any fish passage facilities; consequently, it is a physical barrier to upstream migration. Additionally, regulated water releases and storage operations affect stream connectivity and steelhead migration within the lower river. Access to and from the ocean across the sandbar at the mouth of the river is also highly influenced by dam releases and is further discussed as a stream flow connectivity barrier in write-up SY_ 1.

Recommended Action: Most of the high quality salmonid habitat within the Santa Ynez River watershed is located upstream of Bradbury Dam. (See Appendix B “Santa Ynez River Watershed Potential Steelhead Spawning and Rearing Habitat” map, National Marine Fisheries Service.) The recovery of the Santa Ynez River steelhead is dependant on providing access to more high quality spawning and rearing habitat. Providing steelhead access to and from the tributaries found upstream of Bradbury Dam would provide access to a large amount of high quality habitat, including the highly productive Santa Cruz Creek drainage. Perhaps the most effective Santa Ynez steelhead restoration measure requiring investigation is steelhead passage upstream of Bradbury Dam to reconnect the ocean and upstream habitat.

A comprehensive study of fish passage at Bradbury Dam should include an investigation of a full range of alternative means of providing adult steelhead fish passage to spawning and rearing habitat above Bradbury Dam, as well as effective downstream passage of rearing juvenile steelhead downstream to the ocean. Restoration, to the maximum extent feasible, of the natural pattern of migration and emigrations of fish between the ocean and upstream spawning and rearing habitat. Additionally, screening of diversions through the Tecolote Tunnel and other water intakes should be investigated in conjunction with the fish passage investigation. A critical component of any fish passage discussion for Bradbury Dam is identifying the long-term objectives for the regions water storage and usage over the next 25-50 years and beyond. Therefore the long-term operation of Bradbury Dam should be considered in conjunction with other major impoundments in the Santa Ynez River (Gibraltar and Juncal Dam). A comprehensive study is needed to determine the feasibility of the many alternatives possible for returning steelhead upstream of Bradbury Dam.

Barrier ID: SY_7

Stream: Santa Ynez River

Barrier Type: Low -flow road crossing

Physical Location: Road crossing to Sage Hill Group Camp

GPS Location: N 34° 32' 43.5" W 119° 47' 25.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ LPNF

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial



Description: This low-flow road crossing measured 170 feet across the channel and 15 feet wide. A moderately steep apron composed of boulders and concrete extends downstream 10 feet. The vertical height from the natural downstream channel bottom to the downstream lip of the road surface measured 3 feet.

Diagnosis: When adequate water depth occurs during moderate and high flows, adult salmonids can jump/swim onto the road surface with a moderate to high degree of difficulty. Due to a lack of roughness, excessive water velocities over the smooth concrete crossing may impede/block upstream migration during higher flows. During these flow conditions, water also becomes turbulent down the sloping apron and may impede or prevent upstream passage for smaller salmonids. All fish passage is prevented during lower flows due to the shallow (or absent) water depth on the crossing and apron. This crossing represents a partial barrier, especially during lower flows, and reduces the window of opportunity for salmonid passage at this site.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour, increased jump height, apron gradient, maintenance, etc. Future efforts should be made to improve passage at this site, in conjunction with scheduled maintenance, by lowering the crossing to streambed grade and/or creating a boulder ramp downstream of the crossing and apron that provides a moderate slope up to the crossing surface. Concentrating low flows, and water depth, in a roughened channel across the crossing would improve passage conditions during low flows.

Barrier ID: SY_8

Stream: Santa Ynez River

Barrier Type: Low-flow crossing

Physical Location: Paradise Road crossing to Lower Oso day use area

GPS Location: N 34° 32' 46.3" W 119° 46' 34.3"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ LPNF

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/11/03

Barrier Status: Partial



Description: This new (fall 2003) road crossing measured 400 feet long by 14 feet wide and 6 inches thick. The crossing was still under construction when observed. The crossing surface was at streambed grade with a mild to flat sloping surface. The substrate had not yet been backfilled around the concrete pour.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, salmonids will be able to jump and/or swim onto the road surface with a low degree of difficulty. Water velocities will become slightly accelerated over the smooth concrete crossing during higher flows and may impede upstream passage for smaller salmonids. All fish passage may be prevented during low flows due to the shallow water depth spread out over the crossing's surface. While passable during a significant window of flow conditions, this crossing represents a partial barrier during low flows.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour. Future efforts should be made to improve (or ensure) passage at this site. Concentrating lower flows, and water depth, across the road in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_9

Stream: Santa Ynez River

Barrier Type: Low-flow crossing

Physical Location: Paradise Road crossing upstream of Falls Day Use Area

GPS Location: N 34° 32' 18.1" W 119° 44' 48.8"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ LPNF

Surveyor(s) and Date: Shaw Allen 11/11/03

Barrier Status: Partial



Description: This low flow crossing measured 175 feet across the channel and 14 feet wide. The maximum height from the top of the road to the downstream channel measured 6 feet at river-left where significant undercutting has occurred. This is likely the low point in the crossing.

Diagnosis: Moderate to high stream flows are needed at this site to establish a downstream jump-pool and/or sufficient depth for salmonids to migrate up the boulders on river-right. Due to the scour height and required jump to migrate onto the crossing, this structure presents a moderate to high degree of difficulty to salmonid passage during moderate and high flows respectively. Water velocities become accelerated over the smooth concrete crossing during higher flows due to a lack of roughness. During these higher flow conditions, easier fish passage may be obtained on river-right where flows spill over the downstream boulders at road surface grade. All fish passage is prevented during lower flows due to the shallow water depth spread out over the crossing's surface and apron. This crossing represents a partial barrier, especially during low and moderate flows, when insufficient water depth occurs on the crossing or downstream pool depth.

Recommended Action: This crossing should be modified to improve salmonid passage, in conjunction with needed maintenance, by either removing and lowering the crossing to streambed grade or establishing a boulder ramp downstream of the crossing that prevents scour and establishes a low streambed gradient that allows fish to easily swim onto the crossing. Concentrating the flows, and water depth, over the crossing in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_10

Stream: Santa Ynez River

Barrier Type: Low-flow crossing

Physical Location: Paradise Road crossing downstream of Live Oak Day Use Area

GPS Location: N 34° 32' 6.4" W 119° 43' 24.5"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ LPNF

Surveyor(s) and Date: Shaw Allen 11/11/03

Barrier Status: Partial



Looking downstream

Description: This road crossing measured 240 feet across the stream channel and 13 feet wide. Most of the crossing surface occurs at or near streambed grade and has a mild or flat slope.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, salmonids can jump and/or swim onto the road surface with a low to moderate degree of difficulty. Due to a lack of roughness, water velocities become accelerated over the smooth concrete crossing during higher flows and may impede or prevent upstream passage for smaller salmonids. All fish passage is prevented during lower flows due to the shallow water depth spread out over the crossing's surface. While passable during a significant window of flow conditions, this crossing represents a partial barrier, especially during lower flows.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour, increased jump height, etc. In conjunction with scheduled maintenance, future efforts should be made to improve and ensure passage at this site. Concentrating the flows, and water depth, over the crossing in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_11

Stream: Santa Ynez River

Barrier Type: Low-flow road crossing

Physical Location: Paradise Road crossing upstream of Live Oak Day Use Area

GPS Location: N 34° 32' 13.0" W 119° 43' 20.7"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ LPNF

Surveyor(s) and Date: Shaw Allen 11/11/03

Barrier Status: Partial



Description: This crossing measured 170 feet across the channel and 14 feet wide. A vertical drop from the downstream substrate to the downstream lip of the road measured 2 feet 6 inches. A large pool occurs immediately upstream.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, salmonids can jump and/or swim onto the road surface with a moderate degree of difficulty. Due to a lack of roughness, water velocities become accelerated over the smooth concrete crossing during higher flows and may impede or prevent upstream passage for smaller salmonids. Depending on the velocities encountered during high stream flows and the size/condition of fish, salmonids may have difficulty swimming across the road surface. All fish passage is prevented during lower flows due to shallow water depth spread out over the crossing's surface. While passable during a significant window of flow conditions, this crossing represents a partial barrier, especially during lower flows, and reduces the window of opportunity for migration at this site.

Recommended Action: This crossing should be monitored to ensure that passage conditions do not become more difficult due to downstream scour and increased jump height. Future efforts should be made to improve passage conditions at this site, in conjunction with scheduled maintenance, by lowering the crossing to streambed grade and/or creating a boulder ramp downstream of the crossing that allows fish to easily swim onto the crossing. Concentrating the flows, and water depth, over the crossing in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_12

Stream: Santa Ynez River

Barrier Type: Low-flow road crossing

Physical Location: Paradise Road crossing upstream from Red Rock Day Use Area

GPS Location: N 34° 32' 23.4" W 119° 42' 56.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ LPNF

Surveyor(s) and Date: Shaw Allen 11/11/03

Barrier Status: Partial



Description: This road crossing occurs at a braided section of the river where two road crossings occur on either side of a central island. The road crosses the channel at river-left for 75 feet and is 14 feet wide. Smaller boulders slope downstream for 5 feet at a moderate slope. The drop from the downstream lip of the road crossing to the streambed measured 2 feet 6 inches. The road crosses the second channel at river-right for 60 feet. The height from the road surface to the downstream channel measured 2 feet 6 inches.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, salmonids can jump and/or swim onto the road surface with a moderate degree of difficulty. Due to a lack of roughness, water velocities are accelerated over the smooth concrete crossing during higher flows and may impede or prevent upstream passage for smaller salmonids. All fish passage is prevented during lower flows due to shallow water depth spread out over the crossing's surface. While passable during a significant window of flow conditions, this crossing represents a partial barrier, and reduces the window of opportunity for salmonid passage at this site.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour and increased jump height. Future efforts should be made to improve passage at this site, in conjunction with scheduled maintenance, by lowering the crossing to streambed grade and/or creating a boulder ramp downstream that allows fish to easily swim onto the crossing and prevents scour. Concentrating the flows, and water depth, over the crossing in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_13

Stream: Santa Ynez River

Barrier Type: Low-flow road crossing

Physical Location: Paradise Road crossing adjacent to Redrock Trailhead Parking Area

GPS Location: N 34° 32' 4.8" W 119° 42' 43.6"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ LPNF

Surveyor(s) and Date: Shaw Allen 11/11/03

Barrier Status: Partial



Description: This road crossing measured 70 feet across the channel and 14 feet wide. The height from the downstream lip of the road to the downstream substrate measured 2 feet 7 inches. Large pools occur upstream and downstream.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, adult salmonids can jump and/or swim onto the road surface with a moderate degree of difficulty. Due to a lack of roughness, water velocities are accelerated over the smooth concrete crossing during higher flows and may impede or prevent upstream passage for smaller salmonids. All fish passage is prevented during low flows due to shallow water depth spread out over the crossing's surface. This crossing represents a partial barrier, especially during lower flows, and reduces the window of opportunity for salmonid passage at this site.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour and increased jump height. Future efforts should be made to improve passage at this site, in conjunction with scheduled maintenance, by lowering the crossing to streambed grade and/or creating a downstream boulder ramp that allows fish to easily swim onto the crossing. Concentrating the flows, and water depth, over the crossing in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_14

Stream: Santa Ynez River

Barrier Type: Concrete Arch Dam (Gibraltar Dam)

Physical Location: Approximately 0.25 mile upstream from Devils Canyon Creek

GPS Location: N/A

Ownership/Interest: City of Santa Barbara/ Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/03

Barrier Status: Complete



Description: Information about this dam was obtained from the Santa Barbara County Public Works Department- Water Resources Division's web site. Gibraltar Dam was built in 1920 by the City of Santa Barbara and accomplished the first diversion of water to the south coast through Mission Tunnel. The dam is a constant radius concrete arch dam that measures 150 feet tall. The reservoir capacity in 1920 was 14,500 acre-feet. The drainage area above the dam is reported to be 214 square miles. Sedimentation had reduced capacity to 7,800 acre-feet by 1945, but the dam was raised 23 feet in 1948 to regain close to the original capacity. However, sedimentation has continued to reduce the capacity of the reservoir by an average of 215 acre-feet each year since 1948. The City of Santa Barbara's website identifies the storage capacity at 7264 acre-feet per a 1998 bathymetric survey. However, the 1-04 water supply report by Steve Mack (as of 9-30-03) lists storage capacity at 7,098 acre-feet (pers. comm. Trautwein).

Diagnosis: This dam was not constructed with any fish passage facilities and was the first major dam to block upstream migration for the Santa Ynez River steelhead. In addition to being a physical barrier to upstream migration, the dam also indirectly limits downstream salmonid migration by reducing flows below Gibraltar.

Recommended Action: This reservoir is near the end of its useful water storage life and may be filled-in with sediment by 2015 at the calculated sedimentation rate. Retirement and removal of this soon-to-be filled-in reservoir should be considered in coordination

with Bradbury Dam fish passage discussions and alternatives. Sediment sale and dam removal should be investigated. The planning process for dealing with the obsolescence of dams outlined in two recent studies by the Aspen Institute (2002) and the Heinz Foundation (2002) should be used as a guide for addressing the long-term future of Bradbury Dam, including the restoration of fish passage at this site.

Barrier ID: SY_ 15

Stream: Santa Ynez River

Barrier Type: Low-flow road crossing

Physical Location: Romero Camuesa Road crossing at Juncal Campsite

GPS Location: N 34° 29' 11.4" W 119° 32' 27.1"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/11/03

Barrier Status: Partial



Description: This concrete low-flow crossing measured over 300 feet long and extends far onto either side of the stream channel at this wide section of the river. The surface of the concrete crossing measured 16 feet wide and has a flat to mild downstream slope. Observed flows of approximately 0.25 c.f.s. dropped 1-foot 8 inches into a downstream pool that has a maximum measured depth of 16 inches. A large upstream pool extends for several hundred feet and appears to be a location where subsurface flows emerge and provide consistent summer flows in this reach.

Diagnosis: During the observed base-flow conditions, fish passage is impeded due to the shallow water depth spread out over the crossing and the moderate jump height and limited downstream pool depth. During moderate and high flows, adequate water depth will allow salmonids to jump or swim onto the crossing and migrate upstream with a low to moderate degree of difficulty. While passable during a significant window of flow conditions, this crossing represents a partial barrier, especially during lower flows, and reduces the window of opportunity for salmonid passage at this site.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour and increased jump height. Future efforts should be made to improve passage at this site, in conjunction with scheduled maintenance. This wide, unconfined section of the river would be a difficult and expensive place to construct a bridge and removal of the crossing may reduce or eliminate the upstream pool, which has been identified by LPNF as critical habitat for sensitive amphibians and turtles. Designing and constructing a boulder ramp downstream of the crossing that provides access onto the crossing would allow fish to easily swim onto the crossing. This could also backfill water depth over the crossing allowing easier fish passage. Concentrating the flows, and water depth, over the crossing in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_16

Stream: Santa Ynez River

Barrier Type: Low-flow road crossing

Physical Location: First LPNF road crossing downstream of Juncal Dam

GPS Location: N 34° 29' 21.8" W 119° 30' 57.0"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/6/03

Barrier Status: Partial

Description: This low-flow crossing measured 107 feet across the stream channel and 14 feet wide. The surface of the concrete crossing has a moderate downstream slope that lowers 6 inches over the 14-foot length. A boulder and concrete apron extends 24 feet downstream of the crossing with a total vertical drop of 2 feet 6 inches from the crossing surface to the downstream natural streambed.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, adult steelhead can jump or swim onto the road surface with a moderate to high degree of difficulty. Due to a lack of roughness, water velocities are accelerated over the smooth concrete crossing during higher flows. During these flow conditions, water also becomes turbulent down the sloping apron and may impede or prevent upstream passage for smaller salmonids. All fish passage is prevented during lower flows due to the absent or shallow water depth spread out over the crossing's surface and apron. This crossing represents a partial barrier, especially during lower flows, and reduces the window of opportunity for salmonid passage at this site.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour, increased jump height, apron gradient, etc. Future efforts should be made to improve passage at this site, in conjunction with scheduled maintenance, by lowering the crossing to streambed grade and/or creating a boulder ramp downstream that allows easier passage onto the crossing. Concentrating the flows, and water depth, over the crossing in a roughened channel would improve passage conditions during low flows.

Barrier ID: SY_17

Stream: Santa Ynez River

Barrier Type: Concrete Arch Dam (Juncal Dam)

Physical Location: Approximate Santa Ynez River streambed elevation: 2090 feet

GPS Location: N/A

Ownership/Interest: Montecito Water District/Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/11/03

Barrier Status: Complete (see diagnosis)



Description: Information about Juncal Dam was obtained on the Santa Barbara County Public Works Department- Water Resource Division and Montecito Water District websites. The dam was completed in 1930 and serves as the water supply for the Montecito Water District on the south side of the Santa Ynez Mountains. The Montecito Water District website reports that the dam measures 80 feet tall and 240 feet across the top. An impressive series of connected arch dams were also built to the south of the main dam to increase the reservoir capacity of Jameson Reservoir. The storage capacity is reported to be 5,291 acre-feet. Upstream tributaries feed the reservoir as well as stream flows that are conveyed from Alder Creek through an aqueduct (See barrier assessment SY_AR_2 and SY_AR_3). The dam's watershed is approximately 17 square miles. An earthen debris dam was built in the 1990's upstream of the reservoir approximately 0.25 miles on the Santa Ynez River, but this structure was blown out with high stream flows and no longer spans the river channel or impedes fish passage.

Diagnosis: This dam has no fish passage facilities and completely blocks upstream salmonid passage; additionally, the storage and distribution of water in the reservoir reduces flows in the Santa Ynez River between Juncal dam and Gibraltar Reservoir, and ultimately below Bradbury Dam. Note: salmonids downriver may be able to migrate up Alder Creek (a downstream tributary), jump over the Alder Creek diversion dam, get sucked into the diversion, and be transported through the aqueduct into Jameson Reservoir, allowing access upstream of Juncal Dam. See Alder Creek barrier assessments for more detail on this unintended and extremely difficult fishway around Juncal Dam. This Alder Creek diversion could be modified to enhance upstream access.

Recommended Action: In conjunction with Bradbury and Gibraltar Dam fish passage discussions and alternatives, consider the long-term operations and sediment filling at Juncal Dam and Jameson Reservoir with the Montecito Water District. The planning process for dealing with the obsolescence of dams outlined in two recent studies by the Aspen Institute (2002) and the Heinz Foundation (2002) should be used as a guide for addressing the long-term future of Juncal Dam, including the restoration of fish passage at this site.

Barrier ID: SY_18

Stream: Santa Ynez River

Barrier Type: Low-flow road crossing

Physical Location: #1 LPNF road crossing upstream of Jameson Reservoir

GPS Location: N 34° 29' 25.6" W 119° 28' 35.0"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/11/03

Barrier Status: Partial



Description: This road crossing measured 103 feet long, with approximately 85 feet crossing the active stream channel. The crossing measured 14 feet wide and has a flat to mild slope. A large-boulder apron has been placed downstream of the crossing to prevent downstream scour. This 10 to 20-foot long boulder apron has a moderate downstream slope to natural substrate below. The surface of the crossing has moderate wear and cracking with an irregular surface.

Diagnosis: This structure impedes the upstream spawning migration of Jameson Reservoir rainbow trout, which have been found to be genetically similar to native southern steelhead. All fish passage is prevented during lower flows due to shallow water depth spread out over the crossing's surface and insufficient water depth over the boulder apron. During moderate to high flows, adequate water depth may facilitate upstream migration of trout across the rough apron and onto the crossing. Extremely high flows may produce velocities across the concrete surface that would prevent passage of smaller trout. This crossing represents a partial barrier, especially during lower flows, and reduces the window of opportunity for rainbow trout to migrate upstream of this site.

Recommended Action: Fish passage should be improved at this site to ensure effective upstream migration of spawning rainbow trout/steelhead descendants' from Jameson Reservoir that need to access upstream perennial habitat. Reducing the crossing to streambed level with a roughened surface or replacing it with a bridge would provide effective upstream migration. A bridge would also improve vehicle access during higher flows.

Barrier ID: SY_19

Stream: Santa Ynez River

Barrier Type: Steep gradient/insufficient flow

Physical Location: Approximately 0.25 mile upstream of Steelhead Creek confluence

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/12/03

Barrier Status: Partial



Description: Upstream from the confluence with Steelhead Creek (the unnamed northern tributary at Upper Santa Ynez Campsite), the Santa Ynez River is a smaller, dry stream with insufficient flow and relatively poor salmonid habitat. Steep boulder gradients occur in this stream reach with drops up to 9 feet tall and limited downstream pool formation.

Diagnosis: Several steep boulder gradient sections occur downstream from this location and the absence of flows combine to make upstream passage extremely difficult and undesirable. During high stream flows, the boulder configuration may change and allow limited upstream migration. Perennial flows and high quality salmonid habitat extend upstream on Steelhead Creek and likely mark the upstream headwater habitat for the Santa Ynez River rainbow trout and historic steelhead runs.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_SL_1

Stream: Santa Lucia Creek

Barrier Type: Culvert crossing

Physical Location: Vandenberg Air Force Base- Lompoc gate road crossing

GPS Location: N 34° 42' 18.8" W 120° 30' 4.7"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/ VAFB

Surveyor(s) and Date: Shaw Allen

Barrier Status: Unknown



Description: Permission to survey adjacent private land was not obtained and limited observations were made from adjacent public roads. The culvert appears to be approximately 100 feet long, based on the road width and fill.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions could not be determined. This long culvert likely impedes or prevents upstream salmonid passage to some degree due to shallow water depths and excessive water velocities encountered during different stream flows.

Recommended Action: Contact Vandenberg Air Force Base and the County to seek permission to survey upstream habitat conditions and characteristics surrounding the crossing and adjacent channel.

Barrier ID: SY_SL_2

Stream: Santa Lucia Creek

Barrier Type: Culvert crossing

Physical Location: Highway 1 road crossing

GPS Location: N 34° 42' 51.4" W 120° 29' 18.8"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/17/03

Barrier Status: Partial

Description: Permission to survey this culvert from adjacent private land was not obtained and limited observations were made from the surface of Highway 154. The corrugated metal culvert pipe has an approximate diameter of 6 feet and length of approximately 150 feet. The downstream end of the culvert is at streambed level.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions could not be determined. This long culvert likely impedes or prevents upstream salmonid passage due to shallow water depths and excessive water velocities encountered during different stream flows. This tributary may not contain adequate salmonid habitat conditions upstream.

Recommended Action: Contact landowner(s) and seek access to survey upstream habitat conditions and characteristics surrounding the crossing and adjacent channel.

Barrier ID: SY_SN_1

Stream: Sloans Creek and La Salle Creek

Barrier Type: Concrete Channelization

Physical Location: Extends from near the Santa Ynez River to the confluence of Sloans Creek and La Salle Creek concrete channels. The concrete channel appears to proceed upstream on Sloan Creek approximately 1.0 mile and upstream on La Salle Creek approximately 0.7 miles to a bridge crossing (SY_SN_LS_1) approximately 0.6 miles up La Salle Canyon Road from Ocean Ave.

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works- Flood Control/Roads

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown



Description: The original configuration of lower Sloans Creek and La Salle Creek across the flatlands west of Lompoc has been highly altered and rerouted for agricultural development, irrigation, and flood control. Both La Salle Creek and Sloans Creek have been channelized in concrete where they flow out of the foothills and combine to form one large trapezoidal concrete channel that crosses the flatlands in a straight line north to the Santa Ynez River. A network of irrigation ditches, canals, and what appear to be detached remnant stream channels occur adjacent to the main concrete channels. Without access to private lands, observations of this network of waterways were extremely limited. Downstream from the Central Ave. crossing, the trapezoidal flood control channel is approximately 25 feet wide with 8 feet tall angled walls. The concrete bottom has varying concentrations of deposited sediment and vegetation. The USGS map shows a possible dam and storage or debris basin at the confluence of these two creeks that may divert flows into irrigation canals.

La Salle Creek- To the west of the main Sloans Creek concrete channel a large irrigation ditch occurs that may not even connect to the stream, but may accept diverted water from lower La Salle Creek or be a former stream channel and/or irrigation ditch. Whether this waterway connected to the Santa Ynez River could not be determined. Roads with culverts were observed crossing this irrigation canal at Artesia Rd. and Central Ave. While not directly observed, it appears that a dam may divert La Salle Creek flows from the lower creek into this irrigation canal approximately three tenths of a mile up La Salle Creek from the Ocean Avenue road crossing.

Upper Sloans Creek- Roadside observations up San Pascual Road to the end of Sloans Canyon did not reveal any barriers along upper Sloans Creek, but they may occur on private property where no observations could be made.

Diagnosis: Additional assessment of this entire lower drainage network is needed to fully understand the implications to salmonid fish passage. It is likely that passage is prevented upstream of this concrete channel due to shallow low-flow conditions, excessive high-flow velocities, the overall length, and lack of resting areas. Other structures may be present in the channel that prevent upstream passage such as diversion dams, slope changes, and road crossing additions. The mouth of the channel near the Santa Ynez River could not be observed and may also impede passage.

Recommended Action: Conduct a thorough investigation of the historic and current stream conditions for lower Sloans and La Salle Creeks, assess salmonid viability in the drainage, and determine benefits to restoring fish passage. Naturalization of these streams could provide valuable public and natural resource benefits for the area as well. Seasonal overflow wetlands along the lower drainage could provide flood control, irrigation, and water quality benefits while increasing habitat quality.

Barrier ID: SY_SN_LS_1

Stream: La Salle Creek

Barrier Type: Concrete channelization under bridge

Physical Location: Approximately 0.6 miles up La Salle Canyon Road from Ocean Ave.

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/17/03

Barrier Status: Partial



Description: Permission to access and survey this structure was not obtained and limited observations were made from La Salle Canyon Road. This concrete channel extends under a private bridge and appears to be approximately 8 feet wide. It appears to extend downstream to the lower flood control channel that connects La Salle to Sloans Creek.

Diagnosis: This concrete channel is likely impassable due to the excessive length and absence of resting areas for fish. Shallow water depth during low flows and excessive velocities during higher flows would likely prevent upstream fish passage.

Recommended Action: Further assess upstream habitat conditions and salmonid potential with landowner permission. Should adequate habitat conditions occur upstream, assess hydraulic and channel conditions at the crossing and downstream channelization and investigate passage alternatives with the county and other stakeholders. The most effective solution for fish passage would involve removal of the channel, biotechnical bank stabilization, and installation of a wide-span bridge.

Barrier ID: SY_SN_LS_2

Stream: La Salle Creek

Barrier Type: Culvert road crossing

Physical Location: Approximately 600 feet before the end of La Salle Canyon Road

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/17/03

Barrier Status: Partial

Description: Permission to access and ground survey this structure was not obtained and limited observations of this culvert crossing were made from La Salle Canyon Road. This private driveway crossing contains a 2-foot diameter corrugated metal culvert pipe that is approximately 30 feet long. The height from the lip of the downstream end of the culvert pipe to the surface of the downstream pool is approximately 5 feet. The pool depth is approximately 1 foot. A small amount of surface flow was observed.

Diagnosis: This culvert is likely impassable to all salmonids during all flows due to the excessive jump height from the downstream pool that does not appear to backfill more than 1 or 2 feet deep during moderate to high flows. Additional surveying is needed to accurately determine fish passage severity.

Recommended Action: Further assess upstream salmonid habitat conditions with landowner permission. Should adequate habitat conditions occur upstream, assess hydraulic and channel conditions at the crossing and investigate passage alternatives with the landowners. The most effective solution for fish passage would involve removal of the culvert and installation of a wide-span bridge or large embedded culvert.

Barrier ID: SY_SN_LS_3
Stream: La Salle Creek
Barrier Type: Footbridge
Physical Location: End of La Salle Canyon Road
GPS Location: N/A
Ownership/Interest: Private
Surveyor(s) and Date: Shaw Allen 11/17/03
Barrier Status: Unknown

Description: Permission to ground survey this structure was not obtained and limited observations of this footbridge were made from La Salle Canyon Road. No observations of the stream channel below the bridge could be made from the road.

Diagnosis: Fish passage conditions along this stream reach are unknown.

Recommended Action: Further assess stream channel conditions at this bridge and upstream salmonid habitat conditions with landowner permission. Should adequate habitat conditions occur upstream and a fish passage barrier occur, investigate passage alternatives at this site with the landowners.

Barrier ID: SY_VV_1

Stream: Vandenberg Village Creek (unnamed tributary in Vandenberg Village)

Barrier Type: Culvert crossing

Physical Location: Highway 1 Road crossing

GPS Location: N 34° 41' 22.9" W 120° 27' 28.8"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/17/03

Barrier Status: Partial



Description: Each box of this double box culvert measured 6 feet wide by 3 feet tall at the downstream end. The adjacent stream channel has a silt bottom with dense cattail growth forming a significant blockage. Fine sediment is backed up into the culvert. The culvert boxes at the upstream end measure 6 feet tall and this is likely the same height as the downstream end, which has 3 feet of silt deposited inside the culvert. Angled concrete wingwalls extend downstream for 30 feet. The length of the culvert is approximately 275 to 300 feet based on the road width and earth fill. Trickling surface low was observed.

Diagnosis: This culvert is most likely impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered inside the culvert and thick growth of cattails at the downstream end. During higher flows, excessive velocities through the entire structure likely impede or block upstream passage. The cattail growth may be forming a sediment blockage while causing sediment to deposit inside the culvert. This blockage may be reducing the flow capacity of the culvert and may also be preventing salmonid passage.

Recommended Action: Due to the observed late-fall, spring flows, providing effective passage at this site might provide a direct benefit to the Santa Ynez River steelhead population. Conduct a more detailed analysis of upstream habitat conditions and crossing characteristics with adjacent landowner permission. Investigate passage alternatives at this site with CALTRANS. The most effective solution for both fish passage and stream and transportation benefits would involve removal of the culvert and installation of a wide-span bridge.

Barrier ID: SY_VV_2

Stream: Vandenberg Village Creek (unnamed tributary on USGS map)

Barrier Type: Culvert crossing

Physical Location: Burton Mesa Road crossing

GPS Location: N 34° 42' 4.4" W 120° 27' 12.6"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/17/03

Barrier Status: Partial



Description: Permission to ground survey the private land adjacent to the culvert was not obtained and limited observations were made from Burton Mesa Road. This corrugated metal culvert pipe has a diameter of 6 feet. There is a concrete apron extending downstream at an angle for approximately 6 feet on river-right and 14 feet on river-left. The observed surface flow crosses the middle of the apron for approximately 9 feet. Sacrete revetment occurs along the downstream banks and connects to the end of the apron. The height from the lip of the apron to surface of the downstream pool is approximately 2 feet 6 inches. The height from the lip of the metal culvert pipe down to the apron is approximately 6 inches. The total length of the culvert is approximately 90 to 100 feet based on road width and earth fill. Stream flow of approximately 0.2 c.f.s was observed and potential salmonid habitat is present in this apparently spring-fed creek.

Diagnosis: This culvert is most likely impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered, small jump below the apron and culvert, and minimal pool depth. During higher flows, access into the culvert is possible, but excessive water velocities likely limit or completely block upstream passage.

Recommended Action: Providing effective passage at this site might provide a direct benefit to the existing Santa Ynez River steelhead population. Assess upstream habitat conditions and investigate passage alternatives at this site with the County. The most effective solution for fish passage involves removal of the culvert and installation of a bridge.

