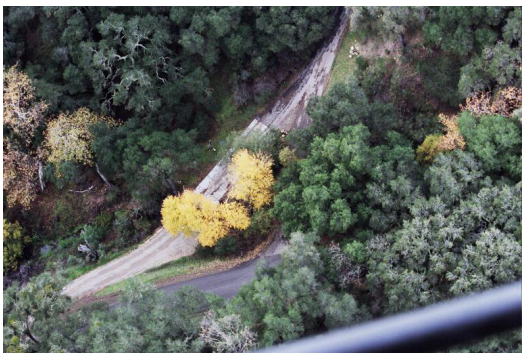
Barrier ID: SC_TT_21, SC_TT_22
Stream: Tepusquet Creek
Barrier Type: Culvert Crossings
Physical Location: Approximately 1.3 miles upstream of Colson Creek
GPS Location: N/A
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt Stoecker and Jim Stoecker 12/16/02


SC_TT_21 and SC_TT_22

Description: Access to ground survey these two culvert crossings was not obtained. Observations of these culvert crossings were made from the air and adjacent Tepusquet Road, and are limited in detail. These two private road crossings occur only 25 feet apart from each other. The overall lengths of the culverts are approximately 12-15 feet. From the road, the downstream culvert crossing (SC_TT_21) appears to have one 3-foot diameter corrugated metal culvert and the upstream crossing culvert (SC_TT_22) appears to have one 5-6 foot diameter corrugated metal culvert.

Diagnosis: The severity of these culverts crossings to fish passage could not be accurately determined from the road, but there impact appears significant. Water velocities were observed to be high through the culverts. Outlet configurations could not be accurately determined. It appears likely that both crossings would negatively impact fish passage, and possibly prevent upstream migration, by producing shallow water conditions during low flows and excessive water velocities during higher flows. There does not seem to be any practical reason for having two crossings at this location.

Recommended Action: Work with the owner to assess the possibility of removing both crossings and replacing them with one bridge that does not impact the stream channel and allows unimpeded passage for salmonids.

Barrier ID: SC_TT_23
Stream: Tepusquet Creek
Barrier Type: Crossing
Physical Location: Approximately 1.5 miles upstream of Colson Creek
GPS Location: N/A
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Access to ground survey this structure was not obtained. Observations of this culvert crossing were made from the air and are limited in detail. No photograph was attained due to the thick riparian vegetation over this crossing and observations of the crossing configuration were not possible. The road was observed to cross the creek at this location and some crossing structure is likely.

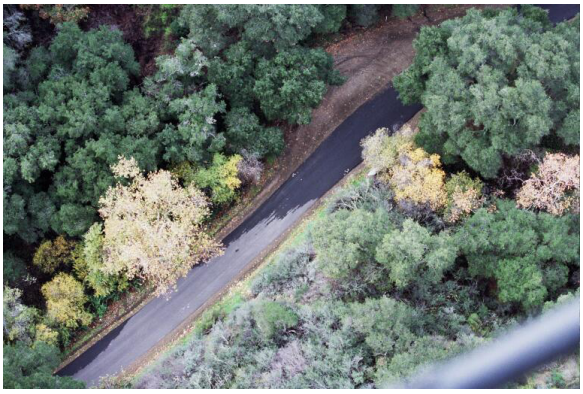
Diagnosis: The severity of this crossing to fish passage could not be determined. It seems likely, based on adjacent crossings, that a culvert crossing may be present. Most culverts negatively impact fish passage to some degree by producing shallow water conditions during low flows and excessive water velocities during higher flows.

Recommended Action: Work with the owner to assess potential impacts of this crossing on fish passage. If a migration barrier is present, assess the possibility of removing the crossing and replacing it with a bridge that does not impact the stream channel and allows unimpeded passage for salmonids. It may be possible to provide improved access across the stream in coordination with adjacent landowners while eliminating barrier crossings and consolidating access across a shared bridge.

Barrier ID: SC_TT_24
Stream: Tepusquet Creek
Barrier Type: County Culvert Crossing
Physical Location: First Tepusquet Road Crossing upstream of Colson Creek
GPS Location: N 34* 56' 30.5" W 120* 13' 40"
Ownership/Interest: Santa Barbara County Public Works
Surveyor(s) and Date: Matt Stoecker and Jim Stoecker 12/16/02; Matt Stoecker 12/30/02


SC_TT_24 (Looking upstream); 12/16/02


SC_TT_24 (Looking downstream) 12/16/02


SC_TT_24 (Aerial View) 12/30/02

Description: This county road crossing on Tepusquet Road consists of one 6-foot diameter corrugated metal culvert that conveys stream flows underneath. The overall length of the culvert is approximately 60 feet. The inlet and outlet of the culvert are set at streambed level and an average of 12 inches of substrate was deposited along the bottom of this large culvert.

Diagnosis: The mild slope of the culvert would allow adequate upstream migration for salmonids during lower and moderate flows with a low to moderate degree of difficulty. During high stream flows, the deposited substrate would likely flush out of the culvert and excessive water velocities through the culvert may prevent upstream migration.

Recommended Action: Work with the county to assess the possibility of removing the culvert crossing in coordination with future road improvement projects and replacing it with a bridge that does not impact the stream channel and allows unimpeded passage for salmonids and restoration of this stream reach.

Barrier ID: SC_TT_25
Stream: Tepusquet Creek
Barrier Type: Bedrock waterfall
Physical Location: Approximately 0.2 miles upstream from the Tepusquet Road crossing (SC_TT_24)
GPS Location: N 34* 56' 35.3" W 120* 13' 44.9" (from road adjacent to waterfall)
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/30/02

Description: Access to ground survey this structure was not obtained. Observations of this waterfall were made from the air and Tepusquet Road, and are limited in detail. This impressive bedrock waterfall drops approximately 25-30 feet and has carved a large pool at the base.

Condition: Stable bedrock feature.

Diagnosis: While the downstream pool depth could not be determined, the height of the waterfall would preclude any upstream salmonid passage during all flows.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_TT_CN_1
Stream: Colson Creek
Barrier Type: Culvert Crossing
Physical Location: Approximately 0.4 miles upstream from Tepusquet Creek confluence
GPS Location: N 34* 55' 37" W 120* 12' 53.1 (Taken from adjacent road)
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: Access to ground survey this structure was not obtained. Observations of this crossing were made from Colson Canyon Road and are limited in detail. The dimension and condition of this private crossing could not be determined from the road, but it is likely that a culvert conveys flows under the paved road-fill crossing.

Diagnosis: The severity of this structure for fish passage could not be determined. Most culverts negatively impact fish passage to some degree by producing shallow water conditions during low flows and excessive water velocities during higher flows.

Recommended Action: Work with the crossing owner to further assess the configuration of this crossing and impacts on fish passage. Discuss the possibility of replacing the crossing with a bridge that does not impact the stream channel and allows unimpeded passage for salmonids.

Barrier ID: SC_TT_CN_2
Stream: Colson Creek
Barrier Type: Culvert Crossing
Physical Location: Approximately 0.8 miles upstream from Tepusquet Creek confluence
GPS Location: N 34* 55' 44.1" W 120* 12' 38.2" (Taken from adjacent road)
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: Access to ground survey this structure was not obtained. Observations of this crossing were made from Colson Canyon Road and are limited in detail. One single corrugated metal culvert with a diameter of approximately 7 feet was observed from the road. This culvert conveys water under the crossing at a moderate to high gradient and flows dropped approximately 12 inches into the downstream pool that appeared to be at least 2 feet in depth.

Diagnosis: The severity of this structure for fish passage could not be accurately determined, but it is likely that salmonids could jump into the culvert outlet during most migration flows with a low to moderate degree of difficulty. Shallow water conditions during low flows and excessive water velocities during moderate and higher flows would partially restrict or completely prevent upstream salmonid passage.

Recommended Action: Work with the crossing owner to further assess the configuration of this crossing and impacts on fish passage. Discuss the possibility of replacing the crossing with a bridge that does not impact the stream channel and allows unimpeded passage for salmonids.

Barrier ID: SC_TT_CN_3
Stream: Colson Creek
Barrier Type: Crossing
Physical Location: Approximately 1.6 miles upstream from Tepusquet Creek confluence
GPS Location: N 34* 56' 15.6" W 120* 12' 21.0" (Taken from adjacent road)
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: Access to ground survey this possible crossing structure was not obtained. Observations of this crossing were made from Colson Canyon Road and are limited in detail. While the configuration of this crossing could not be observed due to thick riparian vegetation, a private dirt road visibly crossed the creek at this location. It seems likely, based on downstream crossings and limited observations of the crossing, that a culvert and earth fill crossing occur at this sight.