Barrier ID: SY_VV_WF_1

Stream: West Fork Vandenberg Village Creek

Barrier Type: Culvert crossing

Physical Location: Burton Mesa Road crossing

GPS Location: N 34° 42' 4.0" W 120° 27' 17.4"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/17/03

Barrier Status: Partial



Description: Permission to ground survey the private land adjacent to the culvert was not obtained and limited observations were made from Burton Mesa Road. This culvert measured approximately 120 feet long, 4 feet tall, and 6 feet wide at the base (surface of the deposited substrate inside the culvert). Due to the amount of deposited substrate inside the culvert it was impossible to determine if the culvert is circular and highly embedded or if it is an arch culvert. Angled wingwalls extend downstream for approximately 15 feet. A channel has been scoured out inside the culvert and runs the entire length. Surface flow and adequate salmonid habitat were observed at the upstream end of this culvert.

Diagnosis: This culvert is likely passable with a low degree of difficulty for salmonids during low and moderate flows due to the low gradient, natural substrate bottom, and adequate water depth in the scoured channel. During higher flows, excessive velocities through the culvert may flush out the substrate and limit or completely block upstream passage. This structure likely impedes upstream fish passage during certain flows and its severity is dependant on substrate deposition inside the culvert.

Recommended Action: Providing effective passage at this site might provide a direct benefit to the existing Santa Ynez River steelhead population. Conduct a more detailed analysis of this crossing with adjacent landowner permission and County involvement. Investigate passage alternatives at this site with the County. The most effective solution for fish passage is removal of the culvert and installation of a bridge.

Barrier ID: SY_VV_WF_2

Stream: West Fork Vandenberg Village Creek

Barrier Type: Culvert crossing

Physical Location: St. Andrews Way Road crossing

GPS Location: N 34° 42' 46.3" W 120° 27' 2.4"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/17/03

Barrier Status: Unknown

Description: Permission to ground survey the crossing and adjacent stream channel was not obtained and limited observations were made from St. Andrews Way Road. Culvert appears to be approximately 60 feet long judging by the road and fill width.

Diagnosis: Additional analysis is needed to determine the severity of this culvert. The culvert may be impassable to upstream migrating salmonids during low flows due to shallow flow conditions encountered in the culvert. During higher flows, excessive velocities through the culvert may limit or completely block any upstream passage.

Recommended Action: Providing effective passage at this site might provide a direct benefit to the Santa Ynez River steelhead population. Contact the landowner(s) and seek permission to survey upstream habitat conditions and the crossing. If adequate salmonid habitat occurs upstream then fish passage alternatives should be identified and discussed with the County. The most effective solution for fish passage and transportation benefits would involve removal of the culvert and installation of a bridge.

Barrier ID: SY_SM_1

Stream: San Miguelito Creek

Barrier Type: Culvert crossing

Physical Location: Central Avenue road crossing

GPS Location: N 34° 39' 41.9" W 120° 28' 27.6"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to ground survey the entire culvert and adjacent channel was not obtained and limited observations were made from public roads. The culvert is approximately 140 feet long with two concrete boxes measuring approximately 15 feet tall by 15 feet wide. Wingwalls angle downstream for approximately 30 feet. The downstream creek channel has been channelized but has a “natural” stream bottom.

Diagnosis: A detailed survey of this structure is needed to adequately determine the severity to fish passage. The long culvert likely impedes or prevents upstream salmonid passage due to shallow water depths and excessive water velocities encountered during lower and higher stream flows, respectively. San Miguelito Creek contains adequate salmonid spawning and rearing habitat as well as a contemporary salmonid population. Effective fish passage should be provided at this barrier and other upstream barriers.

Recommended Action: Contact adjacent landowners and the County and seek permission to survey the crossing and adjacent channel. Fish passage improvements should be implemented at this site if salmonid passage is significantly impeded. The most effective fish passage project and transportation improvement may be to remove the crossing and replace it with a bridge that does not impact the stream channel. Any project would need to consider upstream channelization and flood control developments.

Barrier ID: SY_SM_2

Stream: San Miguelito Creek

Barrier Type: Concrete Flood Control Channel

Physical Location: Central Avenue crossing upstream to Flood Control Basin

GPS Location: N 34° 39' 41.3" W 120° 28' 27.6" Central Ave

Ownership/Interest: Santa Barbara County Flood Control

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Upstream from Central Ave. Crossing

Description: Permission to ground survey the entire concrete channel and adjacent private lands was not obtained and limited observations were made from public roads. Downstream from the North Avenue crossing the channel is trapezoidal and upstream the channel has vertical walls. The flat concrete bottom has a mild gradient at the locations observed.

Diagnosis: A detailed survey of this structure is needed to adequately determine the channel characteristics and severity to fish passage. The long channel likely impedes or prevents upstream salmonid passage due to shallow water depths or excessive water velocities encountered during lower and higher stream flows, respectively. This long channel also appears to lack significant resting spots during moderate to high stream flows. San Miguelito Creek contains adequate salmonid spawning and rearing habitat as well as an existing salmonid population and effective fish passage should be provided at this and other barriers.

Recommended Action: Fish passage improvements should be implemented at this site following discussions with stakeholders and an alternatives analysis. The most effective fish passage and stream restoration project would involve removal of the concrete channel and stabilization of the adjacent banks using biotechnical techniques. This may be possible by expanding current capacity and further protecting adjacent development with the construction of flood retention walls/berm outside of a naturalized channel.

Barrier ID: SY_SM_3

Stream: San Miguelito Creek

Barrier Type: Flood Control Basin/Dam

Physical Location: Approximately 100 feet upstream from Olive Avenue crossing

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works- Flood Control District

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Complete



Description: Access to ground survey the entire flood control basin and adjacent land was not obtained and limited observations were made from Olive Road. Downstream from the large flood control basin a dam is constructed at the upstream end of the long, concrete flood control channel. The upstream end of the concrete channel terminates at the dam with a vertical concrete wall measuring greater than 9 feet tall.

Diagnosis: This structure blocks all upstream salmonid passage due to the excessive jump height and lack of downstream pool depth. Excessive turbulence and water velocity also prevents upstream passage during high flows when sufficient water depth occurs in the downstream channel. San Miguelito Creek contains adequate salmonid spawning and rearing habitat as well as an existing salmonid population upstream and effective fish passage should be provided at this and other barriers.

Recommended Action: This dam and downstream flood control channel directly block endangered Santa Ynez River steelhead from accessing a significant amount of adequate spawning and rearing habitat found upstream in San Miguelito Creek. Fish passage should be provided. Due to developments in Lompoc and the constriction of the creek from this debris dam downstream, a comprehensive alternatives analysis should be conducted by the County and a long-term creek restoration and fish passage plan should be developed with stakeholders. A naturalized San Miguelito Creek with adequate flood protection and a restored steelhead run would likely improve the quality of life in the Lompoc area and increase water quality. Realigning the lower creek outside city limits in a naturalized channel is an option worth studying.

Barrier ID: SY_SM_4

Stream: San Miguelito Creek

Barrier Type: Flood Control Channel #2

Physical Location: Extends upstream from Flood Control Basin approximately 0.5 mile

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works- Flood Control

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown

Description: Permission to access and survey this entire concrete channel was not obtained and limited observations were made from public roads. This concrete channel appears to be similar to the channel downstream of the flood control basin (barrier SY_SM_2).

Diagnosis: A detailed survey of this structure is needed to adequately determine the severity to fish passage. The long channel likely impedes or prevents upstream salmonid passage due to shallow water depths or excessive water velocities encountered during lower and higher stream flows, respectively. This long channel also appears to lack significant resting spots during moderate to high stream flows. San Miguelito Creek contains adequate salmonid spawning and rearing habitat as well as an existing salmonid population and effective fish passage should be provided at this and other barriers.

Recommended Action: Contact adjacent landowners and the County and seek permission to access and survey the channel and adjacent stream reaches. Fish passage improvements should be implemented at this site following discussions with stakeholders and an alternatives analysis of potential options should be conducted. The most effective fish passage and stream restoration project would involve removal of the concrete channel and stabilization of the adjacent banks using biotechnical techniques. This may be possible by expanding current channel capacity and further protecting adjacent development with the construction of flood retention walls/berm outside of the naturalized channel. Any project needs to be discussed in conjunction with downstream developments.

Barrier ID: SY_SM_5

Stream: San Miguelito Creek

Barrier Type: Bridge crossing

Physical Location: Norcutt's Walnut Ranch crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown



Description: Permission to access and ground survey this crossing and adjacent channel was not obtained and limited observations were made from the Miguelito Road.

Diagnosis: Fish passage conditions at this site are unknown.

Recommended Action: Contact landowner and seek access to survey the crossing and channel at this site.

Barrier ID: SY_SM_6

Stream: San Miguelito Creek

Barrier Type: Bridge

Physical Location: Approximately 0.75 mile up Miguelito Road

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown



Description: Permission to access and ground survey this crossing and the adjacent channel was not obtained and limited observations were made from Miguelito Road. The stream channel below this bridge appears to be natural, but riparian vegetation impaired observations.

Diagnosis: Fish passage conditions at this site are unknown.

Recommended Action: Contact landowner and seek access to survey the crossing and channel at this site.

Barrier ID: SY_SM_7

Stream: San Miguelito Creek

Barrier Type: Bridge

Physical Location: Approximately 1.25 miles up Miguelito Road

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown



Description: Permission to access and ground survey this crossing and the adjacent channel was not obtained and limited observations were made from Miguelito Road.

Diagnosis: Fish passage conditions at this site are unknown.

Recommended Action: Contact landowner and seek access to survey the crossing and channel at this site.

Barrier ID: SY_SM_8

Stream: San Miguelito Creek

Barrier Type: Bridge

Physical Location: Approximately 1.75 miles up Miguelito Road

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown



Description: Permission to access and survey this crossing and the adjacent channel was not obtained and limited observations were made from Miguelito Road.

Diagnosis: Fish passage conditions at this site are unknown.

Recommended Action: Contact landowner and seek access to survey the crossing and channel at this site.

Barrier ID: SY_SM_9

Stream: San Miguelito Creek

Barrier Type: Channelization

Physical Location: Miguelito County Park

GPS Location: N 34° 35' 32.0" W 120° 28' 10.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: The stream channel underneath the bridge has been protected with concrete and boulder riprap. The riprap channel extends approximately 30 feet underneath the bridge and spans 16 feet wide across the channel. Sacrete bank revetment extends downstream from the bridge for 12 feet and measures approximately 12 feet tall. This revetment is anchored into the riprap channel bottom. The lower end of the riprap channel and the south bank revetment are both damaged and cracked. The approximate height from the downstream lip of the riprap channel to the downstream pool measured 2 feet 8 inches. The pool depth measured 6 to 8 inches. Surface flow and adequate salmonid habitat are present.

Diagnosis: The natural channel below this structure is relatively confined allowing the downstream pool to backfill during moderate to high flows. This backfilling will create sufficient depth for salmonids to jump or swim onto the riprap channel. The irregular riprap channel has sufficient roughness to allow upstream passage by larger salmonids during high flows. Excessive velocities and shallow depth during moderate and low flows would likely prevent passage. Downstream scour and the need for bank revetment may be the result of an under-sized bridge and confined stream channel.

Recommended Action: A more detailed investigation of hydraulic and channel characteristics should be conducted to determine alternatives for improving fish passage at this site. Removal of the concrete channel and bank revetment and potentially widening of the bridge and channel may provide the most effective fish passage alternative at this site.

Barrier ID: SY_SM_10

Stream: San Miguelito Creek

Barrier Type: Culvert crossing

Physical Location: Miguelito Road crossing upstream of Miguelito County Park

GPS Location: N 34° 34' 47.9" W 120° 30' 21.0"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: This 5-foot diameter corrugated metal culvert pipe measured 60 feet long and has a moderately steep slope. The height from the lip of the downstream end of the culvert to the streambed below measured 12 inches. This culvert appears to be undersized for this channel.

Diagnosis: This long culvert impedes or prevents upstream salmonid passage due to shallow water depths and excessive water velocities encountered during low and high flows, respectively. Depending on velocities encountered during migration flows, the culvert may allow extremely difficult upstream migration for larger salmonids during moderate flows. No ground surveying was conducted upstream of this structure. Scott Engblom of COMB has identified a waterfall approximately 5 feet tall with a limited downstream pool approximately 1.0 mile upstream from the County Park. This waterfall likely impedes or prevents upstream passage, but may allow limited passage for adult steelhead during high stream flows.

Recommended Action: Due to the presence of salmonids in this stream, passage conditions at this site should be improved to facilitate habitat connectivity. Protecting and improving habitat conditions for the San Miguelito Creek rainbow trout population may have direct benefits for the Santa Ynez River steelhead population by providing adequate passage for outmigrating smolts.

Barrier ID: SY_SM_CE_1

Stream: Celite Creek

Barrier Type: Culvert crossing

Physical Location: Eastern San Miguelito Creek tributary at Celite Road crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown



Upstream end of culvert

Description: Permission to access and survey the culvert and adjacent channel was not obtained and limited observations were made from the public road. The culvert appears to be a box culvert measuring approximately 200 feet long based on the road width and fill.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions are not known. This long culvert likely prevents upstream salmonid passage due to shallow water depths or excessive water velocities encountered during low and high flows, respectively.

Recommended Action: Contact the County and landowner(s) to seek permission to survey upstream habitat conditions and the culvert. Should adequate upstream salmonid habitat occur, fish passage alternatives should be identified and discussed with the crossing stakeholders.

Barrier ID: SY_SM_TT_1

Stream: Thicket Creek (unnamed eastern San Miguelito Creek tributary)

Barrier Type: Box Culvert

Physical Location: Approximately 1.5 miles downstream from SY_SM_9

GPS Location: N 34° 35' 58.8" W 120° 27' 47.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to ground survey the adjacent channel was not obtained and limited observations were made from the public road. This box culvert measured approximately 10 feet wide by 9 feet tall and approximately 130 feet long. There is a riprap apron that extends downstream at a steep gradient for approximately 25 feet.

Diagnosis: Passage severity at this site could not be accurately determined and upstream salmonid habitat conditions are not known. This long culvert likely prevents upstream salmonid passage due to shallow water depths or excessive water velocities encountered during low and high flows, respectively. In addition, the steep downstream apron further adds to the shallow water depth and excessive water velocity problem encountered within the culvert.

Recommended Action: Contact landowner(s) to seek permission to survey upstream habitat conditions and the culvert. Should adequate upstream salmonid habitat occur, fish passage alternatives should be identified and discussed with the crossing stakeholders.

Barrier ID: SY_PA_1

Stream: Purisima Creek

Barrier Type: Concrete flood control channel

Physical Location: Purisima Road crossing downstream to the Santa Ynez River

GPS Location: N 34° 40' 4.8" W 120° 26' 20.6" (at Rucker Road)

Ownership/Interest: Santa Barbara County Public Works- Flood Control

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Rucker Road Crossing

Description: Permission to ground survey this entire structure and adjacent private land was not obtained. Observations of this culvert crossing were made from public roads and are limited in detail. This concrete channel has 6-foot tall walls and measured 6 feet wide along the bottom. The concrete channel appears to extend all the way downstream to the confluence with the Santa Ynez River and extends upstream to the Purisima Road crossing.

Diagnosis: During high flows, this concrete channel is likely impassable due to the lack of roughness and resting spots for fish. During low flows, the structure is impassable due to the shallow water depths encountered. During moderate flows, limited upstream migration may be possible depending on the overall length, slope changes, and outlet conditions. A detailed assessment of the entire channel is needed to accurately assess fish passage severity.

Recommended Action: Work with the county to assess this channel and investigate passage alternatives at this site. The most effective solution for fish passage would involve removal of the concrete channel and stabilization of the banks using biotechnical techniques.

Barrier ID: SY_PA_2

Stream: Purisima Creek

Barrier Type: Culvert crossing

Physical Location: Purisima Road crossing

GPS Location: N 34° 40' 11.3" W 120° 25' 22.6"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to ground survey all of this structure and adjacent private land was not obtained and limited observations were made from public roads. This concrete arch culvert measured 10 feet tall by 6 feet wide and is approximately 100 feet long.

Diagnosis: This culvert is likely impassable during higher flows due to the lack of roughness and resting spots for fish. During low flows the structure is also impassable due to the shallow water depths encountered. During moderate flows salmonids may be able to migrate upstream, depending on potential slope changes and outlet conditions. Additional information is needed to assess fish passage severity.

Recommended Action: Further assess culvert conditions and investigate passage alternatives at this site with stakeholders. The most effective solution for fish passage would involve removal of the culvert and adjacent concrete channel and stabilization of the banks using biotechnical techniques.

Barrier ID: SY_PA_3

Stream: Purisima Creek

Barrier Type: Footbridge with concrete footing

Physical Location: Second upstream footbridge in La Purisima State Park

GPS Location: N 34° 40' 16.4" W 120° 25' 9.8"

Ownership/Interest: California Department of Parks and Recreation

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: This footbridge sits on a 15-inch thick concrete footing that spans the stream channel and only extends underneath the bridge. The height from the downstream lip of the footing to the downstream pool surface measured 1-foot. The maximum pool depth downstream measured 10 inches.

Diagnosis: During moderate and higher flows salmonids can migrate upstream of this structure with a low to moderate degree of difficulty due to the minimal jump height onto the concrete, mild slope, and short distance across the structure. Fish passage is prevented during very low flows due to the shallow water depth encountered on the concrete footing. Spring flow is present in this reach.

Recommended Action: Low-flow fish passage conditions could be improved by providing roughness across the footing by cutting a small resting pool into the concrete with low flow channel running into the resting pool and out the downstream end of the footing. A more long-term and effective approach would be to remove all the concrete in the channel and reinforce the bridge with metal or wood cross bracing beams.

Barrier ID: SY_PA_4

Stream: Purisima Creek

Barrier Type: Footbridge with concrete footing

Physical Location: Third upstream footbridge in La Purisima State Park

GPS Location: N 34° 40' 20.7" W 120° 25' 6.2"

Ownership/Interest: California Department of Parks and Recreation

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: This concrete footing measured 20 inches thick and crossed the entire stream channel. The height from the surface of the downstream pool to the top of the footing measured 2 feet 8 inches. The maximum pool depth measured 22 inches.

Diagnosis: During moderate and higher flows salmonids can migrate upstream of this structure with a low to moderate degree of difficulty due to the short jump height onto the concrete and short distance across the footing. Fish passage is prevented during very low flows due to the shallow water depth encountered on the concrete footing.

Recommended Action: Low flow fish passage conditions could be improved by cutting a roughened channel and notch across the footing. A more long-term and effective approach would be to remove all the concrete in the channel and reinforce the bridge and stabilizing adjacent banks.

Barrier ID: SY_PA_5

Stream: Purisima Creek

Barrier Type: Culvert crossing

Physical Location: La Purisima State Park Road crossing

GPS Location: N 34° 40' 21.4" W 120° 25' 6.2"

Ownership/Interest: California Department of Parks and Recreation

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: This concrete box culvert measured 4 feet tall by 6 feet wide and is approximately 30 feet long. The height from the downstream pool surface to the downstream lip of the culvert measured 10 inches. The maximum pool depth observed was 12 inches.

Diagnosis: This culvert is impassable during low flows due to insufficient water depth in the culvert. The culvert is passable with a moderate to high degree of difficulty during moderate to low flows due to the absence of a jump height at those flows, mild gradient, and relatively short upstream length of the structure. Smaller salmonids would likely be prevented from upstream migration during high flows due to excessive water velocities.

Recommended Action: Investigate long-term objectives, existing flow capacity, and road crossing needs with the State Park and further investigate potential fish passage alternatives at this site in coordination with downstream barrier projects. The most effective solution for fish passage is removal of the culvert and installation of a bridge.

Barrier ID: SY_PA_6

Stream: Purisima Creek

Barrier Type: Grade control Structure

Physical Location: East of the intersection of Calle Seis and Via Lato Roads

GPS Location: N/A

Ownership/Interest: Unknown

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to ground survey this structure was not obtained and limited observations were made from Via Lato Road. This grade control structure appears to be constructed with sheets of corrugated steel. The height from the downstream riverbed to the upstream substrate is approximately 3 feet. Substrate is filled to the top of the steel grade control structure. Corrugated steel wingwalls appear to angle towards the center of the channel and extend downstream for approximately 10 feet.

Diagnosis: This structure is most likely impassable during low flows due to the shallow water conditions that spread out over the structure. No pool was observed downstream from this structure. The grade control is likely passable with a moderate to high degree of difficulty during moderate and high flows when water depth throughout this stream reach allows fish to swim or jump over the structure. Salmonid habitat conditions appear to decrease upstream from the County Park downstream were spring flows are present.

Recommended Action: Seek landowner permission to survey this grade control structure and upstream habitat conditions. Upstream habitat conditions may not warrant providing additional upstream access to salmonids.

Barrier ID: SY_PA_7

Stream: Purisima Creek

Barrier Type: Grade Control Structure

Physical Location: Approximately 250 feet upstream from SY_PA_6

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works- Flood Control

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Access to ground survey this structure was not obtained. Observations were made from Via Lato Road and are limited in detail. This concrete and corrugated steel grade control structure contains metal wingwalls that angle toward the center of the stream channel and extend downstream for approximately 10 feet. A drop of approximately 2 feet 6 inches occurs downstream from the concrete lined bottom to the natural substrate. The concrete bottom has a flat to mild slope.

Diagnosis: This structure is most likely impassable during low flows due to the shallow water conditions that spread out over the structure. No pool was observed downstream from this structure. The grade control is likely passable with a moderate to high degree of difficulty during moderate and high flows when water depth throughout this stream reaches allows fish to swim or jump over the structure. Salmonid habitat conditions appear to decrease upstream from the County Park downstream where spring flows are present.

Recommended Action: Seek landowner permission to survey this grade control structure and upstream habitat conditions. Upstream habitat conditions may not warrant providing additional upstream access to salmonids.

Barrier ID: SY_PA_8

Stream: Purisima Creek

Barrier Type: Grade control structure

Physical Location: Approximately 300 feet upstream from SY_PA_7

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works- Flood Control

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Access to ground survey this structure was not obtained. Observations were made from Via Lato Road and are limited in detail. This concrete and corrugated steel grade control structure contains metal wingwalls that angle toward the center of the stream channel and extend downstream for approximately 10 feet. A drop of approximately 2 feet 6 inches occurs downstream from the concrete lined bottom to the natural substrate.

Diagnosis: This structure is most likely impassable during low flows due to the shallow water conditions that spread out over the structure. No pool was observed downstream from this structure. The grade control is likely passable with a moderate to high degree of difficulty during moderate and high flows when water depth throughout this stream reaches allows fish to swim or jump over the structure. Salmonid habitat conditions appear to decrease upstream from the County Park downstream where spring flows are present.

Recommended Action: Seek landowner permission to survey this grade control structure and upstream habitat conditions. Upstream habitat conditions may not warrant providing additional upstream access to salmonids.

Barrier ID: SY_PA_9

Stream: Purisima Creek

Barrier Type: Grade Control Structure

Physical Location: Approximately 250 feet upstream from SY_PA_8

GPS Location: NA

Ownership/Interest: Santa Barbara County Public Works- Flood Control

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Access to ground survey this structure was not obtained. Observations were made from Via Lato Road and are limited in detail. This concrete and corrugated steel grade control structure contains metal wingwalls that angle toward the center of the stream channel and extend downstream for approximately 10 feet. A drop of approximately 3 feet occurs downstream from the concrete lined bottom to the natural substrate. The concrete bottom has a flat to mild slope.

Diagnosis: This structure is most likely impassable during low flows due to the shallow water conditions that spread out over the structure. No pool was observed downstream from this structure. The grade control is likely passable with a moderate to high degree of difficulty during moderate and high flows when water depth throughout this stream reaches allows fish to swim or jump over the structure. Salmonid habitat conditions appear to decrease upstream from the County Park downstream where spring flows are present.

Recommended Action: Seek landowner permission to survey this grade control structure and upstream habitat conditions. Upstream habitat conditions may not warrant providing additional upstream access to salmonids.

Barrier ID: SY_PA_10

Stream: Purisima Creek

Barrier Type: Culvert crossing

Physical Location: Calle Lindero Road Crossing

GPS Location: N 34° 42' 0.1" W 120° 25' 28.5"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Metal revetment downstream from culvert

Description: Permission to ground survey this structure was not obtained and limited observations were made from Calle Lindero Road. This culvert appears to be a box culvert measuring approximately 40 feet long.

Diagnosis: This structure is most likely impassable during low flows due to the shallow water conditions that occur inside the culvert. Depending on the outlet conditions and slope characteristics this culvert may be passable with a moderate to high degree of difficulty during moderate flows when water depth allows fish to swim into and through the culvert. High flows likely prevent passage due to excessive velocities and due to the lack of resting areas.

Recommended Action: Seek permission from upstream landowners to determine if suitable salmonid habitat occurs upstream of this structure. If adequate habitat occurs, begin discussion with the County, after downstream barriers have been improved, to determine the desirability of this structure and potential fish passage alternatives at this site.

Barrier ID: SY_PA_11

Stream: Purisima Creek

Barrier Type: Grade Control Structure

Physical Location: Approximately 60 feet Upstream from Calle Lindero

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works- Flood Control

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to ground survey this structure was not obtained and limited observations were made from Calle Lindero Road. This concrete grade control structure covers the bottom of the stream channel and extends upstream over 25 feet with an irregular surface and moderately steep slope.

Diagnosis: This structure is impassable during low flows due to the shallow water conditions that spread out over the structure. No pool formation was observed downstream from this structure. The grade control is likely passable with a moderate to high degree of difficulty during moderate flows when water depth throughout this stream reach allows fish to swim onto and across the irregular concrete bottom and along the stream margins. Insufficient flows and poor upstream salmonid habitat conditions would likely deter salmonids from migrating further upstream historically and may continue to do so.

Recommended Action: Determine if suitable salmonid habitat occurs upstream of this structure. If adequate habitat occurs, seek landowner permission to survey this stream reach and grade control structure. If fish passage is found to be significantly impeded, begin discussions with the County and landowners to determine desirability of the structure and potential fish passage alternatives at this site.

Barrier ID: SY_PA_CA_1

Stream: Cebada Creek

Barrier Type: Flood Control Channel/Aqueduct

Physical Location: Extends from approximately 0.25 mile downstream of the Purisima Road crossing to the confluence with Purisima Creek

GPS Location: N 34° 40' 4.5" W 120° 25' 14.9"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Downstream from Mission Gates Road Crossing

Description: Permission to survey this entire structure and adjacent private lands was not obtained and limited observations were made from public roads. This concrete channel is constructed with 4-foot tall walls and measured 6 feet wide at the base. The channel is relatively flat and has a small amount of deposited silt along the bottom.

Diagnosis: This extremely long concrete channel is impassable during low flows when water depths are insufficient. With moderate and higher flows water velocities may exceed the swimming capabilities of salmonids when extended over the entire length of the channel that likely has minimal velocity breaks.

Recommended Action: Determine if suitable salmonid habitat occurs upstream of this structure on Cebada Creek. Upstream habitat observed from the roads appears to be relatively poor and intermittent. If adequate habitat does occur, begin discussion with the County to determine potential fish passage and stream restoration alternatives at this site.

Barrier ID: SY_PA_CA_2

Stream: Cebada Creek

Barrier Type: Culvert crossing

Physical Location: Purisima Road Crossing

GPS Location: N 34° 39' 53.8" W 120° 24' 27.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to ground survey this structure from adjacent private land was not obtained. Observations of this culvert crossing were made from Purisima Road and are limited in detail. Judged by the road width, the culvert measures approximately 100 to 120 feet in length.

Diagnosis: Additional information is needed to assess fish passage severity at this crossing, should passage upstream be warranted. Is likely that this culvert impedes passage to some degree during low and high flows due to insufficient flows and excessive water velocities, respectively.

Recommended Action: Further assess upstream salmonid habitat conditions with landowner permission. Should adequate habitat conditions occur upstream, work with the County to assess hydraulic and channel conditions at this site and investigate passage alternatives. The most effective solution for fish passage would involve removal of the culvert and installation of a bridge. Such a project may not provide a significant benefit to salmonids.

Barrier ID: SY_PA_CA_3

Stream: Cebada Creek

Barrier Type: Concrete channelization

Physical Location: Under Avena Road crossing

GPS Location: N 34° 40' 46.2" W 120° 23' 34.1"

Ownership/Interest: Santa Barbara County Public Works-Roads Division/Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: This concrete channel is approximately 65 feet long. Sacrete walls that are 7 feet tall run the distance of the concrete channel for all but the downstream 20 feet. The downstream 20 feet of the concrete channel becomes an apron with a steep slope to the stream channel below. The apron drops a vertical height of approximately 10 feet. Concrete block walls extend downstream to the end of the structure for the last 20 feet.

Diagnosis: This is most likely a barrier during all flow conditions due to excessive velocities produced across the steep slope of the downstream apron and lack of resting areas. During high stream flows, the downstream channel may fill up enough to allow a difficult jump across the apron and onto the relatively flat channel bottom and facilitate extremely difficult upstream passage.

Recommended Action: Further assess upstream salmonid habitat conditions with landowner permission. Should adequate habitat conditions occur upstream, work with the owners to assess hydraulic and channel conditions and investigate passage alternatives at this site. The most effective solution for fish passage would involve removal of the channel, bank stabilization using biotechnical techniques, and installation of a wider span bridge.

Barrier ID: SY_PA_CA_4
Stream: Cebada Creek
Barrier Type: Concrete Channelization
Physical Location: Cooper Road Crossing
GPS Location: N 34° 40' 48.3" W 120° 23' 15.6"
Ownership/Interest: Private
Surveyor(s) and Date: Shaw Allen 11/18/03
Barrier Status: Partial



Description: Permission to ground survey this structure and adjacent land was not obtained and limited observations were made from Cebada Canyon Road. This concrete channel is approximately 25 feet long and has a 20-foot long concrete apron attached to the downstream end.

Diagnosis: This is most likely a barrier during certain flow conditions due to excessive velocities produced across the downstream apron and lack of resting areas. Additional information is needed to accurately assess fish passage at this site.

Recommended Action: Further assess upstream salmonid habitat conditions with landowner permission. Should adequate habitat conditions occur upstream, work with the owners to assess hydraulic and channel conditions and investigate passage alternatives at this site. The most effective solution for fish passage would involve removal of the channel, bank stabilization using biotechnical techniques, and installation of a wider span bridge.

Barrier ID: SY_PA_CA_5

Stream: Cebada Creek

Barrier Type: Low-flow road crossing

Physical Location: Adjacent to the end of Cebada Canyon Road

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to survey this structure and adjacent private land was not obtained and limited observations were made from Cebada Canyon Road. The crossing appears to be a low-flow road that is constructed at or near streambed level.

Diagnosis: A more detailed assessment of the structure is needed to determine fish passage severity.

Recommended Action: Seek landowner permission to survey this structure and assess fish passage severity. Upstream habitat quality should be assessed to ensure that adequate salmonid habitat conditions occur and fish passage improvements are warranted.