Diagnosis: The severity of this potential crossing for fish passage could not be determined. Most culverts negatively impact fish passage to some degree by producing shallow water conditions during low flows and excessive water velocities during higher flows.

Recommended Action: Work with the crossing owner to further assess the configuration of this crossing and impacts on fish passage. If fish passage is negatively impacted, discuss the possibility of replacing the crossing with a bridge that does not impact the stream channel and allows unimpeded passage for salmonids. If limited access at this site is required, a natural substrate in-stream crossing may provide an inexpensive and effective solution.

Barrier ID: SC_TT_CN_4
Stream: Colson Creek
Barrier Type: Steep Gradient
Physical Location: Approximate elevation 1200 feet
GPS Location: N/A
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: Access to ground survey this section of Colson Creek was not obtained. Observations of this steep stream reach were made from Colson Canyon Road. The actual streambed was not visible from the road, but the steep gradient in this reach can be seen with the elevation rise of the riparian vegetation. The USGS map also shows a steep slope in this stream reach in excess of 15%.

Diagnosis: It is likely that some steep natural feature (i.e. waterfall, steep chute or gradient) would prevent upstream salmonid passage in this stream reach. Passage may be possible though, and a thorough investigation of this reach should be completed to determine weather a natural upstream limit occurs here.

Recommended Action: Gain permission to survey this stream reach.

Barrier ID: SC_TT_CN_5
Stream: Colson Creek
Barrier Type: Bedrock waterfall
Physical Location: Approximately 400 feet upstream from the LPNF boundary
GPS Location: N 34* 56' 21.3" W 120* 11' 12.5" (from road adjacent to waterfall)
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: This bedrock waterfall measured 11 feet 6 inches tall from the surface of the downstream pool, which has a depth of approximately 3 feet.

Condition: Stable bedrock feature.

Diagnosis: Should the steep gradient section described in barrier write-up SC_TT_CN_4 turn out to be passable, this waterfall would mark the upstream limit for steelhead migration on Colson Creek. The excessive height of this waterfall and limited downstream pool depth would preclude upstream salmonid passage during all flows.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_TT_CN_SG_1
Stream: Spring Creek
Barrier Type: Bedrock Chute
Physical Location: Approximately 0.1 mile upstream from Colson Creek confluence
GPS Location: N/A
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: Access to ground survey this feature was not obtained. Observations of this bedrock chute were made from Colson Canyon Road and are limited in detail. This unnamed tributary enters Colson Creek from the north approximately 0.3 miles downstream from Tyler Creek and has an unnamed "Spring" marked on the USGS map. The creek emerges from a confined bedrock gorge and drops steeply to Colson Creek below. From the road the total distance of the chute could not be observed, but the slope appeared to exceed 15% for more than 75 feet.

Condition: Stable bedrock feature.

Diagnosis: Should the steep gradient section described in barrier write-up SC_TT_CN_4 turn out to be passable, this chute would prevent further upstream steelhead migration into Spring Creek. The excessive height and steep slope of this chute would produce excessive water velocities that would be impassable for salmonids.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_TT_CN_TR_1
Stream: Tyler Creek
Barrier Type: Road Crossing
Physical Location: Approximately 0.1 mile upstream from Colson Creek confluence
GPS Location: N/A
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: Access to ground survey this structure was not obtained. Observations of this crossing were not made, but the crossing is identified on the USGS map and may contain a structure that would impede fish migration.

Diagnosis: The severity of this potential structure on fish passage could not be determined.

Recommended Action: Work with the crossing owner to assess the configuration of this crossing and potential impacts on fish passage.

Barrier ID: SC_TT_CN_TR_2
Stream: Tyler Creek
Barrier Type: Reservoir
Physical Location: Immediately upstream from the West Fork Tyler Creek confluence
GPS Location: N/A
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt and Jim Stoecker 12/18/02

Description: Access to ground survey this structure was not obtained. Direct observations of this structure were not made, but the reservoir is identified on the USGS map. Unless this is a natural water body, it is likely that this feature is/was a small dam and pond utilized for cattle and/or irrigation.

Diagnosis: The severity of this potential structure on fish passage could not be determined.

Recommended Action: Work with the owner to assess the configuration of this potential dam and possible impacts on fish passage.

5.8.3.3 La Brea Creek Migration Barriers

Barrier ID: SC_LB_SF_FL_1
Stream: Fall Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximate 0.1 mile upstream of South Fork La Brea Creek
GPS Location: N/A
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Ground surveying of this stream reach and waterfall was not possible due to time limitations. Observations of this bedrock waterfall were made from the air and are limited in detail. This waterfall appears to have a vertical drop exceeding 8 feet with a shallow downstream water depth.

Diagnosis: This feature appears to prevent further upstream steelhead migration due to the excessive jump height and limited downstream jump depth.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_LB_NF_SH_1
Stream: Smith Creek
Barrier Type: Bedrock and Boulder Waterfall
Physical Location: Approximately 0.75 miles upstream from North Fork La Brea Creek
GPS Location: N/A
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Ground surveying of this stream reach and waterfall was not possible due to time limitations. Observations of this feature were made from the air and are limited in detail. This waterfall is composed of exposed bedrock and large boulders and appears to have a total height in excess of 15 feet with no significant downstream pool depth.

Diagnosis: This feature appears to prevent further upstream steelhead migration due to the excessive jump height and limited jump depth.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_LB_NF_FS_1
Stream: Flores Creek
Barrier Type: Bedrock Chutes
Physical Location: Approximate elevation 3080'
GPS Location: N/A
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Ground surveying of this stream reach and waterfall was not possible due to time limitations. Observations of this bedrock chute were made from the air and are limited in detail. This chute appears to have a steep slope in excess of 20% for a length greater than 15 feet.

Diagnosis: This feature appears to prevent further upstream steelhead migration due to the steep slope that would produce excessive water velocities and/or shallow water depth.

Recommended Action: No recommended action for this natural feature.

5.8.3.4 Horse Creek Migration Barriers

Barrier ID: SC_HE_1
Stream: Horse Creek
Barrier Type: Dam
Physical Location: Approximately 200' upstream from the "Ruin" site on USGS map
GPS Location: N 34* 50' 14.8" W 120* 00' 59.5"
Ownership/Interest: Los Padres National Forest, Santa Barbara County Flood Control (?)
Surveyor(s) and Date: Matt and Jim Stoecker 12/5/02


Severe undercutting


Sacrete berm on top of concrete footing

Description: This obsolete dam consists of a concrete footing that has a sacrete berm built on top. The dam height measured 10 feet 6 inches from the top of the dam to the surface of the downstream pool, which had a maximum depth of 18 inches. The dam's small, upstream reservoir is completely filled in with sediment. Kevin Cooper, Wildlife Biologist with the LPNF, thought the dam might be an old Santa Barbara County debris dam that was built after a local fire to catch sediment and/or act as a possible gaging station. The dam is not thought to serve any current purpose and does not appear to have been used to divert water.

Condition: The dam is extremely undercut up to 6 feet horizontally underneath the footing and 6 feet 6 inches vertically from the downstream substrate to the bottom of the exposed footing.

Diagnosis: Watermarks and scours on adjacent downstream banks indicate that the downstream pool may fill up 2 feet during high stream flows; reducing the jump height to 8 feet 6 inches and increasing the jump depth to 3 feet 6 inches. This excessive jump height and limited jump depth would prevent all upstream steelhead passage, unless a much deeper downstream pool was to scour out with high flows. Even then it is likely that this structure would remain impassable to steelhead during all flows conditions.

Recommended Action: This obsolete dam will eventually fail as it continues to deteriorate. Removal of the dam would open up the entire Horse Creek tributary to upstream steelhead migration, providing perennial rearing habitat. This is one of the largest tributaries of the Sisquoc River within the LPNF and adequate spawning and rearing conditions exist for many miles upstream. This dam occurs on public land, and is within the San Rafael Wilderness and Wild and Scenic River Corridor. Removal of the dam is highly recommended. A unique study of this process should be conducted in coordination with relevant agencies and possibly a local university such as UCSB or Cal Poly. This dam removal study could aid agencies in assessing the long-term impacts of this type of small dam removal on potential steelhead recovery response. Such a study is desperately needed in southern California, and elsewhere, as small debris dams blocking steelhead are being looked at throughout the state for possible removal.

One red-legged frog was observed and photographed in the pool downstream of the dam. While the scour pool does create a small amount of habitat for frogs, dam removal would uncover more stream habitat currently buried below the dry, filled in reservoir. One more red-legged frog was observed well upstream of the dam and reservoir area. Any removal study or deconstruction plan should address the presence of this species in that area.

As LPNF personnel put together the Sisquoc River Wild and Scenic River Plan in 2003, it is recommended that this dam removal project on Horse Creek be considered. A Horse Creek dam removal project presents a unique opportunity for a restoration effort that is consistent with long-term sustainable restoration and preservation objectives for the Sisquoc River watershed and it's native resources.

Barrier ID: SC_HE_2
Stream: Horse Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximate elevation 2820'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this waterfall were made from the air and are limited in detail. This bedrock waterfall appeared to exceed 25 feet in height.

Condition: Stable bedrock feature.

Diagnosis: The excessive jump height of this waterfall would prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

5.8.3.5 Manzana Creek Migration Barriers

Barrier ID: SC_MA_1-19
Stream: Manzana Creek
Barrier Type: 19 In-stream Crossings
Physical Location: From approximately .38 miles upstream from the Manzana/Sisquoc River confluence (SC_MA_1), to approximately 2.47 miles downstream of Coldwater Camp (SC_MA_19).
GPS Locations:

SC_MA_1, N 34* 49' 25.6" W 119* 59' 46.6"
SC_MA_2, N 34* 48' 25" W 119* 59' 28.4"
SC_MA_3, N 34* 49' 6.6" W 119* 59' 55.9"
SC_MA_4, N 34* 49' 2.2" W 119* 59' 55.6"
SC_MA_5, N 34* 48' 49.6" W 119* 59' 56.8"
SC_MA_6, N 34* 48' 48" W 120* 00' 10"
SC_MA_7, N 34* 48' 28.9" W 120 00' 21.1"
SC_MA_8, N 34* 48' 28.9" W 120* 00' 21.1"
SC_MA_9, N 34* 48' 26.1" W 120* 00' 16"
SC_MA_10, N 34* 48' 19.5" W 120* 00' 14.3"
SC_MA_11, N 34* 48' 16.5" W 120* 00' 14.2"
SC_MA_12, N 34* 48' 8.5" W 120* 00' 14.6"
SC_MA_13, N 34* 48' 5.6" W 119* 59' 14.2"
SC_MA_14, N 34* 48' 4.6" W 119* 59' 57.9"
SC_MA_15, N 34* 47' 53.5" W 119* 59' 36.6"
SC_MA_16, N 34* 47' 50.7" W 119* 59' 25.3"
SC_MA_17, N 34* 47' 52" W 119* 59' 24.7"
SC_MA_18, N 34* 47' 56.7" W 119* 59' 22.8"
SC_MA_19, N 34* 48' 2.5" W 119* 59' 28.4"

Ownership/Interest: Los Padres National Forest and private landowners
Surveyor(s) and Date: Matt and Jim Stoecker 11/16/02


Typical In-stream Road Crossing on Manzana Creek

Description: Private landowners and LPNF personnel along lower Manzana Creek utilize a total of 19 in-stream road crossings. All crossings consist of natural streambed bottoms and have no observable anthropogenic structures. It appears that they are maintained and likely cleared of debris and large boulders following higher stream flows. The crossings do not significantly impede stream flow and during higher flows they are likely washed out and must be reformed with a tractor and/or truck.

Condition: Natural streambed conditions with occasional clearing of large substrate.

Diagnosis: During migration flows these stream crossings do not cause significant impediments to salmonid passage in their observed configurations. During low flow conditions these crossings could impede salmonid migration if their configuration produced any significant drops, shallow water depths, or accelerated water velocities.

Recommended Action: Work with landowner and LPNF to ensure that clearing activities and debris piling does not impede upstream or downstream fish passage. Ideally, clearing activities can be manipulated to create a natural streambed channel through the crossing that allows sufficient stream depth for low flow migration. Continue to monitor these sites to ensure unimpeded fish passage and natural streambed conditions.

Barrier ID: SC_MA_20
Stream: Manzana Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximately .4 miles upstream of Manzana Campsite at an approximate elevation of 2900'
GPS Location: N 34* 44' 15.0" W 119* 52' 9.9"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/20/02 and 12/15/02


10' tall bedrock waterfall

Description: This bedrock waterfall drops a total of 10 feet from the top of the waterfall to the surface of the downstream pool. This waterfall drops 2 feet vertically at the top and then slants downward at a 60% slope for 5 feet before dropping another 3 vertical feet. The downstream pool has a jump depth of 2 feet 6 inches. This downstream pool has a confined bedrock tailwater control that will cause the pool to increase up to 4 feet during high stream flows.

Diagnosis: During low and moderate flows, this feature is impassable due to the excessive jump height. During high stream flows, the downstream pool may attain depths of over 6 feet and a jump height of 6 feet. Under these high flow conditions, adult steelhead may be able to make a difficult jump over this partial migration barrier. Observations of this waterfall on 12/15/02, with flow estimated at approximately 100 c.f.s., indicate that limited upstream adult steelhead migration during high flows may be possible.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_21
Stream: Manzana Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximately 800 ft. upstream from Manzana Narrows campsite at an approximate elevation of 3060 ft.
GPS Location: N 34* 44' 22" W 119* 51' 52.5"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/20/02

Description: This bedrock waterfall drops a total of 9 feet 6 inches from the top of the falls to the surface of the downstream pool. The downstream pool had a maximum measured depth of 7 feet. While the majority of this feature is composed of exposed bedrock, large boulders are also present at the top of the falls.

Diagnosis: During low and moderate flows, this feature is impassable due to the excessive jump height. During high stream flows, the downstream pool will increase at least 2 feet in depth and the jump height will decrease. Under these high flow conditions, adult steelhead can make a jump with a moderate to high degree of difficulty over this partial migration barrier.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_22
Stream: Manzana Creek
Barrier Type: Estimated Upstream Natural Limit
Physical Location: Elevation 4600'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/20/02

Description: Should the natural features downstream (SC_MA_20 and SC_MA_21) become passable with high flow condition or changes in their configuration; steelhead migration may be feasible to this approximate location.

Diagnosis: Due to the steep gradient at this location further upstream steelhead passage in the future is unlikely. Two additional steep tributaries on the west side of the creek above Big Cone Spruce Campsite may offer limited access to steelhead at the lowest end.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_DY_1, SC_MA_DY_2
Stream: Dry Creek
Barrier Type: In-stream Crossing
Physical Location: SC_MA_DY_1 is located approximately .29 miles upstream of Manzana confluence (±1364'); SC_MA_DY_2 is located approximately .52 miles upstream of Manzana confluence (±1450')
GPS Locations:
SC_MA_DY_1: N 34* 48' 2.7" W 120* 00' 34.8"
SC_MA_DY_2: N 34* 48' 0.2" W 120* 00' 47.8"
Ownership/Interest: Los Padres National Forest/ Landowners on Manzana Creek
Surveyor(s) and Date: Matt and Jim Stoecker 11/16/02


SC_MA_DY_1


SC_MA_DY_2

Description: Both private landowners along Manzana Creek and LPNF personnel utilize these two in-stream road crossings. Both consist of natural streambed bottoms and neither includes any observable anthropogenic feature. It appears they are maintained by clearing debris following high stream flows. The crossings do not cause significant alteration of the streambed and do not impede stream flow. No elevation drops are caused by these crossings.

Condition: Natural streambed conditions with occasional clearing.

Diagnosis: These stream crossings do not cause any significant impediment to salmonid passage.

Recommended Action: No action is recommended at these crossings. Continue to monitor these sites to ensure unimpeded fish passage and natural streambed conditions.

Barrier ID: SC_MA_DY_3
Stream: Dry Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximately 1.08 miles upstream from the Dry Creek/ Manzana Creek confluence
GPS Location: Approximate elevation 1748'
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/16/02

Description: The stream passes over a large waterfall and through a narrow canyon just upstream from this bedrock waterfall. The waterfall measured 8 feet 6 inches tall with a maximum downstream pool depth of 1 foot 6 inches.

Condition: Stable, natural feature.

Diagnosis: Due to the excessive jump height and limited jump pool depth, this waterfall prevents all upstream salmonid passage.

Recommended Action: No action is recommended for this natural feature.

Barrier ID: SC_MA_TB_1
Stream: Turtle Bowl Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximate elevation 1700'
GPS Location: N 34* 47' 2.5" W 119* 58' 18.7"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/17/02


Waterfall at Turtle Bowl Creek

Description: This waterfall has carved an impressive pool into the surrounding bedrock with a maximum depth of 5 feet. The jump height, from the pool surface to the top of the waterfall, measured 12 feet 6 inches tall. This tributary drains into the south side of Manzana Creek approximately 0.5 miles upstream from Coldwater Camp.

Condition: Natural, stable bedrock condition.