Barrier ID: SY_SS_1

Stream: Salsipuedes Creek

Barrier Type: Grade Control Structure

Physical Location: Approximately 225 feet below Santa Rosa Road bridge

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works-Roads Division

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial



Description: Permission to ground survey this ford and adjacent stream channel was not obtained and limited observations were made from the Santa Rosa Road Bridge. This structure consists of medium to large boulders that have been placed in and across the creek channel. Tractor tread marks were present in the bottom of the stream channel and willow trees have been removed by large machinery. The structure was reportedly built by the County Roads Division as a control point (pers. comm. Engblom).

Diagnosis: This structure acts like a small dam and impedes stream flow, blocking fish passage. High flows will likely blow this temporary ford out, but moderate and low flow conditions before high flows may not be able to break apart the ford preventing salmonid passage. Reducing low and moderate flow salmonid migration in this highly important steelhead spawning and rearing tributary will significantly delay or prevent upstream migration.

Recommended Action: This structure should be removed or reduced in vertical height immediately and the construction of such grade controls in the future should be discouraged. Contact the county and determine why this structure was built and identify alternative measures that do not impede fish passage.

Barrier ID: SY_SS_2

Stream: Salsipuedes Creek

Barrier Type: Bridge with grade control (modified with a fish passage facility)

Physical Location: Highway 1 road crossing

GPS Location: N 34° 35' 49.1" W 120° 24' 43.3"

Ownership/Interest: California Department of Transportation/COMB

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial



Description: A boulder and concrete grade control structure occurs immediately downstream from the bridge and spans approximately 60 feet across the entire stream channel. The downstream length varies from approximately 12 to 20 feet. The vertical height from the top of the grade control to the surface of the downstream pool measured approximately 5 feet. The structure was modified to enhance upstream steelhead passage. A series of three pools were created in the grade control by notching them out and a concrete wall was constructed along the downstream river-right edge of the pools that angles toward the river-left and downstream pool. A low elevation point in the grade control was created at the upstream end of the step pools to focus low flows into the fishway.

Diagnosis: Prior to the construction of this fishway, the grade control was impassable during low-moderate flows due to the combined vertical and horizontal jump distance across the structure and shallow water depth on top. The existing fishway provides low to moderate flow fish passage for adult and juvenile steelhead by creating adequate water depth, jump heights, and resting pools across the structure. The structure and fishway have significantly improved the window of opportunity for salmonids to migrate upstream during a wider range of flows, but may continue to limit upstream migration of smaller salmonids during certain flow situations. During high flows, the capacity of the fishway is exceeded and water conditions inside may become too turbulent for salmonids to migrate through it. During these high flows, however, the downstream pool depth

increases to the point where adult steelhead can jump over the entire structure with a moderate degree of difficulty. Upstream juvenile migration may be prevented during these high flows, but the importance of their upstream migration during such high stream flows is questionable. The fishway design appears to be effective under current conditions and proper maintenance. The effectiveness of this fishway depends on the resting pools being free of substrate deposition and debris blockages.

Recommended Action: Continued monitoring and maintenance of this fishway and grade control is needed to ensure that the resting pools, concrete curb, and downstream pool provide adequate passage through the site. This site should be checked immediately following high winter flows to ensure that the fishway is free of debris and large substrate. A long-term consideration at this site, in coordination with maintenance plans and available funding, is the removal of the entire grade control structure, stabilization of the stream grade and bridge using biotechnical techniques, and creation of a naturalized stream channel. This option would provide the most effective and sustainable fish passage, reduce or eliminated maintenance and monitoring costs, and may provide significant downstream sediment movement benefits to the watershed.

Barrier ID: SY_SS_3

Stream: Salsipuedes Creek

Barrier Type: Grade Control Structure

Physical Location: Approximately 80 feet downstream from Jalama Road Bridge

GPS Location: N/A

Ownership/Interest: COMB

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial



Description: This concrete grade control structure crosses the creek for a width of approximately 35 feet and is 3 feet 6 inches thick. The height from the top of the structure to the surface of the downstream pool is approximately 4 feet. The maximum downstream pool depth measured 4 feet. Low stream flows are concentrate over a low point in the structure from the middle of the structure to the bedrock on river-left. The upstream portion of the structure is submerged by the tailout of the large upstream pool.

Diagnosis: Due to the sufficient downstream pool depth and the moderate jump height, adult steelhead can jump over the structure and land in the upstream pool during moderate and higher flows and likely during the observed low flows of fall. Juvenile salmonids can jump the structure with a 1-2 foot increase in downstream pool depth during moderate flows. During extremely high flows, adult steelhead can likely jump the structure and/or migrate up the irregular bedrock sloping past the river-right side of the grade control. A natural bedrock tailwater control occurs downstream from the pool.

Recommended Action: COMB is the lead agency overseeing a project to construct three L-shaped pools downstream of the structure to provide a wider range of passage flows for steelhead. The project is expected to improve low and moderate flow migration and should be completed before the end of January 2004 (pers. comm. Engblom).

Barrier ID: SY_SS_4

Stream: Salsipuedes Creek

Barrier Type: Culvert crossing

Physical Location: Old Jalama Road

GPS Location: N 34° 32' 25.8" W 120° 23' 31.3"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/Private

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Unknown

Description: Permission to ground survey the crossing and adjacent stream channel was not obtained and limited observations were made from Jalama Road. The structure appears to be a culvert underneath a private driveway that may have been the old Jalama Road. This crossing is approximately 0.25 mile upstream from the confluence of the east and west tributaries that form the headwaters to Salsipuedes Creek. The culvert appears to be approximately 40 feet long.

Diagnosis: Fish passage severity at this site could not be accurately determined, but the structure likely impedes or prevents upstream salmonid migration due to shallow water depth or excessive velocities encountered within culverts of this type.

Recommended Action: Contact the landowner(s) to seek access to survey upstream habitat conditions and the crossing. Should adequate upstream salmonid habitat occur and a significant barrier be present at the crossing, fish passage alternatives should be identified and discussed with the crossing stakeholders. Removal of the crossing and installation of a bridge that does not impact the stream channel would provide the most effective fish passage alternative and transportation option.

Barrier ID: SY_SS_5

Stream: Salsipuedes Creek

Barrier Type: Steep Gradient

Physical Location: Downstream of Jalama Road crossing #3

GPS Location: N 34° 31' 41.8" W 120° 23' 8.8" (upstream end of gradient at road)

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Complete



Description: Permission to access and survey this upper reach of Salsipuedes Creek was not obtained and limited observation were made from the road. This natural steep gradient feature occurs immediately downstream from the upper Jalama Road crossing and extends downstream for several hundred feet. The stream in this reach is dry and does not appear to contain adequate salmonid habitat and flow.

Diagnosis: Further upstream steelhead migration is not likely due to the excessive gradient and lack of sufficient flow and adequate salmonid habitat.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_SS_DY_1

Stream: Dry Creek (unnamed western tributary on lower Jalama Road)

Barrier Type: Culvert crossing

Physical Location: Jalama Road crossing

GPS Location: N 34° 35' 1.9" W 120° 24' 38.9"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial



Description: Permission to ground survey the stream channel adjacent to this crossing was not obtained and limited observations were made from Jalama Road. The box culvert appears to measure approximately 45 feet long and 5 feet wide by 6 feet tall inside. The downstream end of the culvert is at streambed level.

Diagnosis: Fish passage severity at this site could not be accurately determined, but is likely impeded due to shallow water depth or excessive velocities encountered within culverts of this type. This small and dry tributary may not contain adequate salmonid habitat upstream and may not warrant any fish passage project.

Recommended Action: Contact the landowner(s) to seek access to survey upstream habitat conditions and the crossing. Should adequate upstream salmonid habitat occur, fish passage alternatives should be identified and discussed with the County. Removal of the crossing and installation of a bridge that does not impact the stream channel would provide the most effective fish passage alternative and transportation option.

Barrier ID: SY_SS_SH_1

Stream: School House Creek (unnamed western tributary upstream from La Hoya)

Barrier Type: Boulders in channel

Physical Location: Under Jalama Road bridge crossing

GPS Location: N 34° 34' 8.1" W 120° 24' 34.0"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Not a Barrier



Description: Permission to access and ground survey the private land adjacent to the crossing was not obtained and limited observations were made from Jalama Road. Boulders appear to have been placed in the stream channel and on the banks underneath the bridge. The boulders extend upstream for approximately 25 feet and downstream for approximately 45 feet. The stream channel still functions like a natural creek.

Diagnosis: No barrier was observed as a result of the boulders. Excellent salmonid habitat and late summer/fall stream flow occurs in this tributary. Three “springs” are shown to occur at the head of upstream tributaries that likely contribute to the observed surface flows at the crossing. This tributary appears to have adequate salmonid habitat and direct benefits for the steelhead population of Salsipuedes Creek.

Recommended Action: No recommended action.

Barrier ID: SY_SS_SH_LH_1

Stream: La Hoya Creek

Barrier Type: Culvert crossing

Physical Location: Jalama Road Crossing

GPS Location: N 34° 34' 41.6" W 120° 24' 46.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial



Description: Permission to access and ground survey the private land adjacent to the culvert was not obtained and limited observations were made from Jalama Road. This concrete box culvert conveys flows approximately 75 feet under the road.

Diagnosis: Additional analysis is needed to determine the severity of this culvert. The culvert may be impassable to upstream migrating salmonids during low flows due to shallow flow conditions encountered in the culvert. During higher flows, excessive velocities through the culvert may limit or completely block upstream passage.

Recommended Action: Providing effective passage at this site might provide a direct benefit to the existing Santa Ynez River/Salsipuedes Creek steelhead population. Contact the landowner(s) to seek access to survey upstream habitat conditions and the crossing. If adequate salmonid habitat occurs upstream and a significant barrier is present at the crossing then fish passage alternatives should be identified and discussed with the County. The preferred CDFG and NMFS treatment option for fish passage and transportation benefits would involve removal of the culvert and installation of a bridge that does not impact the stream channel.

Barrier ID: SY_SS_EJ_1

Stream: El Jaro Creek

Barrier Type: Bridge

Physical Location: First private bridge upstream from Salsipuedes Creek ~ 0.25 mile

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial

Description: Permission to ground survey this crossing and adjacent stream channel was not obtained and limited observations were made from Highway 1. The structure appears to be a wood and steel bridge. The Santa Ynez River Fish Management Plan describes an old ford crossing in this area that occurs on private land and on a road that is unused. The report describes the existence of a concrete apron that has a 3-foot drop downstream of it.

Diagnosis: The stream channel at this site could not be observed and presence of a barrier under the bridge not determined. The Santa Ynez River Fish Management Plan describes the concrete ford structure as a low-flow passage barrier that occurs approximately 50-75 feet upstream from the Cross Creek Bridge.

Recommended Action: Contact the landowner(s) to seek access to survey the crossing and discuss present and future uses at the site. Also, seek access to survey adjacent stream reaches to determine if an additional crossings occurs in this area that may limit fish passage. Adequate and abundant upstream salmonid habitat occurs in El Jaro Creek and the reportedly abandoned ford should be removed to provide effective migration during all flow conditions.

Barrier ID: SY_SS_EJ_2
Stream: El Jaro Creek
Barrier Type: Bridge
Physical Location: Ranch San Julian Bridge
GPS Location: N/A
Ownership/Interest: Private
Surveyor(s) and Date: Shaw Allen 11/19/03
Barrier Status: Unknown

Description: Permission to access and ground survey this crossing and adjacent stream channel was not obtained and limited observations were made from Highway 1. The structure appears to be a wood and steel bridge.

Diagnosis: The stream channel at this site could not be observed and presence of a barrier under the bridge not determined.

Recommended Action: Contact the landowner(s) to seek permission to survey upstream habitat conditions and the crossing. Adequate and abundant upstream salmonid habitat occurs in El Jaro Creek and if a significant barrier is present at the crossing then fish passage alternatives should be identified and discussed with the landowner.

Barrier ID: SY_SS_EJ_LG_1

Stream: Long Creek

Barrier Type: Culvert

Physical Location: Approximately 400 feet upstream from Highway 1 Bridge

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Unknown



Description: Permission to ground survey the crossing and adjacent stream channel was not obtained and limited observations were made from Highway 1. The private crossing appears to be dirt fill on top of a culvert. This crossing occurs on Long Canyon Creek just upstream from the confluence with El Jaro Creek.

Diagnosis: Additional analysis is needed to determine the severity of this culvert. The culvert may be impassable to upstream migrating salmonids during low flows due to shallow flow conditions encountered in the culvert. During higher flows, excessive velocities through the culvert may limit or completely block any upstream passage.

Recommended Action: Providing effective passage at this site might provide a direct benefit to the existing Santa Ynez River/Salsipuedes Creek steelhead population. Contact the landowner(s) and seek permission to survey upstream habitat conditions and the crossing. If adequate salmonid habitat occurs upstream and a significant barrier is present at the crossing then fish passage alternatives should be identified and discussed with the landowner. The most effective solution for fish passage and transportation benefits would involve removal of the culvert and installation of a bridge.

Barrier ID: SY_SS_EJ_AT_1

Stream: Atascoso Creek

Barrier Type: Culvert crossing

Physical Location: Highway 1 crossing

GPS Location: N 34° 31' 9.8" W 120° 18' 41.3"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial



Description: Permission to ground survey the private land adjacent to the culvert was not obtained and limited observations were made from Highway 1. This corrugated metal culvert measured 5 feet in diameter and approximately 275 feet long. Surface flow and adequate salmonid habitat were observed at the upstream end of this culvert.

Diagnosis: This culvert is most likely impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered and small downstream jump. During higher flows, excessive velocities through the entire structure likely limit or completely block any upstream passage. During ideal moderate flow conditions, a large healthy adult may be able to swim through this structure with a high degree of difficulty. The presence of good surface flow during late-fall indicates that this tributary may provide valuable spawning and rearing habitat upstream for steelhead and fish passage should be improved at this site.

Recommended Action: Providing effective passage at this site would likely provide a direct benefit to the existing Santa Ynez River/Salsipuedes Creek steelhead population. Conduct a more detailed analysis of this crossing with landowner permission and CALTRANS involvement. Investigate passage alternatives at this site with CALTRANS. The most effective solution for fish passage and stream and transportation benefits would involve removal of the culvert and installation of a wide-span bridge.

Barrier ID: SY_SS_EJ_AO_1

Stream: Alamo Creek

Barrier Type: Culvert crossing

Physical Location: Highway 1 crossing

GPS Location: N 34° 31' 21.3" W 120° 18' 14.7"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Partial

Description: Permission to ground survey this crossing was not obtained and limited observations were made from Highway 1. The culvert appears to measure approximately 250 feet long.

Diagnosis: Fish passage severity at this site could not be accurately determined, but is likely impeded due to shallow water depth or excessive velocities encountered within culverts of this type.

Recommended Action: Contact the landowner(s) to seek access to survey upstream habitat conditions and the crossing. Should adequate upstream salmonid habitat occur, fish passage alternatives should be identified and discussed with the crossing stakeholders. Removal of the crossing and installation of a bridge that does not impact the stream channel would provide the most effective fish passage alternative and transportation option.

Barrier ID: SY_SI_1

Stream: Santa Rita Creek

Barrier Type: Culvert crossing

Physical Location: Highway 246 crossing

GPS Location: N 34° 39' 49.7" W 120° 19' 47.8"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Partial

Description: Permission to ground survey this crossing and adjacent channel was not obtained and limited observations were made from the Highway 246 crossing. The culvert appears to be a small box culvert that extends approximately 75 feet under Highway 246.

Diagnosis: Fish passage severity at this site could not be accurately determined, but is likely impeded due to the shallow water depth or excessive velocities encountered in the culvert. This tributary does not appear to contain adequate salmonid habitat or perennial flow and may not warrant fish passage improvements.

Recommended Action: Contact upstream landowner(s) and seek permission to survey upstream habitat conditions and the crossing. Should adequate upstream salmonid habitat occur, fish passage alternatives at this site should be identified and discussed with CALTRANS.

Barrier ID: SY_SR_1

Stream: Santa Rosa Creek

Barrier Type: Bridge crossing

Physical Location: Santos Road crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Unknown

Description: Permission to ground survey this crossing and adjacent channel was not obtained and limited observations were made from the public road. The bridge appears to be made of wood and steel.

Diagnosis: Fish passage conditions at this site could not be determined. The tributary does not appear to contain adequate salmonid habitat or perennial flow and may not warrant fish passage improvements.

Recommended Action: Contact the landowner(s) to seek access to survey upstream habitat conditions and the crossing. Should adequate upstream salmonid habitat occur and a barrier occurs at the crossing, fish passage alternatives should be identified and discussed with the crossing stakeholders.

Barrier ID: SY_SR_2

Stream: Santa Rosa Creek

Barrier Type: Culvert crossing

Physical Location: Approximately 450 feet upstream from the Highway 246 Bridge

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen

Barrier Status: Partial



Description: Permission to ground survey this crossing and adjacent channel was not obtained and limited observations were made from Drum Canyon Road. The culvert appears to be 3 to 4 feet in diameter and approximately 35 feet long. The downstream end of the culvert appears to be perched over 5 feet and the slope of the culvert steep.

Diagnosis: Fish passage severity at this site could not be accurately determined, but appears to be impassable due to the perched jump height and shallow water depth or excessive velocities encountered within the culvert. The culvert is likely undersized for a 100 year flow. The tributary may not contain adequate salmonid habitat or perennial flow and may not warrant fish passage improvements.

Recommended Action: Contact the landowner(s) to seek access to survey upstream habitat conditions and the crossing. Should adequate upstream salmonid habitat occur and a barrier exists at the crossing, fish passage alternatives should be identified and discussed with the crossing stakeholders. Removal of the crossing and installation of a bridge that does not impact the stream channel would provide the most effective fish passage alternative.

Barrier ID: SY_SR_3

Stream: Santa Rosa Creek

Barrier Type: Culvert crossing

Physical Location: Approximately 650 feet upstream from Highway 246

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/18/03

Barrier Status: Partial



Description: Permission to ground survey this crossing and adjacent channel was not obtained and limited observations were made from Drum Canyon Road. The culvert appears to be 3 to 4 feet in diameter and approximately 35 feet long. Walls constructed of concrete cinder blocks encase the ends of the culvert.

Diagnosis: Fish passage severity at this site could not be accurately determined, but may be impeded due to the shallow water depth or excessive velocities encountered within culverts of this type. The culvert is likely undersized for a 100 year flow. The tributary may not contain adequate salmonid habitat or perennial flow and may not warrant fish passage improvements.

Recommended Action: Contact the landowner(s) to seek permission to survey upstream habitat conditions and the crossing. Should adequate upstream salmonid habitat occur and a significant barrier be present at the crossing, fish passage alternatives should be identified and discussed with the crossing stakeholders. Removal of the crossing and installation of a bridge that does not impact the stream channel would provide the most effective fish passage alternative and transportation option.

Barrier ID: SY_BG_1

Stream: Burning Creek (unnamed Santa Ynez River tributary between Burning Creek Ranch and Lafond Winery)

Barrier Type: Culvert

Physical Location: Santa Rosa Road crossing

GPS Location: N 34° 35' 41.3" W 120° 16' 5.7"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/19/03

Barrier Status: Unknown

Description: This culvert crossing was observed from the surface of Santa Rosa Road and culvert conditions were not surveyed due to the lack of permission to access private property. Observations of the culvert were extremely limited. Based on the road and fill length observed the culvert is approximately 100 feet long.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions are unknown.

Recommended Action: Contact landowner(s) and seek access to survey upstream habitat and conditions surrounding the crossing and channel at this site.

Barrier ID: SY_ZA_1

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Santa Rosa Road/Avenue of the Flags crossing

GPS Location: N 34° 36' 43.2" W 120° 11' 36.7"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Partial

Description: Permission to ground survey the private land adjacent to the culvert was not obtained and limited observations were made from Santa Rosa Road. Access to observe the culvert outlet was fenced off and potential jump heights downstream were not observed. This culvert consists of two concrete boxes that are 6 feet square. The total length of the culvert is approximately 220 feet.

Diagnosis: This culvert is impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered. During higher flows, excessive velocities through the long culvert likely limit or completely block any upstream passage. This structure is likely impassable to most fish at most flows and severely impedes or blocks access to most of this tributary.

Recommended Action: Seek landowner permission to conduct a more detailed assessment of salmonid habitat conditions in Zaca Creek and determine potential benefits to providing steelhead access to this tributary. Zaca Creek lacked surface flow at road crossings observed during surveying in November. If adequate salmonid habitat is found, mainly surface flows, investigate passage alternatives at this site with the County. The most effective solution for fish passage is removal of the culvert and installation of a bridge.

Barrier ID: SY_ZA_2

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Highway 246 crossing to upstream end of Best Western parking lot

GPS Location: N 34° 36' 45.8" W 120° 11' 30.5"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Partial



Description: This double box culvert consists of two identical culverts that each measure 10 feet wide by 7 feet tall. The length of the culvert is approximately 700 feet. The height from the downstream lip of the culvert bottom to the downstream substrate measured 6 inches. In addition to the road crossings on top, this culvert also has developments like a parking lot built on top of it.

Diagnosis: This culvert is most likely impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered inside the culvert. During moderate flows, adequate depth and velocities may allow salmonids to enter the culvert, but the long length of the culvert and lack of resting spots would likely wear out upstream migrating salmonids. During higher flows, excessive velocities through the long culvert and lack of resting spots likely prevent any upstream passage. This structure is likely impassable to most fish at most flows and severely impedes or blocks access to most of this tributary.

Recommended Action: Further assess salmonid habitat condition and potential in this drainage to determine if fish passage projects are warranted. Conduct a more detailed analysis of this crossing with County involvement. Investigate passage alternatives at this site with the County. Extensive developments on top of this culvert (Best Western) present a challenge to restoring this stream reach and fish passage.

Barrier ID: SY_ZA_3

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Downstream-most Highway 101 crossing #1

GPS Location: N 34° 36' 59.3" W 120° 11' 16.4"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Partial



Description: This crossing consists of three box culverts that each measure 8 feet wide by 57 inches tall. The approximate length of the culvert is 300 feet. Immediately upstream from the culvert there is a pipe discharging a milky white liquid into the stream channel. The bottom of the culvert occurs at streambed level and has a mild gradient.

Diagnosis: This culvert would be impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered inside the culverts. During moderate flows, upstream passage may be possible depending on water depth and velocities encountered in each culvert. Excessive velocities inside the culverts would likely impede or block upstream passage during high velocities.

Recommended Action: Conduct a more detailed analysis of this crossing and upstream habitat conditions with landowner permission and CALTRANS involvement. If adequate upstream habitat conditions are identified, investigate passage alternatives at this site with CALTRANS. The most effective solution for fish passage would involve removal of the culvert and installation of a bridge.

Barrier ID: SY_ZA_4

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: McMurray Road crossing

GPS Location: N 34° 37' 5.2" W 120° 11' 13.5"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Complete



Description: This culvert consists of three concrete boxes each measuring 8 feet wide by 5 feet tall. There is a 30-foot concrete apron at both the upstream and downstream end of the culvert. There is another 7 feet of recently poured concrete added to the downstream end of the downstream apron. The combined length of the culvert and aprons measured 353 feet long. The height from the lip of the downstream apron measured 3 inches to the downstream substrate. Wingwalls extend out for the length of the aprons both upstream and downstream of the culvert.

Diagnosis: This culvert is impassable to upstream migrating salmonids during low flows due to the shallow water depth encountered inside the culverts and on the aprons. Excessive velocities across the steep downstream apron and inside the culvert, in addition to the long distance of the structure, block upstream passage during moderate and high stream flows.

Recommended Action: Conduct a more detailed analysis of this crossing and upstream habitat conditions with landowner permission and County involvement. Investigate passage alternatives at this site with the County. The most effective solution for fish passage would involve removal of the culvert and installation of a wide-span bridge.

Barrier ID: SY_ZA_5

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Highway 101 crossing #2

GPS Location: N 34° 38' 54.1" W 120° 10' 58.0"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Complete



Description: This culvert measured 12 feet tall by 13 feet wide, at the maximum base length, and 195 feet long. Angled wingwalls extend downstream from the culvert mouth on river-right for 35 feet and on river-left for 18 feet. The height from the downstream lip of the culvert bottom to the natural streambed below measured 5 feet 6 inches.

Diagnosis: Excessive jump height and shallow water depths inside the culvert would prevent any upstream salmonid passage during low flows. During moderate to high flows, the downstream pool will likely backfill to a depth that is adequate for adult salmonids to jump into the culvert. While adequate water depth inside the culvert occurs during migration flows, excessive water velocities, moderate slope, long culvert length, and lack of resting spots would likely prevent all upstream salmonid migration.

Recommended Action: If adequate upstream salmonid habitat is identified, and in coordination with downstream fish passage improvements, conduct a more detailed analysis of this structure. Identify alternatives for fish passage with CALTRANS. The most effective fish passage and stream restoration alternative is removal of this entire structure and replacing it with a bridge.

Barrier ID: SY_ZA_6

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Highway 101 crossing #3

GPS Location: N 34° 39' 47.7" W 120° 10' 31.0"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Partial



Description: Permission to ground survey the crossing from adjacent private land was not obtained and limited observations were made from the upstream end of the culvert on top of Highway 101. No access to survey the downstream end of culvert was possible. This culvert is approximately 9 feet wide by 12 feet tall and 250 feet long. Angled wingwalls extend upstream for the length of the apron that measures approximately 20 feet long.

Diagnosis: Shallow water depth inside the culvert would prevent upstream salmonid passage during low flows. During moderate to high flows, adequate water depth inside the culvert occurs but, excessive water velocities, long culvert length, and lack of resting spots would likely prevent all upstream salmonid migration. Additional information about this culvert is needed to determine the fish passage severity.

Recommended Action: If adequate upstream salmonid habitat is identified, conduct a more detailed analysis of this structure and adjacent stream channel with landowner permission and CALTRANS involvement. Identify alternatives for fish passage. The most effective fish passage and stream restoration alternative would be to remove this entire structure and replace it with a bridge.

Barrier ID: SY_ZA_7

Stream: Zaca Creek

Barrier Type: Culvert crossing and apron

Physical Location: Highway 101 crossing #4

GPS Location: N 34° 40' 24.2" W 120° 9' 31.0"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Partial



Description: Permission to ground survey the crossing from adjacent private land was not obtained and limited observations were made from Highway 101. This culvert is approximately 8 feet wide by 12 feet tall and 300 feet long. From the top of the culvert the observed jump height from the surface of the downstream pool to the lip of the concrete apron appeared to be 2 feet. Angled wingwalls extend downstream for approximately 40 feet on river-right and for 25 feet on river-left.

Diagnosis: Shallow water depth across the downstream apron and inside the culvert would prevent any upstream salmonid passage during low flows. During moderate to high flows, adequate water depth for salmonids to swim or jump onto the apron and inside the culvert occurs. Excessive water velocities, long culvert length, and lack of resting spots would likely prevent all upstream salmonid migration through the culvert.

Recommended Action: If adequate upstream salmonid habitat is identified, and in coordination with downstream fish passage improvements, conduct a more detailed analysis of this structure. Identify alternatives for fish passage with CALTRANS. The most effective fish passage and stream restoration alternative would be to remove this entire structure and replace it with a bridge that does not impact the stream channel.

Barrier ID: SY_ZA_8

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Highway 101 crossing #5, at intersection with Zaca Station Road

GPS Location: N 34° 41' 14.0" W 120° 9' 25.2"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/14/03

Barrier Status: Unknown



Description: Permission to ground survey the crossing from adjacent private land was not obtained and limited observations were made from Highway 101. This culvert has three separate roadways crossing over it and measures over 300 feet long. Two private roads cross the culvert on either side of Highway 101.

Diagnosis: Shallow water depth inside the culvert would likely prevent any upstream salmonid passage during low flows. Adequate water depth inside the culvert likely occurs during moderate to high flows but, excessive water velocities, extremely long culvert length, and lack of resting spots likely prevents all upstream salmonid migration.

Recommended Action: If adequate salmonid habitat is identified upstream, and in coordination with downstream fish passage improvements, conduct a more detailed analysis of this structure. Identify alternatives for fish passage with CALTRANS. The most effective fish passage and stream restoration alternative would be to remove this entire structure and replace it with one or more bridges.

Barrier ID: SY_ZA_9

Stream: Zaca Creek

Barrier Type: Apron at bridge crossing

Physical Location: Zaca Station Road

GPS Location: N 34° 41' 43.0" W 120° 8' 58.1"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Partial



Concrete apron below bridge

Description: Permission to access or ground survey the concrete apron from adjacent private land was not obtained and limited observations were made from Zaca Station Road. This concrete apron extends downstream from the bridge for approximately 25 feet. The height from the bottom of the downstream substrate up to the lip of the apron is approximately 5 feet. Downstream scour has undercut the apron and caused significant bank erosion. Natural substrate occurs underneath the bridge.

Diagnosis: Fish passage would be prevented during low flows due to the excessive jump height onto the apron, lack of pool depth, and shallow water conditions that occur on the apron. The downstream pool would likely fill with adequate water depth for adult salmonids to jump onto the apron during moderate to high water flow, but excessive water velocities on the apron may limit the ability of smaller salmonids to migrate across the apron.

Recommended Action: In coordination with downstream fish passage improvements, conduct a more detailed analysis of this structure and adjacent stream channel with landowner permission and County involvement. Identify alternatives for fish passage and downstream bank protection/cattle fencing. The most effective fish passage and stream restoration alternative would be to remove the apron and stabilize the adjacent banks using biotechnical techniques.

Barrier ID: SY_ZA_10

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Approximately 600 feet upstream from Zaca Station Road crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Unknown



Description: Permission to ground survey the culvert was not obtained and limited observations were made from Zaca Station Road. One or two corrugated metal pipes with approximately 3-foot diameters appear to convey flows through an earth-fill crossing. The creek channel is extremely degraded throughout this reach.

Diagnosis: Fish passage would likely be prevented during low flows due to shallow water conditions that occur inside the culvert(s). During high water flow, excessive water velocities inside the culvert(s) would limit the ability of salmonids to migrate upstream.

Recommended Action: In coordination with downstream fish passage improvements, conduct a more detailed analysis of this structure and adjacent stream channel with landowner permission. Identify alternatives for fish passage and downstream bank protection/cattle fencing/stream restoration options. The most effective fish passage and stream restoration alternative would be to remove the apron and stabilize the adjacent banks using biotechnical techniques. Inexpensive access across the stream could be provided with an old railroad cart crossing and upstream crossings consolidated at less crossing sites.

Barrier ID: SY_ZA_11

Stream: Zaca Creek

Barrier Type: Culverts in earth fill crossing

Physical Location: Approximately 0.25 mile upstream from Zaca Station Road crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Partial



Description: Permission to ground survey the culvert was not obtained and limited observations were made from Zaca Station Road. Two corrugated metal pipes with approximately 3-foot diameters convey flows through an earthen fill crossing. The height from the downstream lip of these perched culverts to the downstream substrate appears to be approximately 2 feet.

Diagnosis: Fish passage would be prevented during low flows due to shallow water conditions that occur inside the culverts. During high water flow, excessive water velocities inside the culverts would limit the ability of salmonids to migrate upstream. Limited and difficult upstream passage may be possible during ideal, moderate flows.

Recommended Action: In coordination with downstream fish passage improvements, conduct a more detailed analysis of this crossing and adjacent stream channel with landowner permission. Identify alternatives for fish passage and bank protection/cattle fencing/stream restoration options. The most effective fish passage and stream restoration alternative would be to remove the crossing and stabilize the adjacent banks using biotechnical techniques. Inexpensive and improved access across the stream could be provided with an old railroad cart crossing and consolidated crossing sites.

Barrier ID: SY_ZA_12

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Approximately 0.3 mile upstream from Zaca Station Road crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Unknown



Description: Permission to ground survey the culvert was not obtained and limited observations were made from Zaca Station Road. One corrugated metal pipe with an approximate diameter of 4 feet conveys flows through an earthen fill crossing. The height from the downstream lip of this perched culvert to the downstream substrate appears to be approximately 2 feet. Some concrete appears to encase part of the downstream end of the culvert.

Diagnosis: Fish passage would likely be prevented during low flows due to shallow water conditions that occur inside the culvert. During high water flow, excessive water velocities inside the culvert would likely limit the ability of salmonids to migrate upstream. Limited upstream passage may be possible during ideal, moderate flows.

Recommended Action: In coordination with downstream fish passage improvements, conduct a more detailed analysis of this crossing and adjacent stream channel with landowner permission. Identify alternatives for fish passage and bank protection/cattle fencing/stream restoration. The most effective fish passage and stream restoration alternative would be to remove the crossing and stabilize the adjacent banks using biotechnical techniques. Inexpensive and improved access across the stream could be provided with an old railroad cart crossing and adjacent crossings consolidated at less crossing sites.

Barrier ID: SY_ZA_13

Stream: Zaca Creek

Barrier Type: Culvert crossing

Physical Location: Approximately 0.5 mile upstream from Zaca Station Road crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Unknown



Description: Permission to ground survey the crossing was not obtained and limited observations were made from Zaca Station Road. Presumably this earthen crossing has one or more corrugated metal pipes associated with it, as do the others downstream.

Diagnosis: Fish passage would likely be prevented during low flows due to shallow water conditions that occur inside the culvert(s). During high water flow, excessive water velocities inside the culvert(s) would likely limit the ability of salmonids to migrate upstream. Limited upstream passage may be possible during ideal, moderate flows.

Recommended Action: In coordination with downstream fish passage improvements, conduct a more detailed analysis of this crossing and adjacent stream channel with landowner permission. Identify alternatives for fish passage and bank protection/cattle fencing/stream restoration. The most effective fish passage and stream restoration alternative would be to remove the crossing and stabilize the adjacent banks using biotechnical techniques. Inexpensive and improved access across the stream could be provided with an old railroad cart crossing and consolidated crossing sites.

Barrier ID: SY_ZA_14

Stream: Zaca Creek

Barrier Type: Concrete and Boulder Revetment

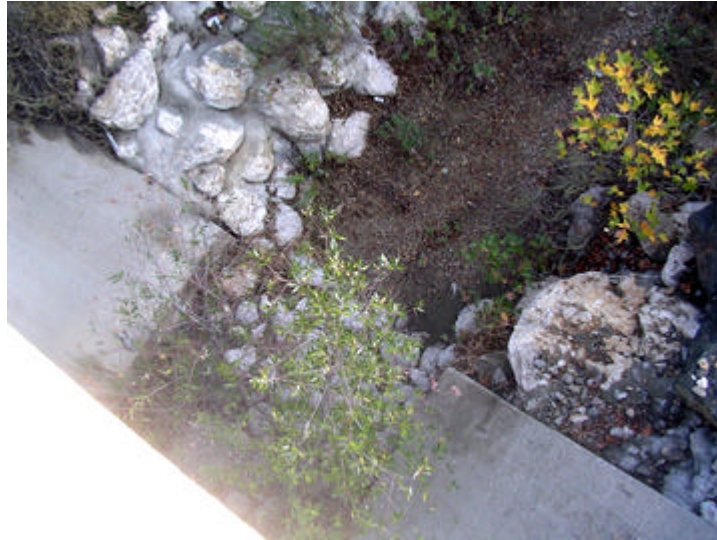
Physical Location: Foxen Canyon Road crossing

GPS Location: N/A

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Partial



Description: Permission to ground survey the adjacent stream channel was not obtained and limited observations were made from the Foxen Canyon Road Bridge. Sloping concrete revetment walls have been constructed underneath the bridge, but do not extend into the streambed. Small boulder revetment occurs between the sloping walls and on the streambed. Upstream boulder and concrete revetment occurs on the banks.

Diagnosis: While water velocities may be slightly accelerated as they are confined between the bank revetments, salmonid passage is not significantly impeded at this site. The small boulder revetment in the channel is at grade level and sufficiently rough to allow upstream migration during all migration flows.

Recommended Action: Continue to monitor this site to ensure that fish passage conditions do not become more difficult and additional revetment work does not increase fish passage severity.

Barrier ID: SY_NI_1

Stream: Nojoqui Creek

Barrier Type: Altered stream channel

Physical Location: Extending approximately 600 feet upstream from Santa Ynez River

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Unknown

Description: Access to survey this stream reach was not obtained and limit observations were made from adjacent public roads. The lower section of Nojoqui Creek has been realigned from the natural channel to the west into a manmade channel that now parallels the eastern side of Highway 101 into the Santa Ynez River. The original mouth of the creek occurred to the west of Highway 101. This realigned reach is believed to occur within an earthen channel, but the configuration and composition is not known.

Diagnosis: Additional surveying is needed to determine the characteristics of this stream reach and potential severity to fish passage.

Recommended Action: Ensuring effective fish passage at this location is essential to the Nojoqui Creek steelhead population. Contact the landowner and seek permission to survey this reach and any adjacent structures that may impede fish passage.

Barrier ID: SY_NI_2
Stream: Nojoqui Creek
Barrier Type: Low-flow road crossing
Physical Location: Upstream end of realigned channel SY_NI_1
GPS Location: N/A
Ownership/Interest: Private
Surveyor(s) and Date: Shaw Allen 11/20/03
Barrier Status: Unknown

Description: Permission to ground survey this private road crossing was not obtained and limited observations were made from adjacent public roads. Observation of a non-bridged crossing was made at this location, but no observation of the streambed and/or crossing could be made from the public road. The crossing is likely a natural bottom ford or earthen fill crossing with culvert(s).

Diagnosis: Additional surveying is needed to determine the characteristics of this crossing and potential severity to fish passage.

Recommended Action: Ensuring effective fish passage at this location is essential to the Nojoqui Creek steelhead population. Contact the landowner and seek permission to survey this structure and any adjacent structures that may impede fish passage. If a significant fish passage barrier occurs, work with the landowner to discuss fish passage alternatives at this site.

Barrier ID: SY_NI_3

Stream: Nojoqui Creek

Barrier Type: Bridge

Physical Location: Approximately 250 feet downstream of second Highway 101 Bridge

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Unknown

Description: Permission to access this structure was not obtained and limited observations were made from Highway 101. No observations could be made of the stream channel underneath the bridge and the presence or absence of a migration barrier could not be determined.

Diagnosis: Additional surveying of this site is needed to determine whether a fish passage barrier is present or not.

Recommended Action: Seek permission to survey this crossing.

Barrier ID: SY_NI_4

Stream: Nojoqui Creek

Barrier Type: Bridge

Physical Location: Upstream Live Oak Ranch Bridge on USGS map

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Unknown

Description: Permission to access this structure was not obtained and limited observations were made from Highway 101. No observations could be made of the stream channel underneath the bridge and the presence or absence of a migration barrier could not be determined. The bridge appears to be constructed of wood and steel.

Diagnosis: Additional surveying of this site is needed to determine whether a fish passage barrier is present or not.

Recommended Action: Seek permission to survey this crossing.

Barrier ID: SY_NI_5

Stream: Nojoqui Creek

Barrier Type: Culvert crossing

Physical Location: Furthest upstream Highway 101 crossing

GPS Location: N 34° 32' 40.8" W 120° 11' 37.3"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Complete



Description: Permission to ground survey the private lands adjacent to the culvert was not obtained. Limited observations of this culvert crossing were made from Highway 101. A concrete apron with wingwalls extends downstream from a concrete box culvert for approximately 25 feet. Metal wall revetment 10 feet tall extends 20 feet further downstream from the apron at river-left. There is a concrete curb across the downstream end of the apron that measured approximately 1-foot taller than the apron and is approximately 10 inches thick. A small notch in the curb and the apron has been worn or created. The height from the top of the concrete curb at the downstream end of the apron to the surface of the downstream pool measured approximately 3 feet. The downstream pool depth was less than 12 inches deep. The total length of the culvert appears to be greater than 300 feet.

Diagnosis: High quality salmonid habitat occurs in Nojoqui Creek upstream of this barrier and *O. mykiss* was trapped migrating into the creek in 1997 (pers. comm. Engblom). The excessive length of the culvert and the absence of resting areas for fish prevents upstream migration at this site. Entrix has conducted a detailed analysis of this culvert and identified it as an impassable velocity barrier (pers. comm. Engblom).

Recommended Action: Further assess culvert and channel conditions and investigate passage alternatives at this site with CALTRANS and other stakeholders. The most effective solution for fish passage is removal of the culvert and installation of a bridge.

Barrier ID: SY_NI_6
Stream: Nojoqui Creek
Barrier Type: Bridge
Physical Location: Folded Hills Ranch Bridge
GPS Location: N/A
Ownership/Interest: Private
Surveyor(s) and Date: Shaw Allen 11/20/03
Barrier Status: Unknown



Description: Permission to ground survey this structure was not obtained and this limited observation was made from Alisal Road. The bridge appears to be constructed of wood and steel. No observations of the stream channel could be made.

Diagnosis: The stream channel was not observed and fish passage not assessed.

Recommended Action: Seek landowner permission to further assess fish passage and channel conditions at the crossing.

Barrier ID: SY_NI_7

Stream: Nojoqui Creek

Barrier Type: Culvert road crossing

Physical Location: Alisal Road Crossing past Nojoqui County Park entrance

GPS Location: N 34° 32' 7.1" W 120° 10' 30.1"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This 4-foot diameter corrugated metal culvert pipe is 38 feet long and encased in sacrete walls at both the upstream and downstream ends. Water marks on the inside walls of the culvert pipe indicate that a 1-foot water depth occurs inside the culvert during certain migration flows.

Diagnosis: This culvert is impassable to upstream migrating salmonids during low flows due to the shallow water depth encountered inside the culvert. During high flows excessive velocities and a lack of resting areas through the culvert likely impede upstream passage for most salmonids. During ideal, moderate flow conditions, larger salmonids should be able to swim through the culvert with a moderate to high degree of difficulty. This structure reduces the window of opportunity for upstream salmonid migration and impedes access to the upper reaches of the creek. This culvert is likely undersized for a 100-year flow.

Recommended Action: Work with the county to investigate passage alternatives at this site. The most effective solution for fish passage and high flow conveyance is the removal of the culvert and installation of a bridge or large embedded culvert (with the diameter sized a little larger than the natural stream channel).

Barrier ID: SY_NI_8

Stream: Nojoqui Creek

Barrier Type: Waterfall

Physical Location: Nojoqui County Park

GPS Location: N 34° 31' 42.1" W 120° 10' 16.8"

Ownership/Interest: Santa Barbara County Parks

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Complete



Description: This spectacular waterfall is well over 75 feet tall and composed of solid bedrock.

Diagnosis: This is the natural upstream limit for salmonid migration due to the excessive height.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_NI_MF_1

Stream: Middle Fork Nojoqui Creek (unnamed)

Barrier Type: Culvert crossing

Physical Location: Alisal Road Crossing

GPS Location: N 34° 32' 27.8" W 120° 8' 57.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: Permission to ground survey land adjacent to this structure was not obtained and limited observations of this culvert crossing were made from Alisal Road. The downstream end of the culvert was not visible from the public roadway road. Based on the roadway and fill length this culvert is approximately 50 feet long.

Diagnosis: This culvert likely impedes salmonid passage to some degree due to the length and confined natural of culverts.

Recommended Action: Seek landowner permission to further assess this culvert and upstream salmonid habitat conditions. Should adequate salmonid habitat conditions occur upstream, assess hydraulic and channel conditions at the crossing and investigate passage alternatives at this site with the County. The most effective solution for fish passage is removal of the culvert and installation of a bridge or large embedded culvert.

Barrier ID: SY_NI_MF_WR_1

Stream: Woodpecker Creek (unnamed southern tributary to the Middle Fork)

Barrier Type: Culvert crossing

Physical Location: Alisal Road crossing

GPS Location: N 34° 32' 23.5" W 120 9' 40.5"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This 4-foot diameter corrugated metal culvert pipe measures 40 feet long and is encased in concrete. There is a concrete and boulder riprap apron extending downstream for 9 feet below the culvert pipe. The height from the lip of the downstream end of the culvert pipe to the creek bed is 4 feet. The rust line inside the culvert pipe indicates that water depths up to 1-foot occur in the culvert pipe during winter flows. Many woodpeckers were flying around while surveying this structure and so this unnamed creek was named.

Diagnosis: This structure is impassable to all salmonids during low flows due to the lack of adequate water depth on the apron and inside the culvert. The downstream pool appears to backfill during migration flows to a depth of 2 to 3 feet. During moderate to high flows salmonids should be able to jump from the downstream pool into the culvert with a moderate degree of difficulty. During these migration flows, excessive water velocities will occur inside the culvert and the absence of resting areas will impede or prevent upstream passage for salmonids. The culvert appears to be undersized for a 100-year flow.

Recommended Action: Seek adjacent landowner permission to further assess upstream habitat potential for salmonids. If adequate conditions occur, investigate passage alternatives with the County. The most effective solution for fish passage is removal of the culvert and installation of a bridge.

Barrier ID: SY_AL_1

Stream: Alisal Creek

Barrier Type: Bridge

Physical Location: Alisal Cattle Ranch, upstream from Rodeo Grounds

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Unknown



Description: Access to ground survey this bridge was not obtained and observations are limited to the bridge itself. The stream channel and potential instream structures could not be observed.

Diagnosis: Passage conditions at this site are unknown.

Recommended Action: Contact landowner and seek access to survey the channel at this site.

Barrier ID: SY_AL_2

Stream: Alisal Creek

Barrier Type: Dam

Physical Location: Approximately 3.0-3.5 miles upstream from Santa Ynez River

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Complete



Description: Access to ground survey this dam was not obtained and observations were limited to the adjacent private road. The following information was obtained from Department of Water Resources (1988). Alisal Dam is an earth-filled structure with a crest height of 28 feet, crest length of 1,100 feet, and an original storage capacity of 2,342 acre-feet (pers. comm. Capelli).

Diagnosis: Fish passage facilities are not known to exist at this dam and therefore upstream fish passage is likely not possible. Water releases from this dam likely dramatically influence downstream steelhead habitat in Alisal Creek and migratory connectivity. This large dam prevents upstream steelhead migration to several miles of stream habitat to as many as 6 tributaries with sources in the Los Padres National Forest.

Recommended Action: Stream habitat is known to exist upstream of this dam in several tributaries that drain from the Los Padres National Forest. Providing steelhead passage up Alisal Creek to, and potentially past, the dam could have significant benefits to the existing Santa Ynez River steelhead population. Fish passage discussions should be initiated with the owner(s) and relevant stakeholders and access sought to survey the dam and surrounding stream reaches, including the tributary habitat upstream of the dam and natural limits to salmonid migration. Adequate salmonid habitat is reported to occur downstream of the dam and golfers at Alisal have reported several recent observations of adult steelhead in the lower creek (pers. comm. Engblom).

Barrier ID: SY_AP_1

Stream: Alamo Pintado Creek

Barrier Type: Grade control structure

Physical Location: Under Figueroa Mountain Road crossing

GPS Location: N 34° 43' 11.4" W 120° 6' 22.0"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Complete



Description: This structure was observed from the road without access to adjacent private property. The structure is an awkward combination of what appears to be the remnants of an old bridge crossing and the addition of grade control features designed to protect the newer Figueroa Mountain Road Bridge. Immediately upstream from the newer bridge there is a concrete wall across the stream channel that is approximately 13 feet tall and 1 foot thick. Concrete and boulder riprap extends upstream from the wall for approximately 25 feet to the remains of an old bridge structure. The upstream structure consists of a concrete channel and walls. The lip of this upstream concrete channel drops approximately 3 feet down to the riprap below. The upstream concrete channel is approximately 18 feet wide and 50 feet long.

Diagnosis: The excessive 13-foot height of the downstream concrete wall and lack of downstream pool represent what appears to be an impassable structure (having only viewed it during dry flow conditions). Should the downstream channel fill up with 6-7 feet of water depth during high stream flows, this structure may provide limited, extremely difficult upstream passage for adult steelhead. Even with this situation, there would be limited upstream resting areas, lack of pool depth for the 3-foot jump upstream, and extremely turbulent water and excessive velocities throughout this reach. Scott Engblom reported that *O. mykiss* were observed in the creek approximately 3 years ago.

Recommended Action: This lowest observed downstream barrier might directly block endangered Santa Ynez steelhead from accessing fair to good quality habitat in the upper headwaters (Birabent Canyon). More detailed channel and hydraulic information should be collected, with private landowner permission, and an alternatives analysis completed to determine feasible options for fish passage at this site. Additional barrier surveying downstream on private land should be conducted. Removal of the entire structure and replacement with a bridge would provide the most effective fish passage solution.

Barrier ID: SY_QA_1

Stream: Quiota Creek

Barrier Type: Low-flow road crossing

Physical Location: First downstream Refugio Road crossing #1

GPS Location: N 34° 34' 2.2" W 120° 5' 39.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This low-flow road crossing measured 18 feet wide from the upstream lip of the road to the downstream lip of the concrete apron. The asphalt road and concrete crossing spans the active stream channel for 68 feet. A 1-foot diameter corrugated metal pipe passes through the center of the low-flow crossing. The concrete and boulder riprap apron has been added to the crossing and extends downstream for 8 feet, spanning the width of the stream channel for 68 feet. The apron has a moderate slope down to the natural streambed.

Diagnosis: This low-flow crossing is passable during moderate to high flow conditions when the downstream pool backfills to a sufficient depth, allowing salmonids to swim onto the apron and road surface. During lower flows this crossing prevents upstream passage due to the shallow water depths that spread out over the road and apron. Extremely high flows will produce excessive velocities across the surface that may block smaller salmonids.

Recommended Action: Quiota Creek is a critical spawning and rearing tributary for the Santa Ynez River steelhead population. Effective fish passage should be provided at this crossing so that migration delays do not restrict upstream barrier passage. The most effective fish passage project is to remove the crossing and replace it with a bridge that does not impact the stream channel. No fish passage project is currently planned for this crossing by the County or COMB (pers. comm. Engblom).

Barrier ID: SY_QA_2

Stream: Quiota Creek

Barrier Type: Low-flow road crossing

Physical Location: Refugio Road crossing #2

GPS Location: N 34° 33' 44.9" W 120° 5' 15.1"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This low-flow road crossing measured 18 feet wide and spans the active stream channel for 36 feet. There is a 1-foot diameter corrugated metal culvert pipe in the center of the crossing with 2 inches of sediment deposited on the bottom. A riprap apron has been added to the downstream side of the road crossing. This apron extends downstream for a maximum length of 9 feet and crosses the stream channel for 30 feet before a 10-foot section at the river-left side broke off. This entire apron is severely undercut and broken. A 6-foot long notch has been worn through the apron directly below the culvert pipe. The height from the downstream pool surface to the top of the road measured 4 feet. The maximum pool depth measured 2 feet 6 inches.

Diagnosis: The downstream pool appears to backfill to a depth of approximately 4 to 5 feet during moderate to high flows. With the notch in the apron, the distance across the road to the upstream pool is reduced to 21 feet. This low-flow crossing is impassable during low flows due to insufficient water depth across the road surface and jump height. The crossing may become passable for adult steelhead during moderate to high flows due to the sufficient jump depth produced and adequate water depth across the relatively short and flat crossing. The crossing will only be passable when there is enough flow to create a sufficient downstream pool depth and water depth over the road.

Recommended Action: The County is reportedly planning to remove this severe barrier and replace it with a bridge, allowing unimpeded upstream fish passage (pers. comm. Engblom). The County plan to replace this crossing with a bridge is highly encouraged and recommended.

Barrier ID: SY_QA_3

Stream: Quiota Creek

Barrier Type: Low-flow road crossing

Physical Location: Refugio Road crossing #3

GPS Location: N 34° 33' 42.4" W 120° 5' 13.6"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/COMB

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This low-flow crossing is 20 feet wide and crosses the active channel for 43 feet. There is a 1-foot diameter corrugated metal culvert pipe in the center of the crossing. A riprap apron extends downstream for a maximum of 6 feet and is severally undercut and damaged. The apron has a 4-foot long notch worn directly below the culvert pipe. The height from the surface of the downstream pool to the downstream lip of the road crossing measured 4 feet 3 inches. The maximum pool depth measured 4 inches.

Diagnosis: The downstream pool shows signs that it fills up to a depth of at least 2 to 3 feet during winter flows. The distance across the road from upstream edge of the notch in the apron measured 22 feet. During lower flows the crossing is impassable to all salmonids due to insufficient water depth across the road and excessive jump height and limited downstream pool depth. During moderate to high flows the downstream pool likely develops sufficient jump depth to allow a moderately difficult jump onto the road and sufficient water depth across the road to allow for moderate to highly difficult passage. Excessive water velocities across the road during high flows may prevent passage to some/all salmonids.

Recommended Action: COMB has proposed to modify the existing crossing with a low-flow channel, upstream vortex weir, and downstream roughened ramp fishway. More project detail is outlined on the COMB website. The CDFG and NMFS are apparently considering this proposed action and considering other alternatives (pers. comm. Engblom). Modifying the existing crossing, as proposed, is not recommended and is not a preferred alternative of either agency. The most effective fish passage project and transportation safety improvement is to remove the crossing and replace it with a bridge.

Barrier ID: SY_QA_4

Stream: Quiota Creek

Barrier Type: Low-flow road crossing

Physical Location: Refugio Road crossing #4

GPS Location: N 34° 33' 41.5" W 120° 5' 9.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This low-flow road crossing measured 18 feet wide and crosses the active stream channel for 50 feet. There is a 1-foot diameter corrugated metal culvert pipe in the center of the crossing. A riprap apron has been added to half of the crossing on the downstream river-left side. The apron extends downstream for a maximum length of 9 feet. The other half of the road crossing, without a riprap apron, has been severally undercut. The height from the downstream substrate to the top of the road crossing measured 3 feet 8 inches.

Diagnosis: This crossing is impassable to all salmonids during low flows when insufficient water depth is spread out over the road crossing and minimal jump pool depth and excessive jump height prevent access to the road crossing. During moderate to high flow conditions the downstream pool depth and water depth across the road is sufficient to allow steelhead to make a moderately difficult jump and swim across the road. Excessive velocities across the road during high flows and spread out shallower flows during moderate flows may severely impede or prevent upstream passage.

Recommended Action: COMB has proposed to modify the existing crossing with a low-flow channel, upstream vortex weir, and downstream roughened ramp fishway. More project detail is outlined on the COMB website. The CDFG and NMFS are apparently considering this proposed action and considering other alternatives (pers. comm. Engblom). Modifying the existing crossing, as proposed, is not recommended and is not a preferred alternative of either agency. The most effective fish passage project and transportation safety improvement is to remove the crossing and replace it with a bridge.

Barrier ID: SY_QA_5

Stream: Quiota Creek

Barrier Type: Low-flow road crossing

Physical Location: Refugio Road crossing #5

GPS Location: N 34° 33' 36.4" W 120° 5' 3.4"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This low-flow crossing measured 18 feet wide at the road surface and crosses the channel for 29 feet. There is a 1-foot diameter corrugated metal culvert pipe in the center of the crossing. A riprap apron extends downstream for 6 feet and is considerably undercut and cracked. The apron has a 4-foot long notch worn directly below the culvert pipe. The height from the surface of the downstream pool to the top of the road crossing measured 4 feet 9 inches. The maximum pool depth measured 4 inches.

Diagnosis: The downstream pool appears to fill up to a depth of 3 feet during moderate to high winter flows. The upstream distance across the road at the notch in the apron measured 20 feet. This crossing is impassable during low and possibly moderate flows due to insufficient downstream jump pool depth, excessive jump height, and insufficient water depth across the road surface. During higher flows the downstream pool depth will allow salmonids to jump onto the road surface, but excessive water velocities across the surface may limit/prevent upstream passage for smaller steelhead. A narrow window of ideal flows will likely pass some larger steelhead for a short duration of flows.

Recommended Action: COMB has proposed to modify the existing crossing with a low-flow channel, upstream vortex weir, and downstream roughened ramp fishway. More project detail is outlined on the COMB website. The CDFG and NMFS are apparently considering this proposed action and considering other alternatives (pers. comm. Engblom). Modifying the existing crossing, as proposed, is not recommended and is not a preferred alternative of either agency. The most effective fish passage project and transportation safety improvement is to remove the crossing and replace it with a bridge.

Barrier ID: SY_QA_6

Stream: Quiota Creek

Barrier Type: Apron at bridge

Physical Location: Refugio Road crossing #6

GPS Location: N 34° 33' 34.7" W 120° 5' 1.9"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: The original low-flow road crossing has been replaced with a steel and wood bridge that appears to be temporary. The riprap apron that was attached to the downstream end of the original road crossing still exists across most of the stream channel. The apron extends downstream for a maximum distance of 6 feet. A notch exists where the 1-foot diameter corrugated metal culvert pipe ran under the old crossing. An 8-foot long section of the culvert pipe remains. At the notch, the apron length to the upstream pool measures 3 feet. The height from the surface of the downstream pool to the upstream end of the riprap apron measured 2 feet 8 inches. The maximum downstream pool depth measured 1-foot 8 inches. The apron is undercut and damaged.

Diagnosis: The riprap apron is passable during moderate to high flows when sufficient water depth in the downstream pool allows salmonids to jump over the apron. During lower flows the apron is impassable due to the lack of jump-pool depth, excessive jump height, and subsurface flows under the apron.

Recommended Action: The County is reportedly planning to replace this temporary bridge with a permanent bridge, allowing unimpeded upstream fish passage (pers. comm. Engblom). The County plan to install a bridge at this site is highly encouraged and recommended. The remnant apron should be completely removed to allow unimpeded passage during all flow conditions.

Barrier ID: SY_QA_7

Stream: Quiota Creek

Barrier Type: Low -flow road crossing

Physical Location: Refugio Road crossing #7

GPS Location: N 34° 33' 33.1" W 120° 5' 1.1"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This low-flow road crossing measured 18 feet wide and crosses the stream channel for 35 feet. A 1-foot diameter corrugated metal culvert pipe passes under the road at the river-left side of the crossing. A boulder and concrete riprap apron extends downstream at a steep angle for 7 feet. Surface flow was observed spilling out of the culvert pipe. The height from the downstream pool surface to the top of the road surface measured 2 feet 10 inches. The downstream pool depth measured 2 feet 6 inches.

Diagnosis: This low-flow crossing is impassable during low flows due to insufficient water depth across the road surface. The culvert diameter is very small and likely produces excessive velocities and/or shallow depth for upstream passage in addition to having a very small area to jump into. During higher flows the downstream pool depth will allow salmonids to jump onto the road surface, but excessive water velocities across the surface may limit/prevent upstream passage for smaller steelhead. A narrow window of ideal flows will likely pass some larger steelhead for a short duration.

Recommended Action: COMB has proposed to modify the existing crossing with a low-flow channel, upstream vortex weir, and downstream roughened ramp fishway. More project detail is outlined on the COMB website. The CDFG and NMFS are apparently considering this proposed action and considering other alternatives (pers. comm. Engblom). Modifying the existing crossing, as proposed, is not recommended and is not a preferred alternative of either agency. The most effective fish passage project and transportation safety improvement is to remove the crossing and replace it with a bridge.

Barrier ID: SY_QA_8

Stream: Quiota Creek

Barrier Type: Low-flow road crossing replaced with bridge

Physical Location: Refugio Road crossing #8

GPS Location: N 34° 33' 31.4" W 120° 4' 57.6"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/ 03

Barrier Status: Not a barrier



Description: The old low-flow road crossing has been removed and replaced with a steel and wood bridge to allow unimpeded salmonid passage at this former barrier site. The bridge may be temporary. Most of the old low-flow crossing has been removed, except for a small section on river right, which is now being used as a foundation for the bridge on that side of the creek. A natural streambed now exists underneath the bridge.

Diagnosis: This former low-flow crossing barrier, that was similar to the many crossings downstream, has been removed and replaced with a bridge and natural streambed allowing unimpeded fish passage.

Recommended Action: The County is reportedly planning to remove this severe barrier and replace it with a bridge, allowing unimpeded upstream fish passage (pers. comm. Engblom). The County plan to install a permanent that does not impact the channel is highly encouraged and recommended.

Barrier ID: SY_QA_9

Stream: Quiota Creek

Barrier Type: Low-flow road crossing

Physical Location: Refugio Road crossing #9

GPS Location: N 34° 33' 17.4" W 120° 4' 50.8"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/20/03

Barrier Status: Partial



Description: This low-flow road crossing measured 18 feet wide and crosses the stream channel for 30 feet. There is a 1-foot diameter corrugated metal culvert pipe passing under the center of the road crossing. A riprap apron extends downstream for a maximum of 6 feet. A notch in the apron has been scoured out below the culvert pipe. The apron and road have been severally undercut. The upstream end of the road has filled up with deposited sediment. A recent effort has been made to dig out the sediment at the upstream opening of the culvert pipe. The height from the downstream substrate to the top of the downstream edge of the road measured 3 feet 6 inches.

Diagnosis: This crossing is impassable during low and possibly moderate flows due to insufficient downstream jump pool depth, excessive jump height, and insufficient water depth across the road surface. During higher flows the downstream pool depth will allow salmonids to jump onto the road surface, but excessive water velocities across the surface may limit/prevent upstream passage for smaller steelhead. A narrow window of ideal flows will likely pass some larger steelhead for a short duration.

Recommended Action: COMB has proposed to modify the existing crossing with a low-flow channel, upstream vortex weir, and downstream roughened ramp fishway. More project detail is outlined on the COMB website. The CDFG and NMFS are apparently considering this proposed action and considering other alternatives (pers. comm. Engblom). Modifying the existing crossing, as proposed, is not recommended and is not a preferred alternative of either agency. The most effective fish passage project and transportation safety improvement is to remove the crossing and replace it with a bridge.

Barrier ID: SY_ZC_1

Stream: Zanja De Cota Creek

Barrier Type: Culvert crossing

Physical Location: Highway 246 road crossing

GPS Location: N 34° 36' 35.2" W 120° 5' 10.0"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Downstream pool



Concrete channel upstream

Description: Permission to ground survey the crossing from adjacent private land was not obtained and limited observations were made from Highway 246. This concrete box culvert is approximately 50 feet long and has angled wingwalls extending downstream for approximately 20 feet. Angled wingwalls extend upstream for approximately 15 feet. The height from the surface of the downstream pool to the lip of the concrete culvert bottom was approximately 5 feet. The downstream pool depth was approximately 2 feet. Excellent late summer/fall stream flows and adequate salmonid spawning and rearing habitat occurs in this stream reach.