Diagnosis: Due to the excessive jump height, upstream salmonid passage is prevented at this waterfall.

Recommended Action: No action is recommended for this natural feature.

Barrier ID: SC_MA_DB_1
Stream: Davy Brown Creek
Barrier Type: Low-flow Crossing
Physical Location: #1 Sunset Valley Road Crossing
GPS Location: N 34* 46' 17.8" W 119* 56' 35.7"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/14/02

Description: This concrete low-flow crossing is approximately 105 feet upstream from the Manzana Creek confluence and spans 130 feet across the stream channel. The upstream to downstream width of the crossing measures 18 feet. At a stream flow of approximately 0.8 c.f.s., water is conveyed over the crossing at a depth of 1 inch or less and was spread across much of the crossing. The maximum downstream pool depth and identified jump depth are the same, measuring 13 inches. A jump height of 18 inches was measured from the downstream pool surface to the top of the downstream edge of the crossing. The crossing has a smooth surface that is slippery due to aquatic algae growth. The surface slope was calculated at 2.3% with a rise of 5 inches over 18 feet.

Condition: The concrete appears to be in good condition with minimal downstream undercutting. The crossing is a potential pedestrian and vehicular hazard due to its extremely slippery surface. A sign is posted warning recreational users of this hazard on the north side of the crossing.

Diagnosis: The shallow water depth across the concrete crossing likely impedes upstream passage of juvenile and adult salmonids during low, base flow conditions. As water depth increases during moderate to high stream flows, upstream adult steelhead passage is possible with a moderate degree of difficulty. Excessive water velocities across the smooth concrete crossing may impede upstream passage of salmonids during exceptionally high flows. The window of opportunity for upstream steelhead and rainbow trout migration is limited due to these factors, especially during exceptionally dry years and low stream flow conditions. Davy Brown Creek is an important perennial tributary for rainbow trout and potentially steelhead, especially during drier years, and upstream passage to refugia pools is critical during lower flows and/or when Manzana Creek dries up near the creek mouth.

Recommended Action: Determine the structural requirements necessary for a bridge at this site and assess the feasibility of installing one. The most effective long-term fish passage solution at this site is complete removal of the structure and replacement with a wide-span bridge that does

not impact the stream channel. A bridge may also be highly desirable to the LPNF. Recreational users must travel over the slippery crossing in order to access the trailhead to the lower Manzana area. In addition to eliminating potential aquatic animal fatalities caused by vehicles crossing in the stream, a bridge would provide safe vehicular access and recreational pedestrian user access across the creek during all stream flows.

Barrier ID: SC_MA_DB_2
Stream: Davy Brown Creek
Barrier Type: Low-flow Crossing
Physical Location: #2 Sunset Valley Road Crossing
GPS Location: N 34* 45' 35.8" W 119* 57' 10.6"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/14/02

Description: This concrete low-flow crossing spans 127 feet across the stream channel connecting the paved road at either end. The upstream to downstream width of the crossing measures 20 feet. With a stream flow of approximately 0.8 c.f.s., spreads out over the crossing at a depth of 1 inch or less. The maximum downstream pool depth measured 16 inches. The jump pool depth measured 10 inches. A jump height of 4 inches was measured from the downstream pool surface to the top of the downstream edge of the crossing. The crossing has a smooth surface lacking any potential resting spots. The surface slope measured 2.1% with a rise of 5 inches over 20 feet. A metal pipe spans across the creek at the upstream end of the structure rising 6 inches above the surface of the crossing.

Condition: The concrete appears to be in good condition with minimal downstream undercutting.

Diagnosis: The shallow water depth across the concrete crossing may impede upstream passage of juvenile and adult salmonids during low, base flow conditions. As water depth increases during moderate to high stream flows, upstream adult steelhead passage would be possible with a moderate degree of difficulty. Excessive water velocities across the smooth concrete crossing may impede upstream passage of salmonid during exceptionally high flows. The window of opportunity for upstream steelhead and rainbow trout migration may be limited due to these factors, especially during exceptionally dry years and low stream flow conditions. Davy Brown Creek is an important perennial tributary for rainbow trout and potentially steelhead, especially during drier years. Upstream passage to refugia pools is critical during lower flows and/or when Manzana Creek dries up near the creek mouth. The lack of jump depth on the crossing below the metal pipe at the upstream end adds an additional element of difficulty for fish passage.

Recommended Action: Determine the structural requirements necessary for a bridge at this site and assess the feasibility of installing one. The most effective long-term fish passage solution at this site is complete removal of the structure and replacement with a wide span bridge that does not impact the stream channel. The natural stream channel width 100 feet upstream from the crossing measured 45 feet between the channel tops. A relatively inexpensive prefabricated

bridge or railroad car bridge could be installed at this location without affecting the natural stream channel. A bridge may also be highly desirable to the LPNF. In addition to possibly eliminating aquatic animal fatalities caused by vehicles crossing in the stream, a bridge would provide safe vehicular and recreational access across the creek during all stream flows.

Barrier ID: SC_MA_DB_3
Stream: Davy Brown Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximate elevation of 2280'
GPS Location: N 34* 45' 15.7" W 119* 57' 51.7"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/14/02

Description: This impressive three-stage waterfall drops a total of 16 feet 8 inches and has carved three pools and several steep chutes into the exposed bedrock. The lowest pool measured 7 feet deep with a jump height of 7 feet to the next pool. The depth of the second pool measured 3 feet deep with a jump height of 6 feet to the third pool, which measured 11 inches deep. A final jump height of 3 feet 8 inches occurs upstream to reach an adequate landing zone. A long, steep bedrock chute with no resting pools and a slope exceeding 20% occurs just upstream of this bedrock waterfall.

Condition: Stable bedrock feature.

Diagnosis: The excessive jump heights found along this waterfall, and steep upstream bedrock chute, prevent further upstream passage for salmonids. Rainbow trout are present up to the pool at the base of this feature.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_DB_MH_1
Stream: Munch Creek
Barrier Type: Low-flow Crossing
Physical Location: Davy Brown Campsite Access Road
GPS Location: Approximate elevation 2053'
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/14/02 and 12/16/02

Description: This concrete low-flow crossing spans the stream channel at the lower end of the Davy Brown Campsite to a locked gate and old jeep track. The crossing does not appear to be used often, if at all, and may not be necessary.

Condition: This structure is in poor condition with visible cracking and moderate downstream undercutting.

Diagnosis: The shallow water depth across the concrete crossing may impede upstream passage of juvenile and adult salmonids during low, base flow conditions. As water depth increases during moderate to high stream flows, upstream passage is possible with a moderate to high degree of difficulty. Excessive water velocities across the smooth concrete crossing may impede upstream passage of salmonids during exceptionally high flows. The window of opportunity for upstream steelhead and rainbow trout migration may be limited due to these factors, especially during exceptionally dry years and low stream flow conditions. Munch Creek is an important perennial tributary for rainbow trout and potentially steelhead, especially during drier years

Recommended Action: Assess the value of this structure with LPNF personnel. Complete removal of the structure will provide the most effective long-term fish passage solution at this site. A crossing does not appear to be necessary at this site and a natural substrate in-stream crossing could allow access during low flows.

Barrier ID: SC_MA_DB_MH_2
Stream: Munch Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximately 0.5 miles upstream from Davy Brown Creek
GPS Location: N/A
Ownership/Interest: Los Padres National Forest

Description: This upstream natural limit to salmonid migration was identified in a 1997 USDA-Forest Service Stream Survey of Munch Creek found in Donna Toth's files at the Santa Lucia LPNF office. A map of this stream reach identifies a "Major Barrier 20', Complete" at this location. Steep contour lines in this location also indicate an upstream natural limit at this site.

Diagnosis: Due to the excessive jump height this feature is apparently impassable for all upstream salmonid passage.

Recommended Action: No action recommended for this natural feature.

Barrier ID: SC_MA_FH_1
Stream: Fish Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximately 1.10 miles upstream from Fish Creek/ Manzana Creek confluence at an approximate elevation of 2156'
GPS Location: N 34* 45' 11.4" W 119* 54' 31.8"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/18/02

Description: This waterfall has carved an impressive 6 ft. deep pool into the surrounding confined bedrock gorge. The jump height, from the pool surface to the top of the waterfall, measured 18 feet.

Condition: Natural, stable bedrock condition.

Diagnosis: Due to the excessive jump height, upstream salmonid passage is prevented at this waterfall. Rainbow trout/ steelhead were present immediately downstream of this feature. The creek was surveyed upstream of the waterfall for an additional 500 ft. but no rainbow trout were observed. This feature is the natural upstream limit to steelhead migration on Fish Creek.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_FH_EF_1
Stream: East Fork Fish Creek
Barrier Type: Bedrock Chute
Physical Location: Approximate elevation 2320'
GPS Location: N 34* 44' 47.5" W 119* 54' 13.2"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/18/02

Description: This 16-foot long bedrock chute has carved into the surrounding bedrock producing a slope of approximately 20%. The small, downstream pool has a maximum depth of 6 inches.