Diagnosis: Excessive downstream jump height and shallow water depth inside the culvert prevents any upstream salmonid passage during low flows. During moderate to high flows, adequate water depth in the downstream pool and inside the culvert will develop but excessive water velocities, culvert length, and lack of resting spots may prevent upstream salmonid migration. Extremely limited and difficult upstream migration may be possible during ideal moderate flow conditions depending on the culvert.

Recommended Action: Providing improved passage at this sight may provide a direct benefit to the existing steelhead population of the Santa Ynez River. Conduct a more detailed analysis of this structure, adjacent stream channel, and overall stream habitat with landowner permission. Identify alternatives for fish passage at this site with CALTRANS. The most effective fish passage and stream restoration alternative would be to remove this entire structure and replace it with a bridge that does not impact the stream channel.

Barrier ID: SY_ZC_2

Stream: Zanja De Cota Creek

Barrier Type: Concrete Apron (utility crossing?)

Physical Location: Santa Ynez County Park

GPS Location: N 34° 36' 41.2" W 120° 5' 4.8"

Ownership/Interest: Santa Barbara County Department of Parks and Recreation

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Description: This concrete apron extends approximately 40 feet between pipe and wire revetment that is filled with small stone and surrounded by bank-lined boulder revetment. The width of the concrete-lined streambed measured 12 feet between the bank revetments. The walls of the pipe and wire revetment measured 6 feet tall. The structure occurs at the downstream end of Santa Ynez County Park. The park is built in, and on top of, the stream channel. The structure appears to protect a utility pipeline crossing.

Diagnosis: This concrete apron is likely a barrier during low flows due to the shallow water depths that occur. Moderately difficult salmonid passage likely exists during moderate to high flows due to the adequate water depth, short channel length, and mild slope.

Recommended Action: Determine the structure's purpose and discuss fish passage options with the County and other stakeholders in coordination with upstream and downstream fish passage improvements.

Barrier ID: SY_ZC_3

Stream: Zanja De Cota Creek

Barrier Type: Altered stream channel

Physical Location: Santa Ynez Park

GPS Location: N 34° 36' 40.0" W 120° 5' 0.1"

Ownership/Interest: Santa Barbara County Department of Parks and Recreation

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Description: Santa Ynez County Park is built on top of the former stream channel of Zanja De Cota Creek. Maintained lawns appear to occur where the original stream channel existed in this area. Low stream flows appear to be conveyed under the lawn in a small culvert and higher runoff may overflow onto the lawn area.

Diagnosis: With the observed absence of surface flow at this site it is difficult to determine what the lawn and stream reach look like in this area with migration flows. Passage appears to be unlikely through the small culvert due to either insufficient water depth during low flows or excessive water velocities during higher flows. The culvert is likely several hundred feet long.

Recommended Action: Further assess upstream salmonid habitat potential with landowner permission. Conduct further analysis of this park and stream reach with the County and identify long-term park objectives and potential creek restoration and fish passage. Removing the culvert and reestablishing a natural stream through the park might have significant and desirable water quality, recreational, and salmonid restoration benefits.

Barrier ID: SY_ZC_4

Stream: Zanja De Cota Creek

Barrier Type: Grade Control Structure

Physical Location: Santa Ynez County Park

GPS Location: N 34° 36' 42.9" W 120° 5' 0.5"

Ownership/Interest: Santa Barbara County Parks and Recreation

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Description: This old broken grade control structure has a maximum measured height of 12 inches from the downstream substrate to the top of the concrete. The grade control crosses the creek channel for 15 feet and occurs at the upstream end of the Santa Ynez County Park.

Diagnosis: This structure would only prevent upstream salmonid passage during low flows when insufficient water depth across the concrete and minimal pool depth occurs.

Recommended Action: This structure does not appear to provide significant grade control and should be removed, in coordination with downstream fish passage improvements. Check with the County to determine if any utility crossings are associated with the structure.

Barrier ID: SY_ZC_5

Stream: Zanja De Cota Creek

Barrier Type: Culvert crossing

Physical Location: Sagunto Street Road crossing

GPS Location: N 34° 36' 46.2" W 120° 4' 59.7"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Description: This 6-foot diameter corrugated metal pipe is encased in concrete walls and measured 35 feet long. Boulders and rocks extend up to 10 feet downstream to stabilize adjacent banks and limit scour. The height from the streambed downstream to the lip of the culvert measured 4 feet 6 inches.

Diagnosis: This culvert is impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered and excessive downstream jump height. During higher flows, excessive velocities through the culvert would limit or completely block any upstream passage. The downstream boulders cause the main body of the pool to form approximately 12 feet downstream from the culvert outlet and cause an increase in the needed horizontal jump distance into the culvert. During ideal moderate flow conditions, larger salmonids might be able to jump into the culvert and swim through with a high degree of difficulty.

Recommended Action: Following downstream fish passage improvements conduct a more detailed analysis of this crossing and adjacent stream channel with landowner permission. Investigate passage alternatives at this site with County. The most effective solution for fish passage and overall stream function benefits would involve removal of the culvert and installation of a wide-span bridge.

Barrier ID: SY_ZC_6

Stream: Zanja De Cota Creek

Barrier Type: Culvert crossing

Physical Location: Intersection of Edison and Tivola Streets

GPS Location: N 34° 36' 51.8" W 120° 4' 51.4"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Complete



Description: This concrete box culvert measured 10 feet wide by 6 feet tall and 135 feet long. The upstream 15 feet of this box culvert has a steep gradient. The height from the surface of the downstream pool to the lip of the box culvert outlet measured 20 inches. The maximum downstream pool depth measured 2 feet.

Diagnosis: Upstream salmonid migration through this culvert would be prevented due to the excessively steep slope encountered at the upstream end of this culvert and associated velocities.

Recommended Action: Conduct a more detailed analysis of this crossing and upstream habitat conditions with landowner permission and County involvement. Investigate passage alternatives at this site with the county following downstream fish passage improvements. The most effective solution for fish passage would involve removal of the culvert and installation of a wide-span bridge.

Barrier ID: SY_ZC_7

Stream: Zanja De Cota Creek

Barrier Type: Culvert crossing

Physical Location: Faraday Road Crossing

GPS Location: N 34° 36' 54.1" W 120° 4' 44.2"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Partial



Description: This concrete box culvert is 10 feet wide by 5 feet, 6 inches tall and is 75 feet long. There is 6 inches of water inside the culvert. A 7-foot long concrete apron with angled wingwalls occurs on both the upstream and downstream ends of this culvert.

Diagnosis: This culvert would not limit salmonid migration in the observed condition during low and moderate flows. High flows may become excessive as they are confined between the culvert walls and the sediment on the bottom may flush out, increasing the fish passage severity.

Recommended Action: Monitor this structure and assess conditions during higher flows to determine whether excessive velocities occur at this site and if accumulated sediment flushes out of the culvert.

Barrier ID: SY_ZC_8

Stream: Zanja De Cota Creek

Barrier Type: Earthen Dam

Physical Location: Approximately 225 feet downstream from Highway 154 crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Complete



Description: Permission to ground survey this structure was not obtained and limited observations were made from Highway 154. The earth basin does not appear to have any connectivity to the upstream channel. The earthen dam is approximately 12 feet tall and the downstream outlet of the basin was not entirely visible. The exact intent of this structure was not clear, but appears to be a private flood control basin.

Diagnosis: This basin appears to be completely impassable due to the lack of connectivity with the upstream channel. High stream flows will likely blow out this earthen dam and reconnect surface flows. Additional assessment of this structure is needed to determine the severity and purpose.

Recommended Action: In coordination with downstream fish passage improvements, determine the desirability and purpose of this feature.

Barrier ID: SY_ZC_9

Stream: Zanja De Cota Creek

Barrier Type: Low-flow crossing

Physical Location: Approximately 200 feet downstream from Highway 154 crossing

GPS Location: N/A

Ownership/Interest: Private

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Partial



Description: Permission to ground survey this structure was not obtained and limited observations were made from Highway 154. This low-flow road crossing is directly upstream from an earth basin. The surface of the concrete crossing appears to be elevated approximately 1-foot above the natural streambed.

Diagnosis: This crossing presents a barrier to fish passage during low flows when insufficient water depth occurs across the road surface. During moderate to higher flows, salmonids would be able to jump or swim onto and across the short crossing with a low to moderate degree of difficulty. Excessive velocities may limit smaller fish passage during very high stream flows.

Recommended Action: Seek landowner permission to assess fish passage improvements, following downstream fish passage improvements. Removal of the crossing and replacement with a bridge or large, embedded culvert would provide effective fish passage.

Barrier ID: SY_ZC_10

Stream: Zanja De Cota Creek

Barrier Type: Culvert crossing

Physical Location: Highway 154 Crossing

GPS Location: N 34° 37' 44.0" W 120° 4' 34.1"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/13/03

Barrier Status: Partial



Description: Permission to ground survey the crossing from adjacent private land was not obtained and limited observations were made from Highway 154. This culvert is approximately 5 feet wide by 7 feet tall and 200 feet long. Angled wingwalls extend downstream for approximately 12 feet.

Diagnosis: Shallow water depth inside the culvert would prevent upstream salmonid passage during low flows. During moderate to high flows, adequate water depth inside the culvert occurs but excessive water velocities, long culvert length, and lack of resting spots would likely prevent upstream salmonid migration. Extremely limited and difficult upstream migration may be possible during ideal moderate flow conditions depending on the culvert slope and characteristics.

Recommended Action: In coordination with downstream fish passage improvements, conduct a more detailed analysis of this structure and adjacent stream channel with landowner permission and CALTRANS involvement. Identify alternatives for fish passage. The most effective fish passage and stream restoration alternative would be to remove this entire structure and replace it with a bridge that does not impact the stream channel.

Barrier ID: SY_SA_HC_1

Stream: Happy Canyon Creek

Barrier Type: Boulder revetment

Physical Location: Under Alisos Road Bridge

GPS Location: N 34° 36' 39.3" W 119° 00' 9.6"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Description: Permission to ground survey this structure and access adjacent private land was not obtained and limited observations were made from Alisos Road. This large boulder revetment project extends downstream from the bridge for approximately 100 feet and covers the entire width of the streambed and extends up the banks for a short distance.

Diagnosis: The large boulders do not appear to be embedded in the streambed but rather laid on top without much packing of finer sediment into the voids between the boulders. The result of this high permeability and elevated construction is likely that lower surface flows are conveyed through the boulders rather than on top of them. This high permeability likely prevents upstream fish passage during low and moderate flows. During higher flows, water will likely begin to provide adequate water depth over the top of the boulders and may allow limited fish passage. From the bridge it was difficult to determine the characteristics of the downstream end of the structure and determine whether any drop and resulting jump height exists that may further impede upstream migration. This structure significantly reduces the window of opportunity for salmonids to migrate upstream, especially during low to moderate flows.

Recommended Action: Continue to monitor this site and seek landowner permission to further assess the characteristics and severity to fish passage. Sediment deposition may decrease the permeability of the revetment and improve fish passage in the future. Scour downstream of the structure may produce a jump downstream that produces a more severe barrier. Should this structure continue to significantly impede salmonid passage than stakeholders should look into alternatives to improve migration upstream.

Barrier ID: SY_HN_1

Stream: Hilton Creek

Barrier Type: Bedrock chute/boulder cascade

Physical Location: 1,300 feet upstream from the Santa Ynez River

GPS Location: N/A

Ownership/Interest: United States Bureau of Reclamation

Surveyor(s) and Date: COMB

Barrier Status: Partial

Description: This natural barrier is identified in the Santa Ynez River Fish Management Plan and the following information is from that report.

Diagnosis: Providing access past this cascade and bedrock chute would reportedly provide steelhead access to approximately 2,800 feet of habitat up to the Highway 154 culvert barrier. The Cachuma Conservation Release Board's website describes the feature as a "near-vertical 6-foot cascade and an approximately 140-foot long confined bedrock chute situated immediately upstream of the cascade".

Recommended Action: The Plan describes modification of the natural features with concrete weirs to create step pool to pass fish over the cascade and installation of anchored boulders in the bedrock chute to create pockets of slower, deeper water for migrating fish to rest in. See the Santa Ynez River Fisheries Studies section of the Cachuma Conservation Release Board website for more detailed information about the fish passage plan being considered for this site. The Environmental Impact Report for this project is currently being finalized for this project (pers. comm. Engblom).

Barrier ID: SY_HN_2

Stream: Hilton Creek

Barrier Type: Culvert crossing

Physical Location: Highway 154 crossing

GPS Location: N 34° 34' 43.2" W 119° 58' 55.4"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/24/03

Barrier Status: Partial



Description: This arch culvert measured 9 feet 6 inches tall by 10 feet wide at the base and the combined culvert and aprons measured 154 feet long. Each upstream and downstream apron measured 14 feet 6 inches. Angled wingwalls extend to the ends of both aprons. The height from the lip of the downstream apron to the surface of the downstream pool measured 3 feet 3 inches. The maximum pool depth measured 1-foot.

Diagnosis: This culvert is impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered inside the culvert and on the aprons and due to the excessive downstream jump height. During higher flows the downstream pool should become adequately deep to provide moderately difficult access onto the apron. Excessive velocities through the entire structure and lack of resting areas likely prevent upstream passage during moderate and higher flows. The Santa Ynez River Fish Management Plan identifies this crossing as a velocity barrier. At least two road crossings are thought to occur upstream of this crossing that may limit upstream passage.

Recommended Action: With the proposed modification of the downstream natural bedrock chute, steelhead may be able to migrate upstream to this structure in the near future. Coordinating fish passage at this site with CALTRANS is being discussed. The most effective fish passage alternative is to remove the entire crossing and replace it with a bridge that does not impact the stream channel. Seek permission to survey upstream road crossings and other potential migration barriers.

Barrier ID: SY_HC_1

Stream: Harvey's Creek (unnamed Santa Ynez River tributary that enters Harvey's Cove on Cachuma Reservoir just west of the County Park)

Barrier Type: Culvert crossing

Physical Location: Highway 154 crossing

GPS Location: W 34° 34' 22.9" N 119° 57' 47.4"

Ownership/Interest: California Department of Transportation (1950)

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial



Description: As a result of sediment deposition in Cachuma Reservoir, this concrete arch culvert is almost filled-in with substrate. The culvert measured 4 feet wide on the sediment surface and 2 feet 6 inches tall. The original capacity and culvert dimensions are larger, but mainly buried. Based on the road width and fill the culvert measures approximately 175 feet long. When Cachuma Reservoir is at maximum storage capacity this structure may be completely submerged.

Diagnosis: This culvert is likely impassable due to the excessive length of the culvert and accelerated flows being confined by the sediment deposits within the culvert. The accumulated sediment has greatly reduced the flow capacity of the culvert. Upstream habitat conditions are unknown.

Recommended Action: Seek permission to conduct a ground survey of upstream habitat conditions and determine salmonid benefit of providing access at this site. Also, further access culvert conditions at the upstream end.

Barrier ID: SY_CA_1

Stream: Cachuma Creek

Barrier Type: Low-flow road crossing

Physical Location: Happy Canyon Road crossing, 50 feet downstream of Lion Creek

GPS Location: N 34° 42' 9.9" W 119° 54' 57.3"

Ownership/Interest: Santa Barbara County Public Works- Roads Division/LPNF

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Description: The road crosses the main channel of the creek for 38 feet and measured 14 feet wide. Large boulders extend downstream for 15 feet. The maximum pool depth downstream from the road crossing measured 10 inches deep. The height from the surface of the downstream pool to the downstream lip of the road surface measured 3 feet. Rainbow trout were observed both below and above this road crossing.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, trout can jump or swim onto the road surface with a moderate to high degree of difficulty. Due to a lack of roughness, water velocities become accelerated over the smooth concrete crossing during higher flows and may impede or prevent upstream passage for smaller salmonids. All fish passage is prevented during lower flows due to the 3-foot jump height and shallow water depth spread out over the crossing's surface. This crossing represents a partial barrier, especially during lower flows, and reduces the window of opportunity for existing trout passage at this site.

Recommended Action: Due to the presence of rainbow trout at this site and the moderate to high severity of the crossing, fish passage should be improved. Overall public transportation safety as well as fish passage would benefit most from the removal of this crossing and installation of a bridge. Seek permission to survey downstream private stream reaches to Cachuma Reservoir to determine if fish passage up this high is possible. Judging by topographic lines, it appears that a natural barrier may occur near the 1560-foot topographic line on the USGS 7.5 minute quad map. At least three downstream private road crossings may also limit upstream migration.

Barrier ID: SY_CA_2

Stream: Cachuma Creek

Barrier Type: Steep gradient/insufficient flow

Physical Location: Confluence of Cachuma Creek and uppermost eastern tributary

GPS Location: N 34° 43' 7.0" W 119° 54' 52.9"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/25/03

Barrier Status: Partial

Description: All of the observed stream flow in Cachuma Creek comes from the eastern tributary and Cachuma Creek is dry and lacking significant salmonid habitat above the confluence. A natural bedrock chute occurs immediately upstream on the eastern tributary that extends upstream for 12 feet and rises approximately 6 feet. An adequate jump-pool does not occur downstream of the chute.

Diagnosis: Fish passage into to the eastern tributary is unlikely due to the steep gradient occurring and flows are limited. Due to the lack of pool formation below the bedrock chute on the eastern tributary, fish do not have an adequate place to gain speed and attempt to jump the grade or swim up the steep slope. The insufficient flow and reduced habitat quality in Cachuma Creek above this confluence likely deters salmonids from migrating much further upstream. No trout were observed upstream from this tributary.

Recommended Action: No recommended actions for these natural features.

Barrier ID: SY_CA_LO_1

Stream: Lazaro Creek

Barrier Type: Waterfall

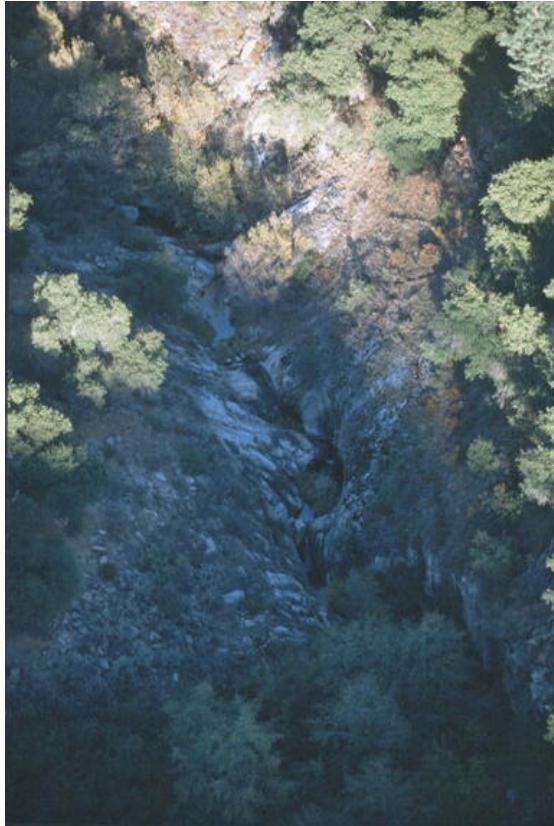
Physical Location: Near the 2680-foot elevation line on USGS 7.5 map

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Complete



Description: This three-part bedrock waterfall was observed from a helicopter and one of the waterfalls measured approximately 20 feet tall. A large downstream pool was present and good summer stream flow and high quality salmonid habitat occurs downstream to at least the Los Padres National Forest Boundary with private property. Not downstream anthropogenic barriers are known to occur on Lazaro Creek.

Diagnosis: This bedrock waterfall represents the upstream natural limit to fish passage on Lazaro Creek due to the excessive jump height. High quality salmonid habitat occurs downstream of this feature.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_CA_SH_1

Stream: Soldier Home Creek (unnamed western tributary to Cachuma Creek just upstream from Cachuma Camp)

Barrier Type: Low-flow road crossing

Physical Location: Happy Canyon Road crossing

GPS Location: N 34° 41' 57.6" W 119° 54' 53.1"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Partial



Description: The road crosses the active stream channel for approximately 20 feet and is 14 feet wide. The overall slope of the crossing is mild and stream flows are concentrated in a shallow V on river-left. Most of the crossing occurs at streambed grade.

Diagnosis: Due to the streambed grade of the crossing and shallow V shape, salmonids can swim onto and across this road during moderate and high flows. Due to a lack of roughness, excessive water velocities over the smooth concrete crossing during high flows may impede or prevent upstream passage for smaller salmonids.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour and increased jump height. The natural upstream limit occurs immediately upstream and modifying the crossing would not provide a significant benefit.

Barrier ID: SY_CA_SH_2

Stream: Soldier Home Creek (unnamed western tributary to Cachuma Creek just upstream from Cachuma Camp)

Barrier Type: Steep gradient

Physical Location: Immediately upstream from Happy Canyon Road crossing

GPS Location: N 34° 41' 57.6" W 119° 54' 53.1"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/12/03

Barrier Status: Complete



Description: This steep boulder gradient is approximately 75 feet long and has minimal resting pools and a steep, sustained gradient.

Diagnosis: This feature is impassable to fish during low flows due to the shallow depth and lack of pools encountered and likely during higher flows due to the excessive velocities, turbulence, and minimal resting stops. Habitat conditions are also fairly poor upstream.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_CA_LC_1

Stream: Lion Creek

Barrier Type: Waterfall

Physical Location: Approximately 1 mile above confluence with Cachuma Creek

GPS Location: N 34° 42' 43.1" W 119° 55' 50.2"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/25/03

Barrier Status: Complete



Description: This bedrock waterfall measured 13 feet tall and varied from vertical to steeply sloped with masses of mineral deposits and vegetation. The downstream pool measured less than 12 inches deep and does not appear to backfill enough to create a significant pool.

Diagnosis: This waterfall represents the upstream natural limit to fish migration due to the excessive jump height and lack of downstream pool depth.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_TS_1

Stream: Tequepis Creek

Barrier Type: Culvert crossing

Physical Location: Highway 154 crossing

GPS Location: N 34° 34' 4.4" W 119° 56' 55.7"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial



Description: This concrete box culvert measured 12 feet wide by 9 feet tall and 68 feet long. Substrate has settled on the bottom of the culvert and on both the upstream and downstream concrete aprons, which are at or near streambed level. Watermarks on the sides of the culvert and wingwalls indicate that during moderate to high flows the culvert fills to a depth ranging from 12 to 18 inches.

Diagnosis: This culvert is impassable during low flows due to insufficient water depth that is spread out inside the culvert. During moderate to high flows, when adequate water depth occurs, adult salmonids can swim into the culvert and may be able to make it through the culvert depending on the velocities encountered. The accelerated velocities and lack of resting areas in the culvert will limit some salmonid migration, especially smaller salmonids during higher flows.

Recommended Action: Tequepis Creek is a known rainbow trout, and former steelhead, spawning and rearing tributary and improving passage here would benefit the rainbow trout population. Coordinate with CALTRANS to determine long-term highway plans for this site and discuss fish passage alternatives. The preferred CDFG and NMFS treatment option for fish passage would involve removal of the culvert and installation of a bridge that does not impact the stream channel. A short-term project for improved rainbow trout passage could involve roughening the inside of the culvert along the edges for velocity breaks. Seek permission to survey private road crossings upstream.

Barrier ID: SY_BT_1

Stream: Broadcast Creek (unnamed Santa Ynez River tributary east of Tequepis Creek)

Barrier Type: Culvert crossing

Physical Location: Highway 154 crossing

GPS Location: N 34° 33' 56.2" W 119° 56' 15.7"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial

Description: This culvert crossing was observed from the surface of Highway 154 and culvert conditions were not surveyed due to the lack of permission to access adjacent private property. Observations of the culvert were extremely limited. Based on the road and fill width observed, the culvert is approximately 175 feet long.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions are not known. Adjacent tributaries contain perennial stream habitat that is adequate for salmonid spawning and rearing. This long culvert likely impedes or prevents upstream salmonid passage due to shallow water depths and excessive water velocities encountered during lower and high flows, respectively.

Recommended Action: Contact landowner(s) and seek access to survey upstream habitat conditions and characteristics surrounding the crossing and adjacent channel.

Barrier ID: SY_SC_1

Stream: Santa Cruz Creek

Barrier Type: Sediment Deposit

Physical Location: Mouth of creek at Cachuma Reservoir

GPS Location: N/A

Ownership/Interest: USBR/COMB/Cachuma County Recreation Area/LPNF

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Partial



Description: Where Santa Cruz Creek encounters the large deposition of sediment at Cachuma Reservoir surface flows were observed to go subsurface into the mass of sediment. The lower 0.25 mile of creek upstream of the reservoir was dry. This sediment deposition is caused by the accumulation of sediment at the creek mouth associated with the construction of Cachuma Dam and filling of the reservoir. This permeable sediment transports the creek flow subsurface and disconnects the stream flow with the reservoir for much of the year.

Diagnosis: Significant precipitation events are required for the creek to maintain surface flow across the sediment deposit and connect to the reservoir allowing upstream fish passage. The duration of this stream connectivity is dependant on rainfall, but may only last for a limited amount of time during a year. During below average rainfall years, there may not be any connectivity between the reservoir and the creek preventing upstream spawning runs and fish passage. Santa Cruz Creek contains some of the highest quality

and abundant salmonid habitat in the entire Santa Ynez River watershed and is a critical spawning and rearing tributary for rainbow trout.

Recommended Action: The presence of this barrier is the direct result of Cachuma Dam operations and should be discussed in conjunction with overall dam and reservoir operations for the Santa Ynez River. Removal of Cachuma Dam and Reservoir would cause the eventual flushing out of sediment and elimination of this barrier and would open up the entire Santa Cruz Creek sub-watershed to steelhead migration. No anthropogenic migration barriers are identified on Santa Cruz Creek and restoration of steelhead to this tributary alone would likely produce thousands of adult steelhead annually and safeguard the Santa Ynez River steelhead population from extinction.

Barrier ID: SY_SC_PE_1

Stream: Peachtree Creek

Barrier Type: Steep Gradient

Physical Location: Near the 3360-foot elevation line on USGS 7.5 map

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Complete

Description: This steep gradient reach was observed from a helicopter and appears to be the first upstream impassable feature upstream from the Los Padres National Forest boundary. Large downstream pools, good summer stream flow, and high quality salmonid habitat was observed downstream within the Los Padres National Forest. No records of downstream anthropogenic barriers were found for Peachtree Creek. Access to survey the private property downstream was not obtained.

Diagnosis: This steep boulder gradient contains numerous impassable drops and chutes up to 9 feet tall and likely represents the upstream natural limit to salmonids.

Recommended Action: No recommended action for this natural feature. Seek permission to survey stream reaches on private property downstream.

Barrier ID: SY_SC_LS_1

Stream: Little Pine Spring Creek (unnamed southern tributary downstream of Santa Cruz Campsite and Cabin. Downstream from Blacks Canyon)

Barrier Type: Steep Gradient

Physical Location: Near the 2200-foot elevation line on the North Fork and near the 2600-foot elevation lines of both South Forks (USGS 7.5 map)

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Complete

Description: Three upstream limits are included here for the three main tributaries to this small drainage. These steep gradient reaches were observed from a helicopter and appeared to be the first upstream impassable features due to excessive gradients. Lower Little Pine Springs Creek was ground surveyed up to the North and South Fork confluence, but further upstream surveying was prevented due to lack of daylight and limited time. Excellent salmonid habitat was observed throughout this small perennial tributary, which contains rainbow trout. Pools up to 5 feet deep were observed and continuous stream flow of approximately 0.2 c.f.s occurred.

Diagnosis: Based on topographic map assessment and helicopter survey (that was limited by thick riparian vegetation) these upstream estimated limits were made where the gradient of streams became excessively steep.

Recommended Action: No recommended action for these natural features.

Barrier ID: SY_SC_EF_1

Stream: East Fork Santa Cruz Creek

Barrier Type: Waterfall

Physical Location: Approximately 300 feet upstream from the West Fork confluence

GPS Location: N 34° 38' 29.4" W 119° 44' 56.3"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/2/03

Barrier Status: Partial



Description: This bedrock waterfall drops a total of 13 vertical feet from the highest upstream point to the surface of the 6-foot deep pool below. The lower 9 feet of the waterfall drops vertically and the uppermost 4 feet is a moderately steep bedrock chute that extends upstream 15 feet to a 3-foot deep pool.

Diagnosis: This waterfall is impassable to salmonids during low and moderate flows due to the excessive jump height and steep bedrock chute at the upper part of the falls. During high stream flows, the downstream pool depth likely increases up to 5 feet, reducing the overall jump height to 8 feet and producing a jump depth of 11 feet. Water velocities during these high flows would be extremely high, but limited upstream passage for large adult steelhead would likely be possible around the sides of the main waterfall flow. The large downstream pool would have deep side eddies on both sides of the waterfall that would provide jump locations around the projecting waterfall flow. This waterfall is a complete barrier to the existing rainbow trout during all flow conditions. Historically, adult steelhead may have been prevented from upstream migration at this waterfall during years with low rainfall and only moderate stream flows.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_SC_EF_2

Stream: East Fork Santa Cruz Creek

Barrier Type: Waterfalls

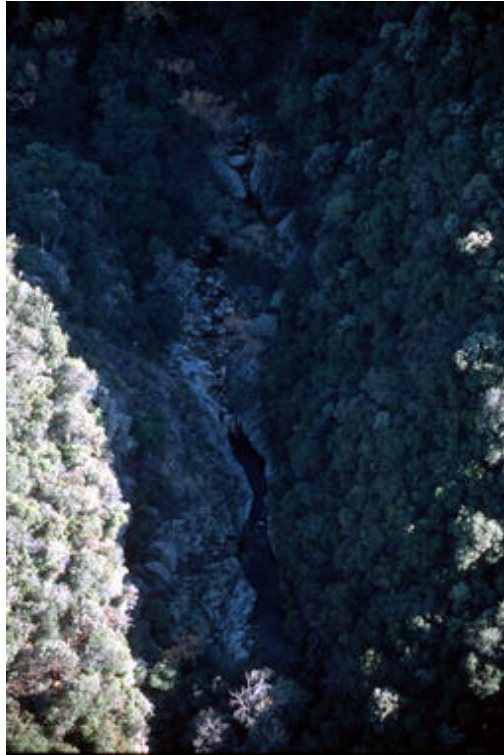
Physical Location: Near the 2680-foot elevation line on USGS 7.5 minute quad

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Partial (see description)



Description: Due to time constraints the East Fork and its tributaries were not ground surveyed upstream from the waterfall near the West Fork Santa Cruz Creek confluence (SY_SC_EF_1). These two waterfalls were identified from the air and the descriptions are limited in detail. Two bedrock and boulder waterfalls occur in this location approximately 175 feet from each other in a confined bedrock canyon. The downstream waterfall drops vertically 10-12 feet into a very large bedrock pool that extends downstream for over 100 feet. The upper waterfall is formed by steep canyon walls that have massive boulders wedged in between them creating a 12 to 15-foot drop into a large pool.

Diagnosis: Both of these waterfalls appear to be impassable to salmonids during all flows due to the excessive jump heights that would experience excessive velocities and turbulence during migration flows. It is hard to completely rule out upstream migration at this sites based upon a 30 second aerial observation during low-flow conditions. High winter flows and modifications to the stream channel and associated boulders may allow

future upstream passage. A backcountry ranger we spoke with at the Santa Cruz Cabin told us that rainbow trout occur in Grapevine Creek, but he thought they were planted there. Excellent pool habitat and flows were observed downstream to the West Fork and upstream to approximately 2 miles past Grapevine Creek. Grapevine Creek also had flow and several large pools. Large stream reaches could not be observed due to the dense riparian growth and additional surveying of this drainage is needed to determine if additional barriers occur on the East Fork and the severity and configuration of these two waterfalls.

Recommended Action: No recommended action for these natural features. Conduct additional ground surveying of the East Fork and its tributaries.

Barrier ID: SY_SC_WF_1

Stream: West Fork Santa Cruz Creek

Barrier Type: Steep Boulder Gradient

Physical Location: 100 feet upstream from the San Rafael Mountain confluence

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/4/03

Barrier Status: Partial

Description: This steep boulder cascade begins immediately upstream from the San Rafael Mountain Creek tributary (unnamed western tributary) confluence. The total height of this gradient is approximately 75 feet over a distance of approximately 300 feet. The steep gradient has several jumps over 3 feet high with minimal downstream pool depth and many steep cascades. The entire structure likely changes configuration with high stream flows, but remains steep.

Diagnosis: Excessive velocities and turbulence encountered during migration flows likely prevents upstream salmonid passage. Upstream fish passage past this point is unlikely due to the steep gradient of this stream reach and presence of higher quality habitat downstream. No trout were observed for the several hundred feet observed upstream of this feature and habitat quality was significantly reduced.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_SC_WF_CE_1

Stream: Coche Creek

Barrier Type: Bedrock chutes

Physical Location: Immediately downstream of upper western tributary confluence

GPS Location: N 34° 41' 24.5" W 119° 43' 56.7"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/5/03

Barrier Status: Complete



Description: This series of bedrock chutes and steep downstream gradient occurs immediately downstream from the largest unnamed western tributary that begins near the Mission Pine Basin Campsite. The two-part bedrock chutes have a total height of 10 feet 6 inches. The lower chute measured 4 feet 6 inches and the upper chute measured 6 feet tall. No pool exists between the chutes. Several steep gradient features occur downstream of this location that may also prevent upstream passage.

Diagnosis: The steep downstream gradient, minimal downstream jump pool, steep bedrock chutes, and further impassable upstream features prevent further upstream salmonid passage. Excessive gradients occur upstream of this feature on both tributaries including a bedrock waterfall over 75 feet tall immediately upstream on the unnamed tributary.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_SC_WF_SR_1

Stream: San Rafael Mountain Creek (unnamed western tributary near 3200' elevation)

Barrier Type: Steep Boulder Gradient

Physical Location: Approximately 0.5 mile upstream from the West Fork confluence

GPS Location: N 34° 40' 55.7" W 119° 47' 29.2"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/4/03

Barrier Status: Partial



Description: This boulder cascade and steep gradient stream reach have a maximum height of 9 feet tall with a downstream pool only 6 inches deep. Several steep gradient features occur downstream near this location.

Diagnosis: While this feature likely becomes mobilized during extremely high stream flows it appears to be impassable in the observed configuration. There are several downstream natural features that would severely limit or prevent upstream passage during most flows. The overall severity of upstream passage past this point is unlikely due to the steep gradient of this stream reach and presence of higher quality habitat downstream. No trout have been observed for several hundred feet downstream. Future channel alterations may allow limited upstream passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_ST_1

Stream: Saint Francis Creek (2nd unnamed tributary east of Tequepis Creek)

Barrier Type: Culvert crossing

Physical Location: Highway 154 crossing

GPS Location: N 34° 33' 42.1" W 119° 55' 31.2"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial



Upstream end of Highway 154 culvert

Description: Permission to access and ground survey private lands adjacent to the culvert was not obtained and limited observations were made from the surface of Highway 154. Based on the road and fill width observed, the culvert is approximately 200 feet long.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions could not be determined. Adjacent tributaries contain perennial habitat that is adequate for salmonid spawning and rearing. This long culvert likely impedes or prevents upstream salmonid passage due to shallow water depths and excessive water velocities encounter during different flow rates.

Recommended Action: Contact landowner(s) and seek access to survey upstream habitat conditions and characteristics surrounding the crossing and adjacent channel. If adequate upstream salmonid habitat occurs, fish passage improvements should be discussed with CALTRANS.

Barrier ID: SY_DV_1

Stream: DeVaul Creek

Barrier Type: Culvert crossing

Physical Location: Highway 154 crossing

GPS Location: N 34° 33' 36.1" W 119° 55' 1.0"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial



Description: This concrete arch culvert measured 9 feet wide at the base, 8 feet 6 inches tall, and 190 feet long. The height from the downstream substrate to the lip at the downstream end of the concrete apron varied from 18 inches to 3 feet. The culvert and apron have a moderately steep gradient.

Diagnosis: This culvert is impassable to upstream migrating salmonids during low flows due to the shallow flow conditions encountered and small downstream jump. During higher flows the downstream pool should provide moderately difficult access onto the apron where excessive velocities through the entire structure likely limit or completely block any upstream passage. During ideal moderate flow conditions, a large healthy adult may be able to swim through this structure with a high degree of difficulty. This structure is likely impassable during most flows and severely impedes or blocks access to most of this tributary.

Recommended Action: Further assess upstream habitat conditions with landowner permission. Should adequate habitat conditions occur upstream, investigate passage alternatives at this site with CALTRANS. The most effective solution for fish passage and long-term transportation benefits/protection would involve removal of the culvert and installation of a wide-span bridge.

Barrier ID: SY_DD_1

Stream: Dead Deer Creek (unnamed Santa Ynez River tributary east of DeVaul Creek)

Barrier Type: Culvert

Physical Location: Hwy 154 crossing

GPS Location: N 34° 33' 24.8" W 119° 54' 39.4"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial

Description: This culvert crossing was observed from the surface of Highway 154 and culvert conditions were not surveyed due to the lack of permission to access adjacent private property. Observations of the culvert were extremely limited. Based on the road and fill width observed, the culvert is approximately 150 feet long.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions are not known. This long culvert likely impedes or prevents upstream salmonid passage due to shallow water depths and excessive water velocities encountered during lower and high flows, respectively.

Recommended Action: Contact landowner(s) and seek access to survey upstream habitat conditions and characteristics surrounding the crossing and adjacent channel.

Barrier ID: SY_SF_1

Stream: San Fernando Rey Creek (unnamed tributary west of Hot Springs Creek)

Barrier Type: Culvert crossing

Physical Location: Hwy 154 crossing

GPS Location: N 34° 32' 52.2" W 119° 53' 48.2"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Unknown

Description: Permission was not obtained to survey this crossing from adjacent private lands and limited observations were made from the surface of Highway 154. Based on the road and fill width this culvert is approximately 150-175 feet long.

Diagnosis: Passage conditions at this site and upstream salmonid habitat conditions are not known. Adjacent tributaries contain perennial stream habitat that is adequate for salmonid spawning and rearing. This long culvert likely impedes or prevents upstream salmonid passage due to shallow water depths and excessive water velocities encounter during low and high stream flows, respectively.

Recommended Action: Contact landowner(s) and seek permission to survey upstream habitat conditions and characteristics surrounding the crossing and adjacent stream channel.

Barrier ID: SY_HS_1

Stream: Hot Springs Creek

Barrier Type: Culvert crossing

Physical Location: County Road to Live Oak Camp and Hwy 154 crossing

GPS Location: N 34° 32' 46.8" W 119° 52' 47.0"

Ownership/Interest: Santa Barbara County Public Works- Road Division/CALTRANS

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Partial



Description: Two roads cross over this long culvert. A concrete box culvert occurs under the county road from Highway 154 to the Live Oak Camp. This box culvert measured 10 feet wide by 10 feet tall and is 35 feet long. Upstream from the county road, the box culvert opens up into a concrete channel with no ceiling for 25 feet where it is attached to an oval corrugated metal culvert that measures 8 feet wide by 9 feet tall and is approximately 200 feet long. This culvert is under the Highway 154 road crossing. The total length of the entire structure is approximately 260 feet long.

Diagnosis: The downstream end of the structure is at streambed level allowing easy access for salmonids into the bottom end of the box culvert. This structure is impassable during low flow conditions due to insufficient water depth and during high flows due to the excessive water velocity through the long structure and absence of resting areas. During moderate flow conditions, a large healthy adult may be able to swim through this structure with a high degree of difficulty. This structure is likely impassable during most flows and severely impedes or blocks access to this tributary.

Recommended Action: Further assess upstream habitat conditions and culvert configuration with landowner permission. Investigate passage alternatives at this site with the County and CALTRANS.

Barrier ID: SY_KY_1

Stream: Kelly Creek

Barrier Type: Concrete channelization

Physical Location: Under Paradise Road Bridge

GPS Location: N 34° 32' 24.5" W 119° 51' 59.3"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/9/03

Barrier Status: Partial



Concrete channel under bridge

Description: This concrete channel is approximately 70 feet long and 50 feet wide running underneath the bridge. The concrete bottom has experienced a moderate to high degree of scour. Holes occur in the concrete providing pools with natural substrate bottoms for almost the entire length of the structure. The height from the downstream pool surface to the lip at the downstream end of the concrete channel measured approximately 12 inches. The downstream pool's maximum depth measured 12 inches.

Diagnosis: This partial barrier is passable for salmonids during medium to high flow conditions due to the minimal jump height onto the structure, the low gradient of the concrete channel, and the presence of pools in the scoured-out concrete bottom that provide velocity breaks. The downstream 6 feet of the concrete channel is likely impassable during low flow conditions due to insufficient water depth that occurs.

Recommended Action: Continue to monitor this site and ensure adequate salmonid passage. While immediate action is not needed, fish passage should be improved in the future in coordination with any maintenance at this site. The concrete bottom could be further roughened at the downstream end and confined in a lo-flow channel to improve passage during low flows.

Barrier ID: SY_KY_BR_1

Stream: Bear Creek

Barrier Type: Box Culvert

Physical Location: Stagecoach Road crossing

GPS Location: N 34° 32' 13.4" W 119° 51' 27.1"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/9/03

Barrier Status: Partial



Concrete apron at upstream end of culvert

Description: Observations of this structure are limited to the surface of Stagecoach Road and permission to access adjacent private property was not obtained. This concrete box culvert measures approximately 10 feet tall by 10 feet wide and 50 feet long. The downstream lip of the culvert measured approximately 1-foot above the surface of the downstream pool, which had a maximum depth of 2 feet.

Diagnosis: During most flows, salmonids can jump into the culvert due to the short jump height and presence of downstream pool depth. The culvert is impassable to upstream migrating salmonids during low flows due to shallow flow conditions and during high flows due to excessive velocities and lack of resting areas. During moderate flow conditions, difficult upstream migration may be possible for healthy adults when water depths are adequate and water velocities are not at a maximum. This structure is likely impassable to most fish at most flows and severely impedes or blocks access to most of this tributary.

Recommended Action: Further assess culvert and channel conditions with landowner permission and investigate passage alternatives at this site with the County and other stakeholders. The most effective solution for fish passage is removal of the culvert and installation of a wide-span bridge. High quality salmonid habitat occurs in Bear Creek upstream of this barrier.

Barrier ID: SY_KY_BR_2

Stream: Bear Creek

Barrier Type: Culvert crossing

Physical Location: Highway 154 crossing

GPS Location: N 34° 32' 9.9" W 119° 51' 37.3"

Ownership/Interest: California Department of Transportation

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Complete



Description: This metal culvert measured 9 feet wide by 10 feet tall and 348 feet long. The moderately steep concrete apron extends downstream for an additional 12 feet 6 inches. The height from the downstream pool surface to the lip at the downstream end of the concrete apron measured 18 inches. The downstream pool's maximum depth measured 2 feet.

Diagnosis: Salmonids can jump from the downstream pool onto the concrete apron during most flow conditions due to the short jump height and adequate jump depth. Both the bottom of the concrete apron and the bottom of the metal culvert have a moderately steep gradient and are impassable to upstream migrating trout during low flows due to shallow flow conditions and during high flows due to excessive velocities. Due to the excessive length of this culvert, lack of resting spots, and resulting excessive water velocities and/or shallow water depth, this structure is most likely a complete barrier during all flow conditions.

Recommended Action: Further assess culvert and channel conditions and investigate passage alternatives at this site with CALTRANS and other stakeholders. The most effective solution for fish passage is removal of the culvert and installation of a wide-span bridge. High quality salmonid habitat occurs in Bear Creek upstream of this barrier.

Barrier ID: SY_KY_CS_1

Stream: Cold Springs Creek

Barrier Type: Old Dam

Physical Location: Approximately 200 feet below Stagecoach Road crossing

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/24/03

Barrier Status: Not a Barrier



Description: Remnants of this old, broken dam measured 3 feet tall and around 18 inches thick. The dam was constructed with native rock and concrete.

Diagnosis: The dam is broken apart and a natural stream channel occurs around the remains of the structure. The remains of the dam do not impede upstream passage along the adjacent natural streambed.

Recommended Action: No recommended action for this deteriorated structure.

Barrier ID: SY_KY_CS_2

Stream: Cold Springs Creek

Barrier Type: Culvert crossing

Physical Location: Stagecoach Road Crossing at Cold Spring Tavern

GPS Location: N 34° 31' 17.2" W 119° 50' 20.1"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/24/03

Barrier Status: Partial



Description: This concrete box culvert measured 5 feet tall by 5 feet wide and fifty feet long. The downstream jump-height measured 5 feet 6 inches tall over a horizontal distance of 6 feet. The downstream pool measured 3 feet deep.

Diagnosis: Passage conditions downstream on private property could not be determined and it is unknown if steelhead could historically migrate this far upstream. This crossing prevents upstream passage during low flows due to shallow water depth and high flows due to excessive water velocities. During moderate flows the crossing is likely impassable due to excessive velocities inside the culvert, but fish may be able to jump into the culvert and attempt the swim through.

Recommended Action: Seek landowner permission to survey the private reach of lower Cold Spring Creek upstream of Kelly Creek for natural barriers.

Barrier ID: SY_LP_1

Stream: Los Prietos Creek

Barrier Type: Culvert crossing

Physical Location: Paradise Road crossing

GPS Location: N 34° 32' 25.2" W 119° 47' 53.3"

Ownership/Interest: Santa Barbara County Public Works- Roads Division

Surveyor(s) and Date: Shaw Allen 11/10/03

Barrier Status: Complete



Looking downstream at corrugated metal culvert

Description: This perched, corrugated metal culvert measured 6 feet in diameter and 50 feet long. The jump height from the downstream pool to the lip of the culvert measured 15 feet.

Diagnosis: This structure is completely impassable due to the excessive jump height downstream and insufficient pool depth. The downstream pool was dry, but would not backfill enough to allow sufficient jump depth. It is unknown whether this small tributary would contain much beneficial salmonid habitat to warrant an expensive fish passage project at this crossing.

Recommended Action: Further assess upstream salmonid habitat conditions with landowner permission. Should adequate habitat conditions occur upstream, assess hydraulic and channel conditions at the crossing and investigate passage alternatives at this site with the county and other stakeholders. The most effective solution for fish passage is removal of the culvert and installation of a wide-span bridge.

Barrier ID: SY_OO_1

Stream: Oso Creek

Barrier Type: Ford

Physical Location: Road crossing to private residence across from Upper Oso Camp

GPS Location: N 34° 33' 17.5" W 119° 46' 9.2"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/11/03

Barrier Status: Not a barrier



Description: This natural bottom ford crossing consists of native rocks and small boulders formed to a maximum downstream height of 18 inches tall.

Diagnosis: This ford is created each year following the subsidence of high stream flows and blows out with winter flows producing a natural stream bottom. Fish passage is not significantly impeded.

Recommended Action: Ensure that the crossing remains a natural ford and is not “improved” with any in stream construction.

Barrier ID: SY_OO_2

Stream: Oso Creek

Barrier Type: Low-flow road crossing

Physical Location: Upper Oso Camp

GPS Location: N 34° 33' 26.7" W 119° 46' 15.0"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/11/03

Barrier Status: Partial



Description: This low-flow concrete crossing spans 35 feet across the stream channel and measured 14 feet wide. The crossing is elevated above the natural streambed a maximum of 5 inches and has a mild to flat slope.

Diagnosis: When adequate water depth occurs during moderate and high stream flows, salmonids can jump or swim onto the road surface with a low to moderate degree of difficulty. Due to a lack of roughness, water velocities are accelerated over the smooth concrete crossing during higher flows and may impede or prevent upstream passage for smaller salmonids. All fish passage is blocked during low flows due to shallow water depth spread out over the crossing's surface.

Recommended Action: This crossing should be monitored to ensure that passage does not become more difficult due to downstream scour and increased jump height. Future efforts should be made to improve passage at this site, in conjunction with scheduled maintenance. Concentrating low flows, and water depth, over the crossing in a roughened channel would improve passage conditions.

Barrier ID: SY_OO_3

Stream: Oso Creek

Barrier Type: Waterfall

Physical Location: Near the 1520-foot elevation line on USGS map

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/6/03

Barrier Status: Complete



Description: Oso Creek was ground surveyed from the Santa Ynez River upstream to the Upper Oso Campsite crossing. This waterfall was observed from the trail while returning from Santa Cruz Creek surveying. This stream reach was observed from the trail and no downstream barriers were observed. No surface flows were observed upstream from this feature and several adequate pools and trickling surface flow continued downstream to Upper Oso Campsite. This unique looking bedrock waterfall drops vertically 10 feet into a small 12-inch deep pool downstream.

Diagnosis: The excessive jump height and insufficient downstream pool depth prevent further upstream salmonid passage in Oso Creek.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_DS_1

Stream: Devils Canyon Creek

Barrier Type: Culvert crossing

Physical Location: 300 feet upstream of confluence with Santa Ynez River

GPS Location: N 34° 31' 20.3" W 119° 41' 14.8"

Ownership/Interest: City of Santa Barbara/ Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/23/03

Barrier Status: Partial



Description: Two 5-foot diameter corrugated metal culvert pipes measured 18 feet long. A concrete apron extends downstream 30 feet below the culvert outlets and a concrete apron extending upstream of the inlets for 12 feet. Concrete and boulder revetment lines the banks downstream for the length of the apron. A 4-foot drop occurs from the lip of the apron to the downstream substrate.

Diagnosis: During moderate to high stream flows a downstream pool would form and allow a moderately difficult jump onto the concrete apron. Accelerated water velocities across the moderately sloped apron and through the culverts and upstream apron would present a difficult passage situation for adult salmonids and may be impassable for juvenile fish. During high flows the velocities would likely prevent upstream passage and during low flows the excessive jump height, limited pool depth, and shallow flows conditions would prevent passage. On May 9th of 1995 the LPNF Fisheries Crew electro-fished Devils Canyon from the mouth to 0.75 of a mile upstream from this road crossing. A picture of this culvert from that day showed the downstream plunge pool filled up to within 1-foot of the lip of the apron and moderate flow through the culverts and across the apron. Above the culvert the crew shocked three rainbow trout measuring 15, 11, and 9 inches. The 15-inch trout may have been a spawner from Cachuma Reservoir. If this fish did migrate from the Santa Ynez River up Devils Canyon passed this partial barrier. The NMFS (SPAT) team also collected salmonids in Devils Canyon Creek this fall 2003.

Recommended Action: Due to the presence of rainbow trout, adequate upstream habitat, and the relatively high severity of the barrier, fish passage should be improved at this site in conjunction with future maintenance and/or road improvements. Fish passage and overall transportation safety and reliability would benefit most from the removal of this structure and installation of a bridge with natural streambed. Further study of the channel and hydraulic conditions should be conducted and alternative analysis completed.

Barrier ID: SY_DS_2

Stream: Devils Canyon Creek

Barrier Type: Diversion Dam

Physical Location: 75 feet upstream from road crossing (SY_DS_1)

GPS Location: N 34° 31' 1.3" W 119° 41' 10.1"

Ownership/Interest: City of Santa Barbara/ LPNF

Surveyor(s) and Date: Shaw Allen 11/21/03

Barrier Status: Partial



Description: This diversion occurs in a braided stream reach and the diversion inlet and dam gate occur on the river-left braid of the creek. A concrete channel conveys non-diverted flows back to the main creek. The diversion uses a 6-foot wide concrete side-channel with 3-foot tall rock and concrete walls to divert water directly out of the main creek channel. The concrete channel reconnects to the natural channel immediately above the road crossing and extends upstream for 110 feet. The metal flashboard structure is 3 feet tall. There is a notch in the top of the flashboard, which appears to limit the intake of water into the diversion.

Diagnosis: This diversion structure does not span the entire stream channel and does not impede upstream migration during moderate to high flows. The reduction in downstream flows caused by the diversion may reduce downstream connectivity and increase barrier severity. The intake of the diversion is not adequately screened and can entrap downstream migrating trout.

Recommended Action: The diversion should be immediately screened to prevent entrapment of existing trout. Additional assessment of this structures operation should be conducted to determine impacts on downstream flows and stream connectivity.

Barrier ID: SY_DS_3

Stream: Devils Canyon Creek

Barrier Type: Diversion Dam

Physical Location: Approximately 0.25 mile upstream Santa Ynez River

GPS Location: N 34° 31' 9.8" W 119° 41' 14.8"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/21/03

Barrier Status: Partial



Description: This old dam is constructed with small boulders and concrete. The dam measured 3 feet tall and is 2 feet 6 inches thick. There is a 4-inch diameter steel diversion pipe extending out of the dam downstream for 15 feet. The dam is completely filled-in with sediment and not longer appears to function as a diversion.

Diagnosis: A natural side channel occurs to the river-right of this dam where no remains of the structure occur. This side channel provides access to salmonid passage similar to the surrounding natural substrate features.

Recommended Action: Remove the metal pipe to prevent future downstream blockage and observe the dam during winter flows to assess if it impairs passage in any way. If the dam negatively influences fish passage or sediment transport it should be broken apart.

Barrier ID: SY_DS_4

Stream: Devils Canyon Creek

Barrier Type: Steep gradient/Insufficient flow

Physical Location: Approximately 0.75 mile upstream from Santa Ynez River

GPS Location: N 34° 31' 9.8" W 119° 41' 14.8"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 11/21/03

Barrier Status: Complete



Description: Two tributaries form a confluence at this location approximately 0.33 mile upstream from the last observed surface flow.

Diagnosis: It is likely that this area represents the natural upstream limit to salmonid migration due to the steepness of the boulder gradient, lack of summer flow, multiple drops associated with boulder cascades, and higher quality habitat downstream.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_GY_1

Stream: Gidney Creek

Barrier Type: Low-flow crossing

Physical Location: Immediately upstream from Gibraltar Reservoir

GPS Location: N/A

Ownership/Interest: City of Santa Barbara/Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Partial

Description: Observation of this crossing was extremely limited while flying overhead. The crossing appears to be an earthen-fill crossing that may or may have one or more culvert pipes passing underneath.

Diagnosis: Additional ground surveying is needed to accurately measure the structure and determine the severity to salmonid passage.

Recommended Action: Conduct a ground survey of this structure and upstream habitat conditions and quantity.

Barrier ID: SY_MO_1

Stream: Mono Creek

Barrier Type: Debris Dam (Mono Debris Dam)

Physical Location: 0.35 mile downstream of Indian and Mono Creek confluence

GPS Location: N 34° 31' 49.1" W 119° 37' 45.1"

Ownership/Interest: City of Santa Barbara/LPNF

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/18/03

Barrier Status: Complete



Description: The Mono Debris Dam was constructed between 1935-1936 by the Civilian Conservation Corps in coordination with the City of Santa Barbara. The height of the dam from the downstream pool surface to the top of the spillway measures approximately 18 feet. A catwalk passes through the center of the dam allowing access through the dam and observation of the internal chambers within. This dam was designed to catch downstream migrating sediment bound for Gibraltar Reservoir in order to prolong the life of the reservoir. Sediment composed of sand, fine silts, and cobbles has accumulated to the top of the upstream side of the dam's spillway.

Diagnosis: The lack of fish passage facilities and height of the structure prevents all upstream fish passage at this site during all flow conditions.

Recommended Action: This filled-in debris dam no longer serves a significant purpose for catching sediment transported downstream. Salmonid passage to upstream perennial habitat that would provide access to one of the largest reaches of spawning and rearing habitat in the Santa Ynez River watershed. Provision of fish passage at this site should be included in a Forest-wide program for restoring fish movement within the Los Padres National Forest.

Barrier ID: SY_MO_2

Stream: Mono Creek

Barrier Type: Low-flow road crossing

Physical Location: Camuesa Road crossing within Mono Debris Dam Basin

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/18/03

Barrier Status: Partial



Indian Creek and (SY_MO_IN_1) on left. Mono Creek and (SY_MO_2) at center.

Description: This low-flow crossing is almost identical to the adjacent Camuesa Road crossing on Indian Creek. See barrier write-up SY_MO_IN_1.

Diagnosis: During moderate and high flows salmonids can jump/swim onto the crossing surface and negotiate upstream with a low to moderate degree of difficulty. Water velocities will be accelerated over the crossing during high flows and may impede or prevent upstream passage for smaller salmonids. Fish passage is prevented during lower flows due to the shallow water depth spread out over the crossing's surface.

Recommended Action: Passage conditions could be temporarily improved by designing and constructing a boulder ramp immediately downstream of the crossing where the current pool occurs. This sloping ramp of boulders should extend approximately 3 inches higher than the crossing surface at the lowest point in the crossing to ensure moderate backfilling of water across the crossing's surface. This crossing should continue to be monitored to ensure that adequate upstream salmonid migration conditions occur. Existing rainbow trout populations likely migrate between the Indian and Mono drainages.

Barrier ID: SY_MO_3

Stream: Mono Creek

Barrier Type: Insufficient flow

Physical Location: Near the 4000-foot elevation line on USGS map

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Partial

Description: Due to time and budget constraints, upper Mono Creek was not ground surveyed and limited observations were made from the air. At this location on Mono Creek no surface flows were observed, riparian vegetation was sparse, the stream channel had become very small, and the creek resembles a small gully lacking adequate salmonid habitat. No complete migration barriers were observed on Mono Creek from the Mono Debris Dam Basin crossing (SY_MO_2) upstream to this location. Several boulder features up to 5 feet tall occur in The Narrows that would impede fish passage during lower flows, but would allow passage during moderate and higher flows. Excellent salmonid habitat with large pools and surface flow was observed from the Roblar Creek confluence downstream through The Narrows. Downstream of The Narrows, fair to good salmonid habitat occurs with smaller pools and inconsistent surface flow to just upstream of the Mono Debris Basin's upstream extent. The Lacosca Creek tributary and the next eastern tributary system upstream were surveyed from the air. No surface flow was observed in either arid system and habitat conditions for salmonids appeared to be poor. Pine Canyon Creek contained surface flows and adequate salmonid habitat and appears to be the upper headwater habitat for salmonids migrating up Mono Creek.

Diagnosis: Due to the poor habitat conditions and lack of stream flow at this location, further upstream salmonid migration is unlikely.

Recommended Action: Not recommended action for this natural feature.

Barrier ID: SY_MO_IN_1

Stream: Indian Creek

Barrier Type: Low-flow road crossing

Physical Location: Camuesa Road Crossing

GPS Location: N 34° 32' 8.8" W 119° 37' 55.6"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/18/03

Barrier Status: Partial



Description: This low-flow crossing spans 125 feet across the stream channel and measured 13 feet wide. The surface of the concrete crossing has a mild downstream slope. During the observed dry conditions, a vertical drop of 2 feet was measured from the downstream crossing surface lip to the downstream natural streambed.

Diagnosis: During moderate and high flows, salmonids can easily jump/swim onto the crossing surface and negotiate upstream with a low degree of difficulty. Water velocities would be slightly accelerated over the crossing during high flows and may impede or prevent upstream passage for smaller salmonids. Fish passage is prevented during low flows due to the shallow water depth spread out over the crossing's surface.

Recommended Action: Passage conditions could be temporarily improved by designing and constructing a boulder ramp immediately downstream of the crossing where the current pool occurs. This sloping ramp of boulders should extend approximately 3 inches higher than the crossing surface at the lowest point in the crossing to ensure moderate backfilling of water across the crossing's surface. A roughened low-flow channel could be cut in the crossing to the low-point of the boulder ramps.

Barrier ID: SY_MO_IN_2

Stream: Indian Creek

Barrier Type: Low-flow road crossing

Physical Location: Camuesa Road Crossing

GPS Location: N 34° 32' 23.8" W 119° 38' 6.7"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/18/03

Barrier Status: Partial



Description: This low-flow crossing measured 13 feet wide. The surface of the concrete crossing has a mild downstream slope. An apron extends 3 to 5 feet downstream of the crossing with a total drop of 4 feet from the crossing surface to the downstream natural streambed. The slope of the apron varies from approximately 30 to 45 degrees.

Diagnosis: During moderate and high flows, salmonids can jump/swim onto the crossing surface with a moderate degree of difficulty and negotiate across the crossing with a moderate degree of difficulty. Water velocities are accelerated over the crossing during high flows and may impede or prevent upstream passage for smaller salmonids. Fish passage is prevented during low flows due to the shallow water depth spread out over the crossing's surface.

Recommended Action: Passage conditions could be temporarily improved by designing and constructing a boulder ramp immediately downstream of the crossing where the current pool occurs. This sloping ramp of boulders should extend approximately 3 inches higher than the crossing surface at the lowest point in the crossing to ensure moderate backfilling of water across the crossing's surface. A roughened low-flow channel could be cut in the crossing to the low-point of the boulder ramps.

Barrier ID: SY_MO_IN_3

Stream: Indian Creek

Barrier Type: Low-flow road crossing

Physical Location: Camuesa Road Crossing

GPS Location: N 34° 33' 26.1" W 119° 38' 8.1"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/18/03

Barrier Status: Partial



Description: This low-flow crossing measured 13 feet wide. The surface of the concrete crossing has a mild downstream slope. A vertical drop varying between 12 and 18 inches occurs from the crossing surface to the downstream substrate.

Diagnosis: During moderate and high flows, salmonids can jump/swim onto the crossing surface with a low degree of difficulty and negotiate across the crossing with a low to moderate degree of difficulty. Water velocities would be slightly accelerated over the crossing during high flows and may impede or prevent upstream passage for smaller salmonids. Fish passage would be impaired or prevented during lower flows due to the shallow water depth spread out over the crossing's surface.

Recommended Action: Passage conditions could be temporarily improved by designing and constructing a boulder ramp immediately downstream of the crossing where the current pool occurs. This sloping ramp of boulders should extend approximately 3 inches higher than the crossing surface at the lowest point in the crossing to ensure moderate backfilling of water across the crossing's surface. A roughened low-flow channel could be cut in the crossing to the low-point of the boulder ramps.

Barrier ID: SY_MO_IN_4

Stream: Indian Creek

Barrier Type: Weir

Physical Location: Upstream of Camuesa Road Crossing

GPS Location: N 34° 32' 35.8" W 119° 38' 28.8"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/18/03

Barrier Status: Partial



Description: This concrete weir spans the entire channel with a mild V-shape. A metal plate covers the upstream side of the weir to protect the concrete from downstream migrating debris. The weir is 16 inches thick. A vertical drop of 4 feet 6 inches occurs from the low point of the V to the surface of the downstream pool. The downstream pool had a maximum depth of 4 feet 6 inches. Deposited sediment occurred upstream of the weir to within 10 inches of the top.