Condition: Natural, stable bedrock.

Diagnosis: Due to the excessive slope of the smooth bedrock chute, excessive water velocities during moderate and high flows and shallow water depth during low flows prevents further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_FH_SF_1
Stream: South Fork Fish Creek
Barrier Type: Bedrock Waterfall
Physical Location: 200 feet upstream from the East Fork Fish Creek
GPS Location: Approximate elevation of 2280'
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/18/02

Description: This impressive, vertical bedrock waterfall measured over 18 feet tall from a small downstream pool that measured 12 inches in depth to the top.

Condition: Natural, stable bedrock.

Diagnosis: Due to the excessive jump height, this structure is impassable to upstream salmonid migration.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_SS_1
Stream: Sulphur Springs Creek
Barrier Type: Impassable Bedrock Chute
Physical Location: Estimated elevation of 2905'
GPS Location: N 34* 45' 53" W 119* 51' 59.9"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/21/02

Description: This steep bedrock chute drops 12 vertical feet over a distance of 30 feet. Downstream of this chute a large boulder jam has accumulated and drops flows vertically 10 feet into a shallow pool with 12 inches of depth.

Condition: The bedrock chute section of this feature is stable.

Diagnosis: Due to the excessive jump height and steep bedrock chute, this feature is impassable during all stream flows.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_T1_1
Stream: Un-named Tributary #1
Barrier Type: Boulder Cascade
Physical Location: Estimated elevation of 2540'
GPS Location: N 34* 44' 8.5" W 119* 52' 55.1"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/19/02

Description: This boulder cascade has a slope exceeding 15% with a drop of 6 feet and no downstream pool depth. This unnamed tributary flows into the south side of Manzana Creek approximately 0.6 miles downstream from the Manzana Campsite.

Diagnosis: This feature is impassable due to the excessive slope and jump height with no downstream jump pool depth.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_T2_1
Stream: Tributary # 2
Barrier Type: Bedrock Waterfall
Physical Location: Approximately 850 feet upstream of Manzana Creek
GPS Location: N 34* 43' 57.1" W 119* 52' 49.7"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/19/02

Description: This bedrock waterfall has a total height of 8 feet 6 inches from the top of the feature to the surface of the downstream pool, which has a maximum pool depth of 2 feet. Stream flows sheet across 12 feet of smooth bedrock dropping 3 feet before freefalling 5 feet 6 inches to the downstream pool. This unnamed tributary flows into the south side of Manzana Creek approximately 0.5 mile downstream from the Manzana Campsite.

Diagnosis: This feature is impassable due to the excessive jump height, lack of upstream landing pool, and excessive water velocities across the bedrock chute at the top of the structure.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_T3_1
Stream: Tributary # 3
Barrier Type: Boulder Cascade
Physical Location: Estimated elevation of 2889'
GPS Location: N 34* 43' 59.8" W 119* 52' 24.8"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/19/02

Description: This boulder jam produces a cascade 11 feet tall with no downstream pool developed. This unnamed tributary flows into the south side of Manzana Creek immediately downstream from the Manzana Campsite.

Diagnosis: This feature is impassable due to the excessive jump height and lack of a downstream jump pool.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MA_MT_1
Stream: Manzana Trail Creek
Barrier Type: Boulder and Bedrock Waterfall
Physical Location: Approximately .56 miles upstream from Manzana Narrows campsite at an approximate elevation of 3230'
GPS Location: N 34* 44' 28" W 119* 51' 26.1"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 11/20/02

Description: This boulder and bedrock waterfall has a jump height of 8 feet and downstream pool depth of 12 inches. Immediately upstream from this waterfall the stream slope exceeds 10%.

Diagnosis: During low and moderate flows, this feature is impassable due to the excessive jump height and limited downstream pool depth. During high stream flows, this structure may still be impassable in the current configuration due to the lack of adequate downstream jump depth and excessive jump height. The boulders associated with this structure may become mobile during high stream flows and the altered configuration may allow limited upstream migration in the future.

Recommended Action: No recommended action for this natural feature.

5.8.3.6 Upper Sisquoc River Tributary Barriers (Upstream from Manzana Creek)

Barrier ID: SC_BO_1
Stream: Burro Creek
Barrier Type: Waterfall
Physical Location: Approximately 300 feet upstream from Sisquoc River
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/6/02

Description: This bedrock waterfall measured 7 feet tall from the top to the dry streambed downstream.

Condition: Fairly stable natural feature.

Diagnosis: This entire tributary was dry from the mouth upstream to this waterfall and beyond for at least 500 feet. Surveying did not proceed past that point. During migration flows, the downstream pool would likely fill to a maximum depth of less than 2 feet. The excessive jump height would likely prevent further upstream steelhead migration. Adequate salmonid rearing habitat was not observed in this tributary.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_WR _1
Stream: Water Creek
Barrier Type: Bedrock Chute
Physical Location: Approximate elevation 2360'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this waterfall were made from the air and are limited in detail. This bedrock chute extends approximately 15 feet vertically with a very steep slope.

Condition: Stable bedrock feature.

Diagnosis: The excessive slope and height of this chute would prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_WR_WF_1
Stream: West Fork Water Creek
Barrier Type: Steep gradient
Physical Location: Approximate elevation 2120'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this steep stream gradient were made from the air and are limited in detail. From the air, this stream reach appeared to have a slope exceeding 15%.

Diagnosis: It appears that the excessive slope of this stream reach would prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this nature feature.

Barrier ID: SC_WR_EF_1
Stream: East Fork Water Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximate elevation of 1920'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

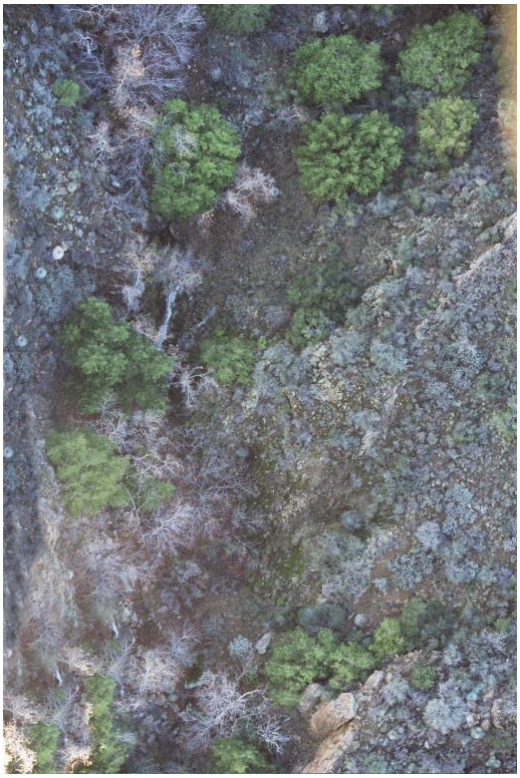
Description: Observations of this waterfall were made from the air and are limited in detail. This waterfall and chute have carved through a confined section of exposed bedrock and drop flows over 40 feet into a pool below. A vertical waterfall at the downstream end is at least 15 feet tall and a long, steep bedrock chute extends immediately upstream over 25 feet.

Condition: Stable bedrock feature.

Diagnosis: The excessive jump height of the waterfall and long, steep chute would prevent any upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_WN _1
Stream: Wellman Creek
Barrier Type: Bedrock waterfall
Physical Location: Approximate elevation 2360'
GPS Location: NA
Ownership/Interest: LPNF
Surveyor(s) and Date: Matt Stoecker 12/30/02


Bedrock waterfall

Description: Observations of this bedrock waterfall were made from the air and are limited in detail. This waterfall drops vertically more than 20 feet.

Condition: Stable bedrock feature.

Diagnosis: The excessive height of this waterfall would prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_AL _1
Stream: Abel Creek
Barrier Type: Steep Gradient
Physical Location: Approximate elevation 3400'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this steep gradient section were made from the air and are limited in detail. This steep stream reach extends over 100 feet with a slope exceeding 15%. This location is approximately 0.4 mile upstream from the "Ernest Blanco Spring" marked on USGS maps.