Diagnosis: During moderate to high flows, the downstream pool depth will increase several feet and reduce the jump height while increasing the jump pool depth. During these conditions adult steelhead could jump over the weir with a moderate degree of difficulty. Existing rainbow trout would have a harder time, but larger trout could likely negotiate the weir during ideal flow conditions with a high degree of difficulty.

Recommended Action: Determine the current usefulness of the weir. If the weir is not essential it should be removed to ensure unimpeded upstream access for the current salmonid population that can become stranded downstream in this lowest observed pool on Indian Creek. This structure is a significant impediment to migration between the Mono and Indian Creek salmonid populations. Enhancing connectivity between these two “isolated” populations should be improved to limit inbreeding and promote genetic mixing.

Barrier ID: SY_MO_IN_5

Stream: Indian Creek

Barrier Type: Waterfall

Physical Location: Near the 2800-foot elevation line on USGS map

GPS Location: N 34° 37' 25.7" W 119° 39' 58.0"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/21/03

Barrier Status: Complete



Description: This impressive two-stage bedrock waterfall drops 16 feet into a 9-foot deep pool that spills water down an additional 27-foot drop. This lower drop varies from a vertical waterfall drop to a steep chute with a slope of approximately 60 degrees. A long, narrow, gorge pool occurs downstream with a maximum depth of 12 feet.

Diagnosis: This stable bedrock feature is impassable to all salmonids due to the excessive height. No trout were observed for approximately 0.5 mile upstream of the waterfall. Rainbow trout have been reported upstream of this falls and may be the offspring from former stocking efforts (pers. comm. Capelli). Isolated reaches of flow and excellent pool habitat occur downstream of the waterfall and rainbow trout are present.

Recommended Action: Not recommended action for this natural feature.

Barrier ID: SY_MO_IN_BN_1

Stream: Buckhorn Creek

Barrier Type: Insufficient flow

Physical Location: Upstream from second large northern tributary

GPS Location: N 34° 35' 26" W 119° 42' 16.6"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/21/03

Barrier Status: Partial



Description: At this location on Buckhorn Creek the channel has become a small 4-foot wide gully with upland grasses growing in the channel and no sign of perennial flow or adequate spawning habitat. Excellent salmonid habitat, spring flows, and rainbow trout occur from approximately 0.25 mile downstream from the second northern tributary downstream to the Lower Buckhorn Campsite. The second northern tributary appeared to be a flashy, dry tributary as well, but was double the size of the mainstem of Buckhorn Creek. The above photograph shows the Buckhorn Creek channel coming down from the top left to where Shaw Allen is standing (at the confluence) and the larger, dry, second northern tributary comes in from the right side of the photo. From this confluence, the Buckhorn flows out of the picture to the left.

Diagnosis: It is unlikely that any salmonid migration would occur beyond this point due to the poor habitat conditions and lack of flow.

Recommended Action: No recommended action.

Barrier ID: SY_MO_IN_BN_NF_1

Stream: North Fork Buckhorn Creek (unnamed first upstream northern tributary)

Barrier Type: Steep gradient

Physical Location: Near the 3200-foot elevation line on the USGS 7.5 map

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 10/21/03

Barrier Status: Estimated upstream limit

Description: Due to time constraints this tributary to Buckhorn Creek was only surveyed at the confluence with the mainstem of Buckhorn Creek. This tributary had a small trickling flow and contained adequate salmonid habitat at the confluence.

Diagnosis: Based on assessment of the USGS maps it appears that upstream salmonid migration could continue to near the 3200-foot elevation where excessive stream gradient is observed and would likely limit further upstream passage.

Recommended Action: Ground survey this tributary to determine the exact upstream natural limit and habitat conditions.

Barrier ID: SY_MO_AR_1

Stream: Alamar Creek

Barrier Type: Insufficient flow

Physical Location: Upstream of Bill Faris Campground near 4400-foot elevation

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Complete

Description: Due to time constraints, Alamar Creek was not ground surveyed and limited observations were made from the air. At this location on Alamar Creek the channel has become very small and dry with an increase in gradient. Adequate salmonid habitat was not observed upstream from this point.

Diagnosis: It is unlikely that any salmonid migration would occur beyond this point due to the poor upstream habitat conditions, increase gradient, and lack of flow. Downstream from Bill Faris Campground adequate salmonid habitat was observed with consistent flow and several large pools present. None of the small tributaries to Alamar Creek were observed to have surface flow or considerable salmonid habitat.

Recommended Action: Not recommended action.

Barrier ID: SY_MO_RR_1

Stream: Roblar Creek

Barrier Type: Waterfall

Physical Location: Near the 3280-foot elevation line on USGS 7.5 minute map

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Complete

Description: Due to time constraints, Roblar Creek was not ground surveyed and limited observations were made from the air. At this location on Roblar Creek a bedrock waterfall over 20 feet tall was observed.

Diagnosis: This waterfall is impassable during all flows due to the excessive jump height. Several excellent, deep pools were observed downstream from this waterfall providing good salmonid habitat.

Recommended Action: No recommended action.

Barrier ID: SY_MO_PE_1

Stream: Pine Canyon Creek

Barrier Type: Waterfall

Physical Location: 3920-foot elevation line USGS 7.5 minute map

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker 12/15/03

Barrier Status: Complete

Description: Due to time constraints, Pine Canyon Creek was not ground surveyed and limited observations were made from the air. At this location on Pine Canyon Creek a bedrock waterfall approximately 20 feet tall was observed where the canyon becomes confined and turns sharply to the north.

Diagnosis: This waterfall is impassable during all flows due to the excessive jump height. Several excellent, deep pools were observed downstream from this waterfall providing good salmonid habitat.

Recommended Action: No recommended action.

Barrier ID: SY_BE _1

Stream: Blue Creek

Barrier Type: Steep gradient

Physical Location: Approximately 0.4 mile upstream of Romero Camuesa Road Bridge

GPS Location: N 34° 29' 4.4" W 119° 33' 24.3"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/12/03

Barrier Status: Complete

Description: This steep, boulder gradient and debris jam measured 7 feet tall and had no downstream pool. The creek becomes dry downstream from this location and overall habitat quality has become poor in this stream reach.

Diagnosis: This feature likely prevents all upstream salmonid passage due to the excessive jump-height, and limited downstream pool formation. This feature may become mobilized during higher flows and allow limited upstream access to questionable habitat.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_BE_EO_1

Stream: Escondido Creek

Barrier Type: Bedrock Chute

Physical Location: Approximately 0.25 mile upstream from Blue Canyon Creek

GPS Location: N 34° 29' 0.8" W 119° 33' 59.6"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/12/03

Barrier Status: Complete



Description: This bedrock and boulder chute measured 12 feet 6 inches tall from the surface of the downstream pool. The chute is nearly vertical. The downstream pool had a maximum measured depth of 6 feet and was confined in a narrow bedrock pool 3 feet wide at the jump location. A 5-foot tall boulder cascade occurs immediately upstream of this feature.

Diagnosis: This feature likely prevents all upstream salmonid passage due to the excessive jump-height, and confined downstream pool that would be completely covered with a waterfall during high stream flows. Rainbow trout are present downstream of this feature.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_AC_1

Stream: Agua Caliente Creek

Barrier Type: Low-flow road crossing

Physical Location: Romero Camuesa Road crossing

GPS Location: N 34° 30' 31.6" W 119° 34' 36"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/9/03

Barrier Status: Partial



Description: This low-flow crossing spans 125 feet across the active stream channel and measured 14 feet wide. The total concrete crossing measured 240 feet long across the channel and up adjacent banks. The crossing occurs at streambed level with surface flows of 0.15 c.f.s pooling up to 3 inches deep onto the crossing from downstream and across to an upstream pool. A metal grate spans 14 feet across the road near the middle river-right side.

Diagnosis: Due to the connectivity of surface flow across the channel, this structure has a minimal impact on upstream salmonid migration. During exceptionally dry years the crossing may prevent upstream passage during lower flows and high velocities may have a small negative impact on upstream passage during high flows. Substrate downstream at, or above, crossing elevation should backfill the crossing during moderate flows and reduce velocities significantly during higher flows.

Recommended Action: Continue to monitor the crossing to ensure that fish passage severity is not increased by downstream scour or future construction projects.

Barrier ID: SY_AC_2

Stream: Agua Caliente Creek

Barrier Type: Debris Dam (Pendola Debris Dam)

Physical Location: Approximately 0.25 mile upstream from Pendola Guard Station

GPS Location: N 34° 30' 47.4" W 119° 34' 30.6"

Ownership/Interest: Los Padres National Forest/City of Santa Barbara

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/9/03

Barrier Status: Complete



Description: The Pendola Debris Dam is constructed of interlocking concrete blocks on top of a concrete foundation. The concrete foundation measured at least 5 feet tall on the river-left side and continued into the substrate downstream. The dam measured approximately 170 across the stream channel from downstream. The top of the dam measured up to 7 feet thick. The vertical height from the downstream substrate to the top of the dam's notch at center measured 18 feet 6 inches. A concrete curb measuring 5 feet thick spans across the entire stream channel 40 feet downstream from the debris dam. This curb is partial buried in substrate in some locations and exposed in others. Sediment is deposited to the top of the upstream side of the dam rendering it full. Mature willows are growing on top of the dam. Tamarisk was also observed growing in the debris basin.

Diagnosis: The height of the structure completely blocks upstream salmonid passage under all flow conditions.

Recommended Action: This filled-in debris dam no longer serves a significant purpose for catching sediment transported downstream. Provision of fish passage at this site should be included in a Forest-wide program for restoring fish movement within the Los Padres National Forest.

Barrier ID: SY_AC_3

Stream: Agua Caliente Creek

Barrier Type: Low-flow road crossing

Physical Location: #1 Crossing on LPNF Road 6N16 to Agua Caliente Spring

GPS Location: N 34° 32' 4.4" W 119° 33' 44.7"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/9/03

Barrier Status: Partial



Description: This concrete low-flow crossing spans 113 feet across the stream channel and adjacent banks with approximately 68 feet occurring in the active stream channel. The road measured 12 feet 6 inches wide with a concrete apron sloping an additional 6 feet downstream. The surface of the concrete crossing has a mild downstream slope. The moderately steep apron drops 2 feet over the 6-foot length. A 6-inch drop from the road surface occurs to the top of the concrete apron. Large boulders extend up to 12 feet downstream on the river-left side and drop a maximum height of 3 feet 6 inches. Deposited sediment has accumulated to the top of the upstream side of the crossing.

Diagnosis: During moderate and high stream flows, adult salmonids could jump or swim onto the crossing surface and negotiate upstream of the crossing with a moderate to high degree of difficulty. Water velocities would be accelerated over the crossing during high flows and may impede or prevent upstream passage for smaller salmonids. Fish passage is prevented during low flows due to the shallow water depth spread out over the crossing's surface and apron.

Recommended Action: Following downstream fish passage improvements at the Pendola Debris Dam, this crossing should be removed and replaced with a bridge or modified with a roughened low-flow channel and downstream boulder ramp.

Barrier ID: SY_AC_4

Stream: Agua Caliente Creek

Barrier Type: Low-flow road crossing

Physical Location: #2 Crossing on LPNF Road 6N16 to Agua Caliente Spring

GPS Location: N 34° 32' 11.2" W 119° 33' 45.9"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/9/03

Barrier Status: Partial



Description: This low-flow crossing spans 117 feet across the stream channel and adjacent banks with approximately 65 feet occurring in the active stream channel. The road measured 12 feet wide with a concrete and boulder apron sloping an additional 8 feet downstream into the pool downstream. The surface of the concrete crossing has a mild downstream slope. The steep apron drops vertically 3 feet and projects horizontally 4 feet downstream from the crossing. The downstream pool had a maximum measured depth of 4 feet 6 inches and undercuts the crossing several feet. Deposited sediment has accumulated to the top of the upstream side of the crossing.

Diagnosis: During moderate stream flows, adult salmonids could jump onto the crossing surface and negotiate upstream of the crossing with a moderate to high degree of difficulty. Water velocities would be accelerated over the crossing during high flows and may impede or prevent upstream passage for smaller salmonids. Fish passage is prevented during low flows due to the shallow water depth spread out over the crossing's surface, excessively steep apron, and jump height.

Recommended Action: Following downstream fish passage improvements at the Pendola Debris Dam, this crossing should be removed and replaced with a bridge or lowered to stream grade and outfitted with a roughened low-flow channel and stabilized.

Barrier ID: SY_AC_5

Stream: Agua Caliente Creek

Barrier Type: Low-flow road crossing

Physical Location: #3 Crossing on LPNF Road 6N16 to Agua Caliente Spring

GPS Location: N 34° 32' 19.2" W 119° 33' 53.0"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/9/03

Barrier Status: Partial



Description: This low-flow crossing spans 165 feet across the stream channel and adjacent banks with approximately 80 feet occurring in the active stream channel. The road measured 16 feet wide including the concrete apron on the downstream side. The surface of the concrete crossing has a flat to mild slope. The apron drops at a 45-degree angle, but is submerged for the middle 30 feet of the crossing by up to 15 inches of water. Deposited sediment has accumulated to the top of the upstream side of the crossing.

Diagnosis: During observed low-flow conditions, salmonids could swim onto the crossing and upstream without difficulty. Water velocities would be accelerated over the crossing during high flows and may briefly impede upstream passage for smaller salmonids. This crossing would not significantly impact upstream fish passage, but may change configuration in the future.

Recommended Action: Continue to monitor this crossing, prevent downstream scour, and maintain effective fish passage conditions so that future downstream improvements may allow continued upstream fish passage.

Barrier ID: SY_AC_6

Stream: Agua Caliente Creek

Barrier Type: Debris Dam

Physical Location: Approximately 0.5 mile upstream from Agua Caliente (Hot) Spring

GPS Location: N 34° 32' 31.7" W 119° 33' 39.7"

Ownership/Interest: City of Santa Barbara/ Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/10/03

Barrier Status: Complete



Description: The Agua Caliente Dam was constructed between 1936-1937 by the Civilian Conservation Corps in coordination with the City of Santa Barbara. This dam was designed to catch downstream migrating sediment bound for Gibraltar Reservoir in order to prolong the life of the reservoir. This concrete arch dam measured 58 feet 6 inches tall from the surface of the downstream pool to the top of the main notch that spans 80 feet across the rim of the dam. On either side of the notch the dam height angles up an additional 12 feet. The downstream pool depth could not be determined, but exceeded 10 feet. The overall height of the dam likely exceeds 80 feet. At the notch on top, the dam measured 4 feet thick. The dam is built in an ideal location between confined bedrock walls that create a narrow canyon. The upstream dam basin is completely filled-in with accumulated sediment and covered with an extensive and impressive forest of mature willow trees that extend upstream for approximately 0.5 mile.

Diagnosis: The excessive height of the dam completely blocks upstream fish passage during all flow conditions.

Recommended Action: This filled-in debris dam no longer serves a significant purpose for blocking sediment transport downstream. Providing salmonid passage to approximately 3.5 miles of fair to excellent upstream habitat should be discussed with Los Padres National Forest and other stakeholders, in coordination with the Pendola Debris Dam. Determine and discuss the potential biological impacts to species that may have become established in the upstream willow forest, especially avian species.

Barrier ID: SY_AC_7

Stream: Agua Caliente Creek

Barrier Type: Bedrock chute

Physical Location: Approximately 3.5 mile upstream from Agua Caliente Dam

GPS Location: N 34° 34' 51.3" W 119° 32' 22.5"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/10/03

Barrier Status: Complete



Description: Confined bedrock walls produce a series of large boulder cascades, bedrock chutes, and small waterfalls for over 300 feet at this location. The most severe feature in this stream reach for fish passage is an 11-foot tall bedrock chute 100 feet upstream from the smaller chute and pool shown in the picture. This upper chute has another 13 feet of boulders piled on top of it.

Diagnosis: The upper chute is completely impassable during all flows to all salmonids due to the excessive jump height, steep chute, and limited downstream pool depth.

Recommended Action: No recommended action for this natural feature.

Additional downstream natural impediment- Approximately 0.5 mile upstream from the Diablo Canyon Creek confluence there is a bedrock waterfall that measured 9 feet tall from the downstream pool surface. The large downstream pool measured 5 feet deep. Watermarks showed that the downstream pool backfills over 4 feet producing a 9-foot jump depth and 5-foot jump height to the confined notch at the top of the falls. This natural waterfall would prevent all salmonid passage during low and moderate flows, but could provide limited and difficult upstream passage for adult steelhead during high stream flows.

Barrier ID: SY_JG_1

Stream: Juncal Gate Creek (unnamed northern tributary at #2 Juncal Campsite gate)

Barrier Type: Low-flow road crossing

Physical Location: LPNF road crossing upriver from Juncal Campsite

GPS Location: N 34° 29' 13.7" W 119° 32' 19.6"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/11/03

Barrier Status: Partial



Description: This road crossing measured 69 feet long, with 40 feet crossing the active stream channel. The crossing measured 14 feet wide and has a flat to mild slope. A boulder and concrete apron extends 6 feet downstream at a moderate gradient and with a maximum drop of 6 feet 5 inches on river-left. Native substrate extends up to the road crossing on the river-right downstream side and no drop occurs. The crossing is considerably undercut in some locations. Upstream salmonid habitat conditions were not determined.

Diagnosis: All fish passage is prevented during lower flows due to shallow water depth spread out over the crossing's surface. During moderate to high flows, adequate water depth may facilitate upstream migration of salmonids across the river-right side of the downstream substrate and short apron height onto the crossing. Extremely high flows may produce velocities that would prevent passage of smaller trout across the surface of the crossing.

Recommended Action: Determine the quality and extent of upstream habitat and pursue fish passage options if upstream salmonid habitat conditions warrant it.

Barrier ID: SY_FX_1

Stream: Fox Creek

Barrier Type: Utility crossing

Physical Location: Approximately 300 feet upstream from Santa Ynez River

GPS Location: N 34° 29' 7.8" W 119° 31' 41.8"

Ownership/Interest: Montecito Water District/Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/7/03

Barrier Status: Not a barrier



Description: Broken concrete blocks occur in the stream channel and partially support metal braces that carry an aerial water pipeline that crosses over the creek. The concrete footings span half of the stream channel. This pipeline is owned and operated by the Montecito Water District.

Diagnosis: Fish passage is not significantly impeded at this crossing due to half of the channel remaining in a natural state. The metal supports do present a significant blockage hazard to downstream migrating debris and boulders.

Recommended Action: Monitor this site and prevent future construction in the stream channel that may prevent salmonid access into this important rainbow trout tributary and perennial habitat. Removal of the in-stream concrete and metal braces would eliminate a blockage hazard and safeguard the pipeline. See barrier write up SY_AR_1 for an example of a previous pipeline retrofit project that the District completed and eliminated such a hazard.

Barrier ID: SY_FX_2

Stream: Fox Creek

Barrier Type: Diversion Dam

Physical Location: Near the 2040-foot elevation line on USGS 7.5 map

GPS Location: N 34° 28' 55.3" W 119° 31' 36.1"

Ownership/Interest: Montecito Water District/Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/7/03

Barrier Status: Partial



Description: This concrete diversion dam spans 26 feet across the stream channel and contains a 10-foot wide notch near river-right that drops water vertically 4 feet to the surface of the downstream pool. The downstream pool depth measured only 3 inches. The dam measured 18 inches thick at the top and 22 inches thick at the notch. Flashboards can be inserted into the notch to raise the water level. The diversion pipe was covered at the upstream end by a finely meshed screen. The dam was observed to be diverting water and was seen leaking from the downstream diversion pipe. This pipe crossing the creek several times downstream connecting to the Montecito Water District pipeline (see SY_FX_1) and contributing to the water supply from Jameson Reservoir.

Diagnosis: Due to the absence of downstream pool depth and excessive jump height, upstream salmonid passage is prevented during the observed low flows. When adequate downstream water depth occurs during moderate and higher flows, salmonid passage is possible with a moderate to high degree of difficulty. With the flashboards inserted, fish passage may only be possible for larger salmonids during high flows when sufficient water depth occurs for jumping the entire dam. No salmonids were observed upstream.

Recommended Action: This tributary provides important spawning and rearing habitat for the Santa Ynez River rainbow trout and high quality habitat occurs upstream of this dam for approximately 750 feet to the upstream waterfall. Contact the structures owner(s) and the LPNF to discuss potential fish passage improvement options for this site and the need to maintain adequate downstream flows for the trout population. A small downstream boulder weir or creation of a concrete step pool, in conjunction with leaving the flashboards out during migration flows, would improve passage at this site.

Barrier ID: SY_FX_3

Stream: Fox Creek

Barrier Type: Waterfall

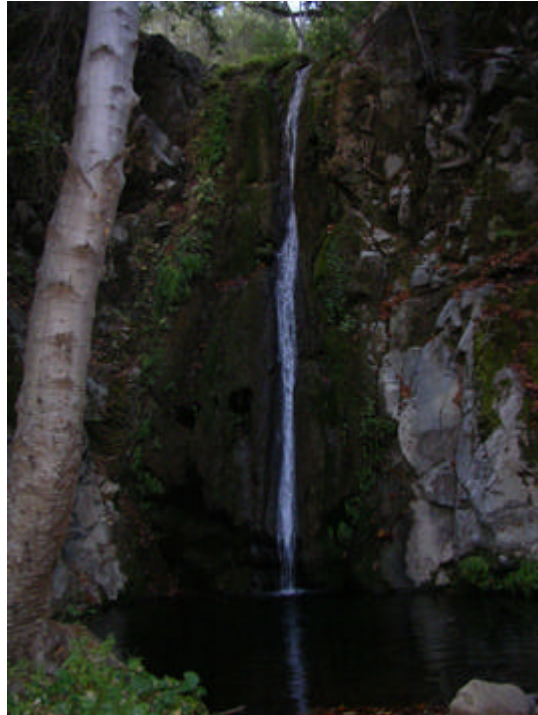
Physical Location: Approximately 750 feet upstream from barrier SY_FX_2

GPS Location: N/A

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/7/03

Barrier Status: Complete



Description: This bedrock waterfall measures approximately 30 tall. A 5-foot deep pool occurs downstream of the falls.

Diagnosis: All upstream fish passage is prevented at this waterfall due to the excessive jump height. Multiple boulder cascades and chutes downstream from this waterfall may limit or prevent upstream passage depending on stream flows and substrate movement with storm flows. This waterfall represents the first stabile and complete upstream barrier to fish passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_AR_1

Stream: Alder Creek

Barrier Type: Utility Crossing

Physical Location: Mouth of Alder Creek, immediately upstream of Santa Ynez River

GPS Location: N 34° 29' 11.9" W 119° 31' 9.3"

Ownership/Interest: Montecito Water District/Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/6/03

Barrier Status: Not a barrier



Description: This “non-barrier” is included in this report as an example of a former pipeline crossing that was recently modified and is no longer a fish passage barrier. When observed in the early 1990’s this pipeline crossed the creek channel and was protected within a wire-and-stone basket dam. A significant drop occurred downstream of the structure that impeded upstream trout passage. The pipeline was removed 7-8 years ago following damage from high stream flows and an aerial pipeline crossing was installed and natural stream channel restored. This aerial crossing no longer impedes fish migration into Alder Creek and provided safety to the Montecito Water District pipeline and water supply. Remnants of the wire-and-stone basket dam still occur downstream of the pipeline crossing on river-left, but do not impede passage.

Diagnosis: Natural channel conditions occur under the aerial crossing and do not impede fish migrate.

Recommended Action: Continue to monitor site and promote this type of pipeline barrier replacement at other utility crossing barrier sites, such as on the Santa Ynez River downstream of Cachuma Dam (see barrier write up SY_5).

Barrier ID: SY_AR_2

Stream: Alder Creek

Barrier Type: Utility crossing

Physical Location: Underneath flume crossing to Jameson Reservoir

GPS Location: N 34° 28' 59.7" W 119° 29' 41.6"

Ownership/Interest: Montecito Water District/Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/6/03

Barrier Status: Partial



Description: This concrete footing structure spans 33 feet across the stream channel. The footing anchors wood pilings that support the flume that carries water from the Alder Creek diversion dam (SY_AR_3) into Jameson Reservoir. The concrete structure extends 22 feet under the flume and is composed of large embedded boulders in concrete. The metal piling anchors are also embedded in the surface of the concrete. During the low flows encountered, a 12-inch drop occurs from the downstream end of the structure to the surface of the downstream pool. The downstream 8 feet of the structure drops a total height of 2 feet 6 inches. The maximum downstream pool depth measured 14 inches.

Diagnosis: During lower flows, upstream salmonid passage is impeded due to the moderate slope of the downstream end of the structure and shallow water conditions encountered. During moderate and higher flows, salmonids can jump/swim onto the concrete with a low degree of difficulty and utilize resting spots provided by the pilings and embedded boulders to swim upstream. Upstream passage during ideal flows can be accomplished with a moderate degree of difficulty.

Recommended Action: Continue to monitor the site to ensure adequate passage. Should the flume be altered in the future, the instream concrete and pilings could be removed and angled, upside-down V-shaped supports installed with anchors located outside the stream channel on the banks.

Barrier ID: SY_AR_3

Stream: Alder Creek

Barrier Type: Diversion dam

Physical Location: Near the 2280-foot elevation line on USGS map

GPS Location: N 34° 28' 58.0" W 119° 29' 40.0"

Ownership/Interest: Montecito Water District/Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/6/03

Barrier Status: Partial



Description: This concrete dam diverts surface flows into the flume that carries water to Jameson Reservoir. The dam measured 10 feet tall from the top to the surface of the downstream pool. A 2-foot wide by 10 inches deep notch occurs near the center of the dam. The dam extends 45 feet across the stream channel. Moderate downstream undercutting of the dam is occurring. The maximum depth of the downstream pool measured 3 feet 6 inches. The flume attaches to the river-left side of the dam and is partially screened. The screen measured 2 feet 8 inches tall by 14 feet long. The coarsely meshed screen is not properly sized to prevent even adult trout from being diverted into the flume. Oddly, there is a large unscreened section underneath the screen that allows fish and smaller debris to enter the flume freely. No stream flow was being diverted.

Diagnosis: Upstream passage at this site would be extremely difficult due to the jump height present, but during ideal flow conditions it appears that the downstream pool could backfill 3 to 4 feet and allow limited and difficult passage for larger trout and possibly. Smaller trout occur upstream and may be the offspring of transplants from below and/or larger spawners that successfully passed the structure. Downstream migrating salmonids can easily become entrapped in the flume and either make it to Jameson Reservoir or die in the flume as it dries out. The Jameson Reservoir Keeper informed us that he has spoken with people that have observed rainbow trout in the flume (pers. comm. Andaloro). Diversions impact downstream migratory connectivity and salmonid habitat.

Recommended Action: A small amount of habitat occurs upstream of the dam to the waterfall (SY_AR_4), but trout are present and the habitat is of high quality. The diversion should be installed with an adequately sized screen that prevents entrapment of downstream migrating salmonids. Upstream passage options should be discussed with the Montecito Water District, the National Forest, and others to determine the feasibility of various alternatives and long-term objectives. It may be possible to improve the facility for fish passage that would benefit all stakeholders. One option to consider would be the lowering of the dam by 2 to 3 feet and the creation of 1 or more downstream jump-pools using boulder weirs and/or concrete step pools.

Barrier ID: SY_AR_4

Stream: Alder Creek

Barrier Type: Waterfall

Physical Location: Near the 2600-foot elevation line on USGS map

GPS Location: N 34° 28' 49.1" W 119° 29' 40.5"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/6/03

Barrier Status: Complete



Description: The total height of this bedrock waterfall measured approximately 30 feet from the top to the surface of the downstream pool. Masses of mineral deposits and algal growth produce impressive hanging formations on the waterfall. A spring was also observed dripping water out of the adjacent cliffs overhanging the falls. The downstream pool had a measured maximum depth of 5 feet.

Diagnosis: This feature is impassable due to the excessive height.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_AR_ME_1

Stream: Morse Creek

Barrier Type: Waterfall

Physical Location: Approximately 0.25 mile upstream from Alder Creek

GPS Location: N 34° 28' 54.7" W 119° 30' 54.9"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/6/03

Barrier Status: Complete



Description: This bedrock and boulder waterfall measured 11 feet tall from the top to the downstream substrate. No pool occurred during the dry conditions encountered, but based on high water marks and debris, it appears that the downstream pool would not exceed 4 feet in depth. This entire area is composed of large boulders that may change the character of this reach following large flow events.

Diagnosis: In the current configuration, this structure represents the upstream limit to all salmonid migration due to the excessive jump height and lack of sufficient downstream jump depth. This dry tributary does not appear to have significant habitat benefits for salmonid rearing, but may provide some limited spawning habitat.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_JL_NF_1

Stream: North Fork Juncal Creek

Barrier Type: Waterfall

Physical Location: Near the 2880-foot elevation line on USGS 7.5 map

GPS Location: N 34° 31' 0.2" W 119° 29' 39.3"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 11/5/03

Barrier Status: Complete



Description: The total height of this bedrock waterfall measured 21 feet from the top to the surface of the downstream pool. The top 8 feet of the structure drops stream flows down a steep, two-part chute. Below the chute, water drops vertically 13 feet into the downstream pool. The large downstream pool had a measured maximum depth of 7 feet.

Diagnosis: This feature is impassable to all salmonids during all flows due to the excessive height. No trout were observed upstream of the falls to the next tributary confluence. Excellent salmonid habitat conditions occur downstream.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SY_SD_1

Stream: Steelhead Creek (unnamed northern tributary at Upper Santa Ynez Campsite)

Barrier Type: Low-flow road crossing

Physical Location: LPNF road crossing at Upper Santa Ynez Campsite

GPS Location: N 34° 29' 29.6" W 119° 27' 3.0"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Shaw Allen 12/11/03

Barrier Status: Partial



Description: This road crossing measured 30 feet across the active stream channel and 15 feet wide. The crossing measured 14 feet wide and has a flat to mild slope with significant wear and irregular depressions with up to 4 inches of water depth. A steep, concrete and boulder apron extends for 10 feet downstream, dropping a height of 6 feet 1 inch to the surface of the downstream pool. The pool had a maximum measured depth of 3 feet during the encountered low flows. *Note-Steelhead Creek is the true perennial headwater stream of the upper Santa Ynez River judging by the flows and larger channel compared to the smaller, dry “mainstem” Santa Ynez River upstream from the confluence with Steelhead Creek. Steelhead Creek contains the best upper Santa Ynez River habitat (above Jameson Res. and excluding N.F. Juncal Creek) for salmonids and was likely the historic upstream spawning and rearing stream for the mainstem Santa Ynez River steelhead population prior to dam construction.*

Diagnosis: This structure significantly impedes upstream rainbow trout to excellent salmonid spawning and rearing habitat. All fish passage is prevented during low and moderate flows due to the shallow water depth spread out over the crossing's surface, excessive velocities on the apron, excessive jump height, and insufficient jump-depth encountered. During high flows, adequate water depth may develop in the downstream pool to allow a difficult jump onto the crossing surface and migration along the road margin. Excessive velocities over the concrete may impeded/prevent passage of smaller trout. While potentially passable during high stream flow conditions, this crossing

represents a severe partial barrier and reduces the window of opportunity for existing rainbow trout to migrate upstream of this site to high quality habitat.