Diagnosis: The excessive slope of this stream reach would likely prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_AL _EF_1
Stream: East Fork Abel Creek
Barrier Type: Steep Gradient
Physical Location: Approximate elevation 3440'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this steep gradient section were made from the air and are limited in detail. This steep stream reach has a slope that appears to exceed 15%. The East Fork of Abel Creek has "Lost Knife Spring" marked on the USGS 7.5 minute topographic map. This steep gradient section is located approximately 0.5 mile upstream from "Lost Knife Spring".

Diagnosis: The excessive slope of this stream reach would likely prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_AL _EFN_1
Stream: Unnamed Northern Tributary to the East Fork Abel Creek
Barrier Type: Waterfall
Physical Location: Approximate elevation 3400'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this waterfall were made from the air and are limited in detail. While visibility was limited, this waterfall is estimated to exceed 15 feet in height. The East Fork of Abel Creek has "Lost Knife Spring" marked on the USGS 7.5 minute topographic map. This tributary is the northern tributary to the East Fork, and enters the East Fork at "Lost Knife Spring".

Diagnosis: The excessive height of this waterfall would prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_AL _WFN_1
Stream: Unnamed Northern tributary to the West Fork Abel Creek
Barrier Type: Steep Gradient
Physical Location: Approximate elevation 3040'
GPS Location: NA
Ownership/Interest: Los Padres National Forrest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this steep gradient section were made from the air and are limited in detail. This steep stream reach occurs in a confined channel and extends over 100 feet with a slope that appears to exceed 15%. The West Fork of Abel Creek occurs opposite from the East Fork, which has "Lost Knife Spring", marked on the USGS 7.5 minute topographic map. This tributary is the northern tributary to the West Fork.

Diagnosis: The excessive slope of this stream reach would likely prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_AL _WFS_1
Stream: Unnamed Southern tributary to the West Fork Abel Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximate elevation 3120'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this bedrock waterfall were made from the air and are limited in detail. The waterfall is estimated to exceed 20 feet in height. The West Fork of Abel Creek occurs opposite from the East Fork, which has "Lost Knife Spring", marked on the USGS 7.5 minute topographic map. This tributary is the southern tributary to the West Fork.

Diagnosis: The excessive height of this waterfall would prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_MN_1
Stream: Mine Creek
Barrier Type: Waterfall
Physical Location: Approximate elevation 2080'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Observations of this waterfall were made from the air and are limited in detail. This waterfall is estimated to exceed 15 feet in height.

Diagnosis: The excessive height of this waterfall would prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_BB_1
Stream: Big Bend Creek
Barrier Type: Steep Bedrock and Boulder Gradient
Physical Location: Approximately 0.25 miles upstream of South Fork Big Bend Creek
GPS Location: N 34* 47' 50.9" W 119* 51' 10.1"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/09/02


Upstream view of boulder/bedrock barrier


Upstream view of boulder/bedrock barrier

Description: This steep bedrock and boulder stream reach occurs in a confined canyon. Large boulders and exposed bedrock produce a nearly vertical drop with a height of 9 feet to the downstream substrate. Immediately downstream a large landslide would also likely prevent upstream migration, but this feature may flush out with high stream flows.

Diagnosis: The excessive height of this feature prevents further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_BB_SF_1
Stream: South Fork Big Bend Creek
Barrier Type: Bedrock Chute
Physical Location: Approximate elevation 2294'
GPS Location: N 34* 47' 35" W 119* 50' 51.2"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/09/02

Bedrock chute looking upstream

Description: This steep bedrock chute measured 6 feet tall over a 12-foot horizontal distance. A small downstream pool occurs with a maximum depth of 12 inches. This tributary to Big Bend Creek is the second southern tributary upstream from the Sisquoc River identified on the 7.5 minute USGS topo map. The next southern tributary downstream was dry at the confluence with Big Bend Creek and does not appear to provide significant salmonid habitat.

Diagnosis: The excessive slope and height of this chute and limited downstream jump pool depth would likely prevent any further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_PT_1
Stream: Pocket Creek
Barrier Type: Bedrock Waterfall
Physical Location: Approximately 350 feet upstream of the Sisquoc River
GPS Location: N 34* 46' 28.6" W 119* 47' 20.1"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/12/02

Description: This 9-foot tall waterfall occurs at the downstream end of an extensive bedrock gorge. Flows have carved interesting "pockets" of water into the gorge walls. The waterfall drops water flows vertically into a dugout pool only 6 inches deep. This tributary enters the Sisquoc River approximately 1.0 mile upstream of Foresters Leap Creek. The tributary enters the Sisquoc on the river-left, or west, side of the river.

Diagnosis: The excessive height of this waterfall and limited jump height prevent further upstream salmonid passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_SF_1
Stream: South Fork Sisquoc River
Barrier Type: Bedrock and Boulder Gradient
Physical Location: Approximate elevation 3240'
GPS Location: NA
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/15/02

Description: Beginning 300 feet downstream from the White Ledge Creek confluence, large boulders and moderate to steep stream gradients begin to appear on the South Fork Sisquoc. These steep boulder gradient sections appear sporadically, along with milder sloped reaches and continue upstream to what was determined to be the natural upstream limit for steelhead, described here. It should be noted that several natural features downstream from this identified upstream limit may limit or prevent upstream salmonid passage during certain flow situations and are subject to seasonal changes in configuration and passage severity. Rainbow trout/steelhead are present throughout this reach to within 200 feet of this identified upstream limit. This natural upstream limit to steelhead migration occurs approximately 1.15 miles upstream from the South Fork Sisquoc River/ White Ledge Creek confluence. This upstream limit is actually a series of three massive bedrock and boulder cascades that occur within a 100-foot long stretch of stream over an elevation change of 45 feet. The most downstream cascade drops stream flow 12 feet onto bedrock with no downstream jump pool depth.

Diagnosis: The excessive height of these cascades would prevent further upstream salmonid passage in their current configuration. It is possible that the large boulders present may become mobile during high stream flows and change the severity of upstream migration. The extent to which juvenile and adult salmonids can migrate up the South Fork Sisquoc is variable over time and dependant upon seasonal flows. The mobility of large boulders will dramatically change the characteristic of this tributary and impact the extent of upstream migration.

Recommended Action: No recommended action for these natural features.

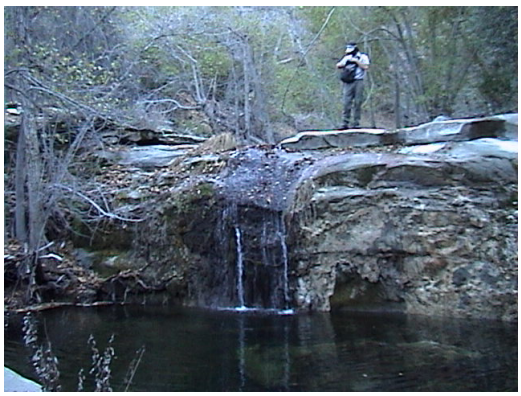
Barrier ID: SC_MH_1
Stream: Maiden Hair Creek
Barrier Type: Steep Boulder Gradient
Physical Location: Approximately 0.3 miles upstream from confluence with Sisquoc River
GPS Location: N 34* 45' 9.4" W 119* 45' 30"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/13/02

Description: This large boulder jam rises 10 feet above the downstream substrate. A small pool 12 inches deep occurs downstream from this steep boulder jam. The adjacent steep-walled stream banks have an impressive array of Maiden Hair ferns. This previously unnamed tributary enters the south side of the Sisquoc River approximately 0.9 miles upstream from the South Fork Sisquoc River.

Diagnosis: The shallow downstream pool depth and excessive jump height at this feature would prevent further upstream steelhead passage.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_FA_1
Stream: Fall Creek
Barrier Type: Bedrock Waterfall and Chute
Physical Location: Approximately .2 miles upstream from the confluence with the Sisquoc River
GPS Location: N 34* 44' 53.4" W 119* 43' 53.5"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/11/02


Bedrock Waterfall


Bedrock Chute

Description: Two natural features are described here. A steep bedrock chute occurs approximately 100 feet downstream from a bedrock waterfall. This bedrock waterfall drops water vertically 9 feet to the surface of the large downstream pool, which had a maximum measured depth of 7 feet. The chute measured 22 feet long with a vertical rise of 7 feet. A small 6 inch deep pool exists downstream of this chute.

Diagnosis: It is likely that the downstream bedrock chute would prevent any upstream salmonid migration due to the shallow and/or excessive water velocities encountered during low and moderate to high flows, respectively. The excessive jump height of the bedrock waterfall upstream would also likely prevent further upstream passage on Fall Creek.

Recommended Action: No recommended action for these natural features.