Recommended Action: Fish passage should be improved at this site to ensure effective upstream migration of spawning rainbow trout from Jameson Reservoir that need to access upstream perennial habitat. This rainbow population has been identified to contain the native southern steelhead genotype and is important to maintain for future recolonization efforts with the Santa Ynez River. Reducing the crossing to streambed level with a roughened surface or replacing it with a bridge would provide effective upstream migration and a bridge would improve vehicle access during higher flows. This narrow channel provides an ideal location to remove this crossing and replace it with a fairly short-span and less costly bridge.

Barrier ID: SY_SD_2

Stream: Steelhead Creek (unnamed upper Santa Ynez River northern tributary)

Barrier Type: Bedrock Chute

Physical Location: Approximately 0.3 mile upstream of Upper Santa Ynez Campsite

GPS Location: N 34° 29' 34.5" W 119° 26' 59.2"

Ownership/Interest: Los Padres National Forest

Surveyor(s) and Date: Matt Stoecker and Shaw Allen 12/11/03

Barrier Status: Complete



Description: This bedrock chute measured 10 feet 4 inches tall and drops at a 45-degree angle to a tiny 6-inch deep pool downstream. A boulder cascade also occurs 300 feet downstream that drops 9 feet into a 4-foot deep pool.

Diagnosis: This bedrock chute prevents further upstream salmonids passage due to the excessive jump height, minimal downstream jump-pool, and excessive velocities produced during high stream flows. The boulder cascade 300 feet downstream also likely prevents upstream fish passage to the excessive jump height, but may be mobilized over time.

Recommended Action: This natural feature represents the end-of-the-line for salmonids migrating upstream on the mainstem of the Santa Ynez River and likely represents the historic upstream natural limit to steelhead migration on the Santa Ynez. Hopefully someday anadromous steelhead will be able to migrate upstream to this site once again!

Barrier Type: Estimated Natural Upstream Limits

Location: Locations are given in approximate elevations (feet) and were determined by identifying the intersection of elevation lines and the streamline.

Surveyor: Matt Stoecker using USGS 7.5 minute topographical maps

Description: The below-mentioned “barriers” are Estimated Natural Limits to upstream steelhead migration. Due to limitations on the study timeline and inaccessibility to private lands, several stream reaches and upstream limits to salmonid migration could not be identified. The above estimated natural limits were determined using California Department of Fish and Game protocol and USGS 7.5 minute topographical maps. Natural limits were determined by locating the most downstream location where the stream reach was observed to sustain a slope of 10-15% or where elevation lines showed an abrupt change indicating a significant elevation drop.

Using the steep gradient protocol (CDFG) does not work well for estimating upstream limits on tributaries that gradually level out at the headwaters onto a rounded hill or mountain. For example, several tributaries to upper Salsipuedes Creek drain from the Santa Rosa Hills and retain a slope of less than 10-15% all the way to the top of the hills. In such cases, habitat condition often become poor and surface flows may cease. Upstream natural limits were estimated for these types of tributaries by marking the location just downstream from where the stream appears to gradually disappear and/or where there is no longer upstream riverine (blue-line) habitat noted on the USGS map.

In some cases, one barrier ID was given for adjacent tributaries that appeared to have a similar elevation for estimated upstream limit. Barriers are organized in order from downstream to upstream Santa Ynez River tributaries.

Diagnosis: These estimated upstream limits are approximations and assume that adequate upstream migration can occur to that location. None of these locations should be considered as definite impassable features, but rather rough estimates until further surveying of the upstream limits is permitted and desirable.

Recommended Action: Additional surveying efforts should be conducted to accurately determine the exact natural upstream limits to steelhead migration on the above-mentioned tributaries to the Santa Ynez River. In some cases, such as low-gradient intermittent streams, identification of exact upstream limits may not be possible based on elevation changes and/or a specific feature.

Barrier ID:

SY_AB_1, Arroyo Burro Creek, 1800'

SY_AC_DO_1, Diablo Canyon Creek, 3800'

SY_AC_DO_EF_1, East Fork Diablo Canyon Creek, 3200'

SY_AC_DO_MA_1, Monte Arido Creek, 3800'

SY_AC_DO_NF_1, North Fork Diablo Canyon Creek, 3240'

SY_AL_3, Alisal Creek, 1280'
 SY_AL_MS_1, Monjas Creek, 1000'
 SY_AL_S1_1, South Tributary 1 Alisal Creek, 1200'
 SY_AL_S2_1, South Tributary 2 Alisal Creek, 1400'
 SY_AL_S3_1, South Tributary 3 Alisal Creek, 1040'
 SY_AL_S4_1, South Tributary 4 Alisal Creek, 1280'
 SY_AP_2, Alamo Pintado Creek, 2600'
 SY_AP_LJ_1, La Jolla Creek, 2320'
 SY_CL_1, Calabazal Creek, 1600'
 SY_CM_1, Camuesa Creek, 2480'
 SY_CN_1, Communication Creek, 1400'
 SY_DD_2, Dead Deer Creek, 1680'
 SY_DV_2, DeVaul Creek, 2000'
 SY_DV_EF_1, East Fork DeVaul Creek, 1800'
 SY_GY_2, Gidney Creek, 1720'
 SY_HE_1, Horse Canyon Creek, 1600'
 SY_HC_2, Harvey's Creek, 1200'
 SY_HN_3, Hilton Creek, 2320'
 SY_HS_2, Hot Spring Creek, 1240'
 SY_JG_2, Juncal Gate Creek, 2360'
 SY_KY_2, Kelly Creek, 1400'
 SY_KY_BR_3, Bear Creek, 1800'
 SY_KY_CS_3, Cold Springs Creek, 1800'
 SY_LC_1, Lompoc Creek
 SY_LP_2, Los Prietos Creek, 1320'
 SY_LS_1, Lewis Creek, 1400'
 SY_PA_12, Purisima Creek, 680'
 SY_PA_CA_6, Cebada Creek, 600' (insufficient flow)
 SY_PE_1, Paradise Creek, 1600'
 SY_QA_10, Quiota Creek, 1240'
 SY_QA_S1_1, South Tributary 1 Quiota Creek, 1600'
 SY_QA_S2_1, South Tributary 2 Quiota Creek, 1200'
 SY_QA_S3_1, South Tributary 3 Quiota Creek, 1400'
 SY_RR_1, Redrock Creek, 1880'
 SY_RR_SG_1, Seagull Creek, 1800'
 SY_SA_CS_1, Corrales Creek, 1800'
 SY_SA_FA_1, Figueroa Creek, 1600'
 SY_SA_HC_2, Happy Canyon Creek, 1800'
 SY_SA_LO_1, Latigo Creek, 2200'
 SY_SC_PE_ME_1, Peachtree Creek, 3400'
 SY_SF_2, San Fernando Rey Creek, 960'
 SY_BT_2, Broadcast Creek, 2000'
 SY_SI_2, Santa Rita Creek, 1000' (insufficient flow)
 SY_SM_10, San Miguelito Creek, 1200' (insufficient flow/habitat)
 SY_SN_2, Sloans Creek, 600'
 SY_SN_LS_4, La Salle Creek, 640'

SY_SR_4, Santa Rosa Creek, 1200' (insufficient flow)
SY_SS_DY_2, Dry Creek, 540' (insufficient flow)
SY_SS_EJ_3, El Jaro Creek, upstream of Llanito Creek (insufficient flow)
SY_SS_EJ_AO_2, Alamo Creek, 1040' (insufficient flow)
SY_SS_EJ_AT_2, Atasco Creek, 880' (insufficient flow)
SY_SS_EJ_LA_1, Los Amoles Creek, 1000'
SY_SS_EJ_LG_2, Long Canyon Creek, 680' (insufficient flow)
SY_SS_EJ_LO_1, Llanito Creek, 1160' (insufficient flow)
SY_SS_EJ_LO_EC_1, El Callejon Creek , 1160' (insufficient flow)
SY_SS_EJ_PC_1, Palos Colorados Creek 1000' (insufficient flow)
SY_SS_EJ_YR_1, Yridisis Creek, 1320'
SY_SS_EJ_YS_1, Ytias Creek, 1200' (insufficient flow)
SY_SS_LH_2, La Hoya Creek, 1200'
SY_SS_SH_2, School House Creek, 680'
SY_ST_2, Saint Francis Creek, 1320'
SY_SU_1, San Lucas Creek, 2040'
SY_SU_ME_1, Mine Creek, 1200'
SY_TS_2, Tequepis Creek, 1800'
SY_ZA_15, Zaca Creek, 1800'

4.0 Additional Recommended Studies

The following studies are recommended in order to obtain additional information that can aid in effective steelhead recovery planning within the Santa Ynez River. Additional site-specific studies are recommended within individual migration barrier assessments.

4.1 Santa Ynez River Water Budget and Dedicated Fish Migration Flows

The recovery of the Santa Ynez River steelhead population depends on improved migratory access between the headwater habitat and the ocean. A stream flow study based upon accepted methodologies such as the Instream Flow Incremental Methodology (IFIM) should be undertaken to determine the flow passage requirements (timing, duration, magnitude) in those sections of the mainstem of the Santa Ynez River which are affected by the operations of Bradbury, Gibraltar, and Juncal Dams. This study, in addition to utilizing acceptable study protocols should incorporate the fish passage criteria established by the California Department of Fish and Game and the National Marine Fisheries Service. To increase the credibility of the study, and maximize public acceptance, this effort should be undertaken by an inter-agency group, with a neutral party such as a university or research institute over-seeing the study process.

4.2 Santa Ynez River Migration Barrier and Habitat Study on Private Lands

No privately owned lands were ground surveyed for this study due to tie and budget limitations and request from the project funder. Additional assessment of stream reaches on private lands is needed to further develop a comprehensive migration barrier database for the entire watershed, particularly below Bradbury Dam.

4.3 Steelhead Spawning and Rearing Habitat Assessment

A detailed steelhead spawning and rearing habitat assessment should be conducted throughout the Santa Ynez River watershed, with particular emphasis on mainstem reaches above Bradbury Dam, and potential spawning and rearing tributaries both above and below Bradbury Dam. This assessment should be based on acceptable habitat assessment protocols such as the Habitat Suitability Index (HIS), and be undertaken by an inter-agency group, with a neutral party such as a university or research institute over-seeing the study process. In addition to natural limiting factors, this study should address anthropogenic factors influencing habitat suitability, including the introduction of exotic species, forest practices, and recreational and commercial uses of the watershed that impact aquatic habitats utilized by steelhead.

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Appendix A- Southern Steelhead Ecology and Life History

The following section has been modified from Stoecker 2002.

Steelhead are rainbow trout which exhibit an anadromous lifestyle; being born in fresh water and spending a portion of their lives in the ocean before returning to fresh water to spawn. The scientific name *Oncorhynchus mykiss* is applied to both steelhead and coastal rainbow trout because they are morphologically similar and differ primarily in behavior. The steelhead is an indicator species of watershed health because their population size is directly correlated to the health of their watershed defined ecosystem. Healthy watershed habitat that provides the clean, cold water needed for steelhead to flourish also provides habitat for other species that utilize a variety of habitat niches within a watershed. The fact that steelhead populations have declined so dramatically in Southern California indicates that the region's watersheds have been severely modified, obstructed, and degraded. The recovery of wild, self-sustainable, steelhead populations in Southern California inevitably depends on reconnecting, restoring, and protecting the watershed components that they depend on.

Historic Distribution and Population Size

In recent history steelhead trout ascended streams from northwestern Mexico up to the Kuskokwim River, Alaska and across the Bering Sea to the Kamchatka Peninsula and Okhotsk Sea drainage's of the Western Pacific (Barnhart, 1986). The current southern limit of *O. mykiss* occurs in northern Mexico. Historically, *O. mykiss* existed in almost every significant watershed within Santa Barbara County, with the largest runs of adult steelhead occurring in the Santa Ynez, Santa Clara, Santa Maria and Ventura Rivers. Of these rivers, the Santa Ynez is thought to have had the largest population of steelhead in all of southern California with estimates of 13,000 to 25,000 adults returning in the 1943-1944 run (Titus, 1994). Moore (1980) estimated the historical steelhead run up the Santa Clara River at around 9,000 adults. Estimates for the 1946 run up the Ventura River are between 4,000 and 5,000 adults (Clanton and Jarvis, 1946). Since the beginning of the century it is estimated that steelhead populations have been reduced to less than one percent of their former population size in Southern California.

Geographic Variability

Despite the small amount of technical data, it has been widely observed that southern steelhead exhibit unique ecological requirements and behaviors, such as temperature requirements, duration of different life stages, environmental flexibility, and displaying polymorphic life history behavior. Rainbow trout that do not become steelhead share many of the same ecological requirements with their anadromous relatives and appear to play a vital role in the sustainability of the anadromous steelhead population. The important relationship between non-anadromous rainbow trout and anadromous steelhead is described by McEwan (2001) and should be references for additional information about the polymorphic life history behavior of *O. mykiss*. This "polymorphic perspective" is critical for resource managers to understand for successful long-term recovery planning. Remarkings on the flexibility of the steelhead to environmental conditions Shapovalov and Taft (1954) noted that, "...steelhead migrate to sea at various ages and over a long period within a season, spend varying amounts

of time in the ocean and return over a fairly long period within a season, are capable of spawning more than once, sometimes spawn before their first journey to sea, and may even remain in fresh water for their entire lives”(Cramer et. al 1994).

Genetic Uniqueness and Importance

Steelhead have excellent homing abilities, so unique stocks or races have developed in specific drainages and in some cases tributaries of that drainage (Moyle, 1976). A 1994 study by Jennifer Nielsen found that the southern steelhead are genetically unique from northern stocks and actually have greater genetic diversity (Nielsen, 1994, 1999). This greater level of genetic diversity indicates that southern steelhead have evolved over a longer period of time and are more ancestral populations than northern steelhead. Recognizing the uniqueness and importance of the devastated southern steelhead population, the National Marine Fisheries Service listed the southern steelhead as an endangered species, under the federal Endangered Species Act, in August of 1997 (Busby, 1996, National Marine Fisheries Service 1997).

Spawning

Steelhead spawn in cool, clear, well-oxygenated streams with suitable depth, current velocity, and gravel size (Reiser and Bjornn, 1979). This habitat type is usually associated with the upper reaches of streams and their tributaries. The optimal water depth for steelhead spawning is approximately 14 inches and ranges from about 6 to 36 inches (Bovee 1978). When a pair of adult steelhead reaches adequate habitat conditions during the spawning run, the female will clear out a depression (redd) in small to medium sized gravel substrate, where her eggs are laid. The male defends the redd from intruders and fertilizes the eggs as the female extrudes them (Shapovalov and Taft, 1954). The female then covers the eggs with a shallow layer of gravel to protect and stabilize them in their embryonic state.

Egg and Larval Development

The duration and success of egg incubation is highly variable and dependent on a number of factors including water temperature, dissolved oxygen concentration, and suspended sediment deposition. Eggs hatch into a larval stage (alevin) where they remain in the redd and feed on their attached yolk sack. Alevin are approximately 14.0 millimeters long when they are hatched and grow to 28.0 millimeter before becoming juveniles, at which point they have absorbed the yolk sac and leave the protection of the redd (Wang, 1986). The egg and larval stages of steelhead development are highly susceptible to environmental factors, and most natural mortality occurs at this time (Shapovalov and Taft, 1954).

Juvenile Development

Young juvenile steelhead (fry) often school together in shallow, protected areas along the stream banks. Fry are carnivorous and feed primarily on aquatic and terrestrial insects. As they grow, fry become territorial and soon the school breaks up and many of the fry move

into riffles that they will inhabit and defend. Fry tend to move into deeper water as they grow in size, inhabiting runs and pools (Barnhart, 1986). Juvenile steelhead are highly variable in length (2.8 cm.- 40.6 cm.) and usually stay in fresh water for one year or more (Scott and Crossman, 1973). The length of juvenile residence is determined by environmental and genetic factors. Southern steelhead tend to exhibit a high amount of flexibility in residence time due to the extreme and highly variable environmental conditions which exist throughout its range. Juvenile steelhead may remain in freshwater as coastal rainbow trout, mature, and spawn without ever migrating to sea. Similarly, rainbow trout offspring may produce young that migrate to the ocean to become steelhead. See McEwan (2001) for more about the polymorphic life history of rainbow trout/steelhead.

Smoltification

Juvenile steelhead lose the dark oval parr marks along the sides and acquire a silver coloration when they undergo a drastic physiological change called smoltification, which allows them to migrate from freshwater to the saline ocean. Smolting steelhead often display a dark tailing edge on their caudal, or tail, fin and have flaky silver scales. On the Santa Ynez River, Scott Engblom's research has found that outmigrating smolts measure between 150-200 mm in total length and are predominantly in the 160-170 mm range. Engblom found that most of the smolting fish are 1 year olds, but some are 2 years old (pers. comm. Engblom).

When favorable conditions exist, smolts leave their former stream habitat and may spend a period of time in an estuarine or freshwater lagoon environment before entering the ocean. Outmigration of smolts on the Santa Ynez River typically occurs between mid-March and early May (pers. comm. Engblom). Due to the highly variable climatic conditions and flow regimes that exist in southern California, smolts may spend a considerable amount of time in the lagoon or slough habitat found at the stream mouth. It is here where smolts, acclimate themselves to salt water and often times wait for adequate flow conditions to open the mouth of the stream allowing migration to the ocean.

The Ocean Odyssey and Adulthood

Smolts gradually attain the steel-blue back coloration of sub-adults while feeding on the bounty of the northern Pacific Ocean. Some steelhead migrate extensively while feeding at sea and fish born in North American streams have been caught by commercial fisherman off the coast of Japan. Steelhead are also known to have short oceanic, or limited estuarine migrations. By utilizing abundant oceanic food sources such as juvenile greenling, squid, and amphipods, the majority of steelhead growth occurs in the ocean (LeBrasseur 1996; Manzer 1968). While at sea, southern steelhead can attain large sizes. Reports from the early 1900's related the popularity of fishing the lower Santa Ynez River for steelhead as large as 9 kg (20 lbs.). The range in size of returning steelhead is highly variable and dependant on many factors such as the duration of time spent in the ocean, abundance of prey, and individual hunting skill. Steelhead returning to freshwater for a second time, or more, are typically the largest returning fish. On the Santa Ynez River, Engblom has recorded adult steelhead from 14 to 28 inches in length (pers. comm. Engblom). Salmonid documentation collected and reported in Stoecker 2002 shows similar variability in the smaller coastal streams with documented steelhead up to 30 inches in length. Sexual maturity is obtained while southern

steelhead are at sea and with this comes adulthood and the eventual urge to return to freshwater streams and spawn. Steelhead have excellent homing abilities and can effectively locate their stream of origin from thousands of miles away by methods not yet fully understood to science. It is believed that celestial navigation, the ability to detect the magnetic pull of the earth, and the ability to smell out individual river chemistry all contribute to guiding adult steelhead back to their natal streams.

The Spawning Run

Due to drought and/or human-related activities, southern steelhead are often impaired or blocked from accessing their natal stream due to low flow conditions. It appears that when faced with this prospect southern steelhead adapt, and either delay their upstream spawning migration until adequate flows exist or enter and ascend another suitable stream nearby. This action of straying from their stream of birth appears to be an important survival technique for a species whose freshwater habitat is dependant on extremely variable climatic conditions and human competition for resources, which may effectively eliminate upstream migration for a number of years. Straying also provides the mechanism for steelhead to recolonize watersheds where they have been extirpated due to natural or human factors.

When favorable flow conditions exist, adult steelhead enter the lagoon, slough, or stream mouth to begin their upstream migration. Steelhead can enter the stream any time flows permit, but in Southern California this generally occurs following sizable rainfall events during late fall, winter, and early spring and is dependant on the stream flow discharge of that particular season. During years with prolonged stream flows, steelhead have a larger window of opportunity to migrate upstream. Once again acclimated to the fresh water, steelhead begin their upstream migration toward the headwaters of the watershed where higher quality spawning and rearing habitat is usually located. During this journey upstream, steelhead utilize many aspects of the riverine habitat, both terrestrial and aquatic. Trees and bank side vegetation are used for shade and protective cover. Steelhead follow the path of least resistance upstream in order to minimize energy outputs. They accomplish this by utilizing submerged structures for protection from the current and by effectively reading the variable stream velocities provided by their riverine environment.

After a short while in fresh water, the silvery adult steelhead begin to take on the appearance of large rainbow trout and exhibit other morphological changes such as jaw configuration; which become more pronounced in the males. Spawning males usually have an elongated jaw and snout that are turned inward toward the mouth. The hooked lower jaw is called a kype. Adult males usually become more colorful than the females in freshwater. As spawning nears, the males often display rusty crimson gill covers and a lateral stripe of similar color. Steelhead spawning characteristics, and the degree to which they change, are variable throughout their range. Southern steelhead usually spawn shortly after ascending the stream to suitable spawning habitat. Unlike Pacific salmon, steelhead may not die after spawning and can return to the ocean, regain lost body weight, and enter the stream again as a larger repeat spawner during the following season(s). Steelhead may repeat this cycle several times during their life.

Appendix B- National Marine Fisheries Service-Santa Ynez River Documentation

Hydrologic features, such as rivers, streams, creeks, etc. (hereafter referred to as streams) included in the distance calculations for the Santa Ynez River watershed were based on those streams specifically requested by the Protected Resources Division. Selection sets that included the Santa Ynez River and some of its tributaries were generated for both above and below Bradbury Dam. The following tributaries were requested:

Below Bradbury Dam – San Miguelito Creek, Salsipuedes Creek, El Jaro Creek, Nojoqui Creek, Alisal Creek, Quiota Creek, Calabazal Creek, San Lucas Creek, Hilton Creek, Birabent Creek, Zaca Creek, Santa Agueda Creek.

Above Bradbury Dam – Cachuma Creek, Santa Cruz Creek, Tequepis Creek, Los Laureles Canyon Creek, Redrock Canyon Creek, Camuesa Creek, Buckhorn Creek, Indian Creek, Mono Creek, Agua Caliente Creek, Blue Canyon Creek, North Fork Juncal Creek, Alder Creek, Juncal Creek, Horse Canyon, Hot Springs Creek, Bear Creek, Cold Springs Creek, Lewis Canyon, Arroyo Burro Creek, Devil's Creek, Gidney Creek, Alamar Creek, Lacosca Creek, Roblar Canyon Creek, Don Victor, Horse Canyon, Morse Creek, Unnamed Creek (Whiskey Creek?).

The selection set was performed using the LLID dataset (cdfg_100k_2003_2.shp) based on the "Name" field. Any streams not located using this selection procedure were identified with the aid of topographic images generated using Sure!MAPS RASTER. The LLID dataset was overlaid onto the topographic image in ArcMap 8.3, and the remaining streams were identified according to the topographic labels. Additional tributaries to these streams were also included in the selection set based on the USGS National Hydrography Dataset classification of "perennial". The NHD layer was overlaid on the LLID dataset. Any streams listed as "perennial" in the NHD FCODE table that were tributary to those streams requested by the Protected Resources Division (listed above) were also included in the LLID selection sets. The selection sets were then exported as shapefiles using ArcMap, and included in a project in ArcView 3.2.

The distance calculations were performed using the Route Tools Extension and the Trace Upstream Tool in ArcView. For the layer above Bradbury Dam, the portion of the Santa Ynez River extending below the dam had to be subtracted from the total to accurately compute stream length. Conversely, for the layer below Bradbury Dam, the portion of the Santa Ynez River upstream of the dam was subtracted. The resulting distances (in feet) were converted to miles.

Notes:

- There will be discrepancies between distances of certain streams considered perennial in the NHD layer and the corresponding LLID streams. These discrepancies are due to the fact that streams in the NHD layer are divided into many different segments while the LLID streams are represented as one

- continuous line. Therefore, although only portions of streams may be considered perennial in the NHD layer, the entire stream was selected in the LLID layer.
- Some streams in the LLID dataset follow slightly different paths than the corresponding streams in the NHD. Therefore, there may be some instances in which a portion of a stream in the LLID dataset bears a different name than the same stream in the NHD. This could result in a difference in stream distance calculations along that route.
 - The HUC boundary was created by dissolving the CalWater 2.2. dataset based on the “CU” field. The CalWater 2.2 dataset was used instead of the USGS dataset to ensure the proper alignment with the Planning Watershed boundaries in the project. These Planning Watersheds were necessary to display small watershed units, and to calculate acreages.

Summary of Stream Distance Calculations:

	Total Lengths		Santa Ynez River	
	(miles)	% of Total	(miles)	% of Total
Below Bradbury	101.45	29.06	11.97	21.87
Above Bradbury	247.6	70.94	42.76	78.13
Total	349.05	100	54.73	100
Bradbury to Gibraltar	129.57	37.12	24.11	44.05
Gibraltar to Juncal	109.29	31.31	14.72	26.9
Above Juncal	8.74	2.5	3.93	7.18

CalWater 2.2 Planning Watershed Boundaries:

CALWATER 22	ACRES	SQUARE MILES	SPWS NAME	PWS NAME
6483	5096.27	7.96037374	Zaca Lake	Bell Canyon
6496	10493.2	16.3903784	Zaca Lake	Zaca Creek
6497	5219.1	8.1522342	Alamo Pintado Creek	Sycamore Canyon
6500	7170.31	11.20002422	Alamo Pintado Creek	Birabent Canyon
6513	9617.53	15.02258186	Vandenberg Village	Santa Lucia Canyon
6515	7446.71	11.63176102	Vandenberg Village	Ken Adam Park
6516	11468.3	17.9134846	Latigo Canyon	Figueroa Creek
6521	7483.32	11.68894584	Cachuma Creek	Upper Cachuma Creek
6522	6086.63	9.50731606	La Purisima Mission	Purisima Canyon
6523	11268.8	17.6018656	Goat Rock	Happy Canyon
6524	5043.77	7.87836874	Latigo Canyon	Corrales Canyon
6525	11495.2	17.9555024	Lisque Creek	SAME AS SPWSNAME
6526	7746.12	12.09943944	La Purisima Mission	Cebada Canyon
6529	10640	16.61968	Santa Cruz Bay Inlet	Grapevine Creek
6532	10070.7	15.7304334	Santa Cruz Bay Inlet	Coche Creek
6533	4740.74	7.40503588	Cachuma Creek	Lazaro Canyon
6534	6322.13	9.87516706	Santa Cruz Bay Inlet	Peachtree Canyon
6535	10097.4	15.7721388	Santa Rita Hills	Santa Rosa Creek
6536	9417.23	14.70971326	Mono Creek	Don Victor Canyon
6537	8618.6	13.4622532	Mono Creek	Alamar Canyon
6538	11180.7	17.4642534	Santa Rita Hills	Santa Rita Valley
6540	8506.21	13.28670002	Mouth of Santa Ynez River	Oak Canyon
6543	9646.3	15.0675206	Zaca Lake	Dry Creek

6545	7528.63	11.75972006	Indian Creek	Bluff Campground
6547	7487.28	11.69513136	De La Cuesta Canyon	Canada de la Laguna
6548	10965.4	17.1279548	Santa Rita Hills	Canada de los Palos Blancos
6549	9549.09	14.91567858	Thompson Park	SAME AS SPWSNAME
6550	6050.29	9.45055298	Mono Creek	La Jolla Spring
6551	19363.2	30.2453184	Santa Ynez Valley	SAME AS SPWSNAME
6552	10525	16.44005	De La Cuesta Canyon	Ballard Canyon
6553	7825.59	12.22357158	Mouth of Santa Ynez River	Lompoc Canyon
6554	7547.73	11.78955426	Mono Creek	Roblar Canyon
6555	7779.7	12.1518914	Mono Creek	Lacosca Creek
6557	5494.4	8.5822528	Cachuma Creek	Lower Cachuma Creek
6559	10484.9	16.3774138	Indian Creek	Buckhorn Creek
6561	8984.6	14.0339452	Santa Cruz Bay Inlet	Upper Santa Cruz Creek
6562	3840.06	5.99817372	Marre Canyon	SAME AS SPWSNAME
6563	7262.84	11.34455608	Santa Cruz Bay Inlet	Lower Santa Cruz Creek
6564	4820.03	7.52888686	Santa Cruz Bay Inlet	Middle Santa Cruz Creek
6565	15085.5	23.563551	Santa Rita Hills	Canada de la Vina
6566	4319.64	6.74727768	Salsipuedes Creek	Lower Salsipuedes Creek
6567	8028.73	12.54087626	San Miguelito Creek	SAME AS SPWSNAME
6568	6661.18	10.40476316	Sloans Canyon	SAME AS SPWSNAME
6569	4285.55	6.6940291	Indian Creek	Indian Creek Campground
6570	2496.25	3.8991425	Goat Rock	SE. of Happy Canyon
6571	10743.8	16.7818156	Mono Creek	Upper Mono Creek
6573	7763.51	12.12660262	Boat Canyon	SAME AS SPWSNAME
6576	7273.56	11.36130072	Inlet to Lake Cachuma	Redrock Canyon
6577	11034.8	17.2363576	La Carpa Spring	Upper Agua Caliente Canyon
6579	1385.63	2.16435406	Cachuma Dam	Johnson Canyon
6581	9804.43	15.31451966	Inlet to Lake Cachuma	Oso Canyon
6582	9292.39	14.51471318	Cachuma Dam	San Lucas Creek
6583	3234.54	5.05235148	Lake Cachuma	SAME AS HSANAME
6584	10428.8	16.2897856	De La Cuesta Canyon	Nojoqui Creek
6585	7247.9	11.3212198	Salsipuedes Creek	Palos Colorados Creek
6586	6805.66	10.63044092	Alisal Ranch	Quiota Creek
6588	8094.35	12.6433747	Salsipuedes Creek	Upper Salsipuedes Creek
6592	9596.71	14.99006102	Headwaters Santa Ynez River	Camuesa Creek

6594	7839.21	12.24484602	Alisal Ranch	Alisal Creek
6595	13886.9	21.6913378	Salsipuedes Creek	Yridisis Creek
6597	3208.96	5.01239552	S. Side Lake Cachuma	Hilton Canyon
6598	6364	9.940568	Mono Creek	Lower Mono Creek
6604	11191.9	17.4817478	Inlet to Lake Cachuma	Los Lauveles Canyon
6606	7901.49	12.34212738	Inlet to Lake Cachuma	Arroyo Burro
6607	3418.51	5.33971262	Headwaters Santa Ynez River	Lower Agua Caliente Canyon
6609	6950.56	10.85677472	La Carpa Spring	Diablo Canyon
6610	7440.07	11.62138934	S. Side Lake Cachuma	Tequepis Canyon
6612	9234.27	14.42392974	Headwaters Santa Ynez River	Juncal Canyon
6613	9049.04	14.13460048	Headwaters Santa Ynez River	Alder Creek
6619	10183.3	15.9063146	Headwaters Santa Ynez River	Blue Canyon
6634	5428.71	8.47964502	Inlet to Lake Cachuma	Devils Canyon

Total Watershed Area in Square Miles

899.8117493

Total Watershed Area in Acres

576063.86

Santa Ynez River Watershed

Potential Steelhead Spawning and Rearing Habitat