Barrier ID: SC_RE_1
Stream: Rattlesnake Creek
Barrier Type: Bedrock Falls
Physical Location: 80 feet downstream from Rattlesnake "Falls"
GPS Location: Approximate elevation of 3204'
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/13/02

Description: This bedrock waterfall drops water vertically 6 feet 6 inches to the surface of a small downstream pool, which had a maximum measured depth of 2 feet. The massive Rattlesnake Falls occurs just upstream and rises over 100 feet tall.

Diagnosis: The relatively shallow downstream jump pool depth and significant jump height would likely prevent further upstream migration. Should this become passable during higher stream flows, only 80 feet of stream occurs above this feature to the foot of the impassable Rattlesnake Falls.

Recommended Action: No recommended action for this natural feature.

Barrier ID: SC_BP_1
Stream: Big Pine Creek
Barrier Type: Bedrock Chutes
Physical Location: Approximate elevation 4100'
GPS Location: N 34* 43' 7" W 119* 39' 58.8"
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: Matt and Jim Stoecker 12/14/02

Description: This series of bedrock chutes carves into exposed bedrock where the river channel becomes confined. At the downstream end, a 4-foot deep pool occurs below the first nearly vertical chute that has a height of 6 feet 6 inches. A small 2-foot deep pool exists at the top of this chute. From this small pool, flows sheet over 10 feet of bedrock and up a 10-foot long section of moderately sloped bedrock and then a 10-foot long chute that exceeds a 25% slope.

Condition: Stable bedrock feature.

Diagnosis: The downstream pool provides sufficient depth to allow a moderately difficult jump over the first chute during migration flows. The long upstream bedrock chutes have no adequate resting areas and excessive stream velocities and slope that prevent all upstream salmonid migration. Immediately upstream, another 15–foot long chute exists that is followed by over 100 feet of steep boulder gradient that is also impassable.

Recommended Action: No recommended action for this natural upstream limit to steelhead migration.

5.8.3.7 Estimated Natural Upstream Limits

Barrier ID:
SC_TT_CN_TR_WF_1, West Fork Tyler Creek, Elevation 2000'
SC_TT_CN_TR_3, Tyler Creek, Elevation 1760'
SC_LB_NF_BR_1, Bear Creek, Elevation 1480'
SC_LB_NF_BR_EF_1, East Fork Bear Creek, Approximately 1.75 miles upstream of Bear Creek
SC_LB_NF_BR_WF_1, West Fork Bear Ck., Approximately .75 miles upstream of Bear Creek
SC_LB_NF_KY_1, Kerry Creek, Elevation 2200'
SC_LB_NF_FS_EF_1, East Fork Flores Creek, Elevation 1740'
SC_LB_NF_RE_1, Roque Creek, Elevation 3160'
SC_LB_NF_SG_1, Stag Creek, Elevation 2200'
SC_LB_SF_1, South Fork La Brea Creek, Elevation 3280'
SC_LB_SF_RE_1, Rattlesnake Creek, Elevation 1520'
SC_LB_SF_SS_1, Salsipuedes Creek, Elevation 2400'
SC_HE_MF_1, Middle Fork Horse Creek, Elevation 2600'
SC_HE_EF_1, East Fork Horse Creek, Elevation 3280'
SC_BM_1, Bald Mountain Creek, Elevation 1360'
SC_FL_1, Foresters Leap Creek, Elevation 3520'
SC_FL_NF_1, North Fork Foresters Leap Creek, Elevation 3400'
SC_FL_SF_1, South Fork Foresters Leap Creek, Elevation 3000'
SC_SR_1, Sweetwater Creek, Elevation 3080'
SC_WL_1, White Ledge Creek, Elevation 3000'
SC_WL_SF_1, South Fork White Ledge Creek, Elevation 3040'
SC_CF_1, Cliff Creek, Elevation 3480'
SC_LN_1, Logan Creek, Elevation 3736'
SC_JL_1, Judell Creek, Elevation 4440'
SC_JL_WFN_1, Northern tributary of the West Fork Judell Creek, Elevation 4640'
SC_JL_WFS_1, Southern tributary of the West Fork Judell Creek, Elevation 4800'

Barrier Type: Estimated Natural Upstream Limits
Ownership/Interest: Los Padres National Forest
Surveyor(s) and Date: by Matt Stoecker using UGSS 7.5 minute topographical maps

Description: The above-mentioned "barriers" are Estimated Natural Limits to upstream steelhead migration. Due to limitations on the study timeline and/or aerial surveying capability, several stream reaches and limits to upstream migration could not be identified from the ground or air. The above estimated natural limits were determined using California Department of Fish and Game protocol and UGSS 7.5 minute topographical maps. Natural limits were determined by locating the most downstream location where the stream reach exceeds a sustained slope of 10-15% or where contour lines showed an abrupt elevation change indicating a significant elevation drop. Locations were determined by identifying the intersection of topographical lines and the streamline and are given in approximate elevations (feet).

Diagnosis: These estimated upstream limits are approximations and assume that adequate upstream migrations occur to that location. None of these locations should be identified as impassable until further assessed to confirm the severity to steelhead migration.

Recommended Action: Additional ground surveying effort may be conducted to accurately determine the specific features that are limits to steelhead migration on the above-mentioned tributaries to the Sisquoc River.

5.8.3.8. Cuyama River Migration Barriers (Downstream from Twitchell Reservoir)

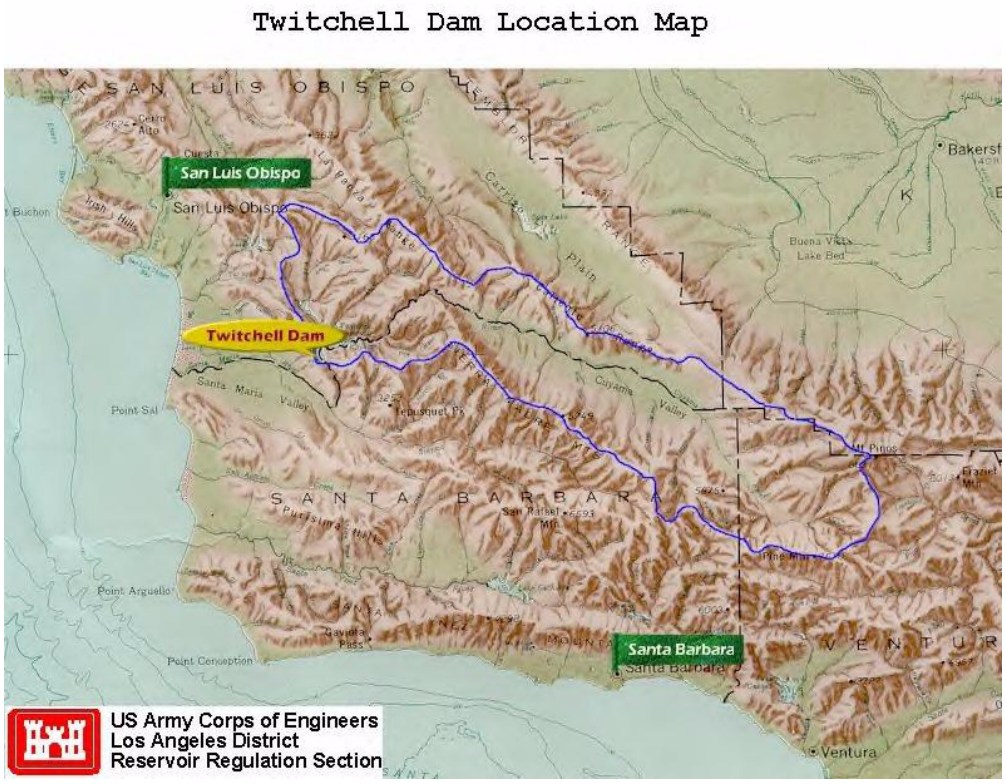
Barrier ID: CA_1,2,3,4,5
Stream: Cuyama River
Barrier Type: Road Crossings
Physical Location:
CA_1, Approximately 0.5 miles upstream from Cuyama/Sisquoc River confluence
CA_2, Approximately 0.7 miles upstream from Cuyama/Sisquoc River confluence
CA_3, Approximately 2.3 miles upstream from Cuyama/Sisquoc River confluence
CA_4, Approximately 3.2 miles upstream from Cuyama/Sisquoc River confluence
CA_5, Approximately 5.5 miles upstream from Cuyama/Sisquoc River confluence
GPS Location: NA
Ownership/Interest: Unknown
Surveyor(s) and Date: Matt Stoecker 12/30/02

Description: Five road crossings were observed on the Cuyama River between the Sisquoc/Cuyama River confluence and Twitchell Dam. Although ground surveying this river reach was outside the scope of this project, observations were made from the air. Descriptions of these structures are limited. CA_1 and CA_2 appear to contain multiple culverts underneath earthen road fill. Road crossings CA_3, CA_4, and CA_5 appear to be bridges with unknown streambed/structure configurations underneath. Passage may not be impeded at these bridge locations.

Diagnosis: Due to the limited observations of these road crossings, the severity of upstream steelhead migration at these structures could not be determined. It appears likely that CA_1 and CA_2 significantly impede or completely prevent upstream migration due to the presence of culverts. Culverts limit steelhead migration by producing shallow water conditions during low flows and excessive water velocities during higher flows.

Recommended Action: Work with crossing owners to determine the configuration of these structures and impacts to steelhead migration. While only a small portion of marginal aquatic habitat occurs downstream of Twitchell Dam, providing salmonids access throughout this reach may have benefits. Surface flow and pools were identified in this reach during late fall and salmonids may be able to inhabit portions of the reach during wetter years or with flow modifications at Twitchell Dam. See the Twitchell Dam write-up, CA_6, for an additional discussion of steelhead restoration efforts involving this reach of the Cuyama River and water releases from Twitchell Dam.

Barrier ID: CA_6
Stream: Cuyama River
Barrier Type: Twitchell Dam
Physical Location: Approximately 8 miles upstream from the Sisquoc/Cuyama River confluence
GPS Location: N/A
Ownership/Interest: United States Bureau of Reclamation/Santa Maria Valley Water Conservation District
Surveyor(s) and Date: Matt Stoecker 12/30/02



Cuyama River and tributary basin upstream from Twitchell Dam

Description: The Santa Maria River is formed by the confluence of the Cuyama and Sisquoc Rivers. The Cuyama River Basin, with a drainage area of about 1,135 square miles, drains essentially all of the northern half and eastern most portion of the Santa Maria River Basin. The United States Bureau of Reclamation constructed Twitchell Dam, then called Vaquero Dam and Reservoir, in the late 1950's as part of the Santa Maria Project. The Project provides recharge to the groundwater basin underlying the Santa Maria Valley and also provides flood protection. The project was completed in 1959 at a cost of approximately 11 million dollars, which was approximately 30 percent less than the original estimate. The name was changed to Twitchell Dam and Reservoir to honor Mr. T.A. Twitchell of Santa Maria, who was instrumental in bringing about the project. Twitchell Reservoir is operated and maintained by the Santa Maria Valley Water Conservation District. The following information and photographs were obtained at http://orcutts1.sbceo.k12.ca.us/public/training/water/tw_history.htm.

Owner: U.S. Bureau of Reclamation
Issue: Loss of capacity due to sedimentation
Type: Earth & Rock Fill
Structural Height: 241 Feet
Crest Length: 1,804 Feet
Volume of Material in Dam: 5,800,000 Cubic Yards
Outlet Works Capacity: 12,700 Cubic Feet per Second
Spillway Capacity: 26,350 Cubic Feet per Second
Reservoir Design Capacity: 239,000 Acre-Feet
Reservoir Area @ 239,000 AF: 3,600 Acres
Annual Yield (Approximate): 20,000 Acre-Feet (groundwater recharge)
Drainage Area Above Dam: 1,135 Square Miles

Under the Current Water Control Manual (WCM), approved in 1960, downstream water releases from Twitchell Dam into the Cuyama River are not required until the reservoir water surface elevation has risen from 474 to 623 feet. When the 623-foot elevation mark has been reached, the lesser of either 500 c.f.s. or the reservoir inflow must be released downstream. See the United States Army Corps of Engineers website http://www.spl.usace.army.mil/resreg/htdocs/twitchell.html for additional information about the physical characteristics and entire schedule of controlled and uncontrolled water releases for Twitchell Dam.

Twitchell Dam and Reservoir following a big El Nino year.

Diagnosis: Twitchell Dam and the manipulated water releases associated with it constitute the most limiting migration barrier to the now endangered steelhead of the Santa Maria River watershed. This dam physically blocks steelhead from accessing over half of the watershed upstream of the dam, where numerous rainbow trout bearing streams such as Huasna River, Kelly Canyon Creek, Deal Creek, Alamo Creek, Bear Trap Creek, and Reyes Creek occur (Donna Toth, LPNF files). In addition, the manipulated downstream water releases have exacerbated the

discontinuity of surface flows, and in turn limited steelhead migration, along the Santa Maria River between the Pacific Ocean and the Sisquoc River.

Prior to the construction of Twitchell Dam a report was commissioned to assess the possible impacts of several proposed dams on the Santa Ynez and Santa Maria Rivers. This report also provided recommendations to maintain the two largest steelhead populations in Santa Barbara County found in these two rivers. In 1945 Leo Shapovalov, a California Division of Fish and Game steelhead biologist, authored the *Report on Relation to Maintenance of Fish Resources of Proposed Dams and Diversions in Santa Barbara County, California.* Shapovalov noted that "by far the largest part of the spawning (of the Santa Maria River steelhead population) takes place above the proposed Round Corral Dam, which would be located below all tributaries of the Sisquoc River with exception of Tepusquet, Foxen Canyon, and La Brea Creeks." The construction of Round Corral Dam was proposed on the Sisquoc River 10 miles upstream from the Cuyama River. Fortunately, this project was shelved. While discussing this proposed dam site on the lower Sisquoc River, Shapovolov continues to state that preventing steelhead from accessing the upper Sisquoc River would "virtually destroy the (Santa Maria watershed's steelhead) run, unless adequate provisions were made for the safe passage of adult steelhead both up and down and of young fish on their downstream migration." In addition to the physical barriers of the proposed dams, Shapovalov acknowledged "properly regulated flow from the reservoirs (including Twitchell Dam) would serve the double purpose of retardation of flow for percolation and providing flow for ascent of spawning steelhead and downstream migration of both adults and young steelhead at periods of low water."

Unfortunately, Twitchell Dam releases are not currently regulated to provide critical flow for upstream and downstream steelhead migration during the winter and spring. In fact, the current operations attempt to do just the opposite, minimizing releases during the winter and spring and slowly releasing flows during the summer to recharge the underground aquifer. These releases generally do not reach the ocean nor do they correspond to a time when the Sisquoc River's flow has subsided. A representative from the federal agency involved with operations at Twitchell Dam stated that the downstream water releases are managed so that surface flows do not reach the Pacific Ocean and as much of the stream flow as possible is percolated into the underground aquifer (*Restoring the Southern California Steelhead* symposium at UCSB in 1998). Because of this water release schedule, the window of opportunity for steelhead to migrate between the ocean and Sisquoc River, which contains almost all of the accessible spawning and rearing habitat within the watershed, is dramatically reduced and during drier years surface flows are prevented from reaching the ocean at all.

Recommended Action:

In a section at the end of his 1945 report, "Recommendations for Protection of the Fishery Resources for the Santa Ynez and Santa Maria River", Shapovalov makes several recommendations that should accompany any dam building on the Cuyama and Sisquoc Rivers, including the following:

- "During the winter season sufficient water be released from both Vaquero (now Twitchell) and Round Corral reservoirs to permit steelhead to ascend from the ocean past Round Corral Dam (up the Sisquoc River)."

- "…Releases of water for ground percolation ……maintain proper conditions in the streams (for steelhead)."

The existing operations at Twitchell Dam do not reflect either of these recommendations. As a result, the second largest steelhead fishery in Santa Barbara County, and one of the largest in the southern California ESU, has been nearly wiped out. The current approved water control

manual (WCM) for Twitchell Dam and Reservoir is dated August 1960. The WCM is scheduled for revision in 2005. In order to revive and preserve the Santa Maria/Sisquoc River steelhead population, a comprehensive long-term management plan is needed to ensure adequate stream flow for upstream and downstream steelhead migration along the migration corridor of the Santa Maria River to the Sisquoc River. The upcoming scheduled revision of the WCM in 2005 offers an opportunity to provide for conjunctive use of the Twitchell Dam releases to benefit both groundwater recharge and steelhead migration along the Santa Maria River migration corridor. The development of a revised WCM should be carried out in coordination with NMFS, CDFG, Santa Maria Valley Water Conservation District, USBR, and other watershed stakeholders. A similar process is ongoing on the Santa Ynez River resulting in the *Lower Santa Ynez River Fish Management Plan* (2000). A well planned out and revised WCM for Twitchell Dam that addresses groundwater recharge for Santa Maria urban and agricultural use and is consistent with CDFG and NMFS objectives is necessary for effectively recovering and preserving the endangered steelhead of the Santa Maria/Sisquoc River.

5.9 Fish Passage Improvement Project Priorities

5.9.1 Twitchell Dam (CA_1)

The most severe migration barrier for Santa Maria River and Sisquoc River steelhead is the prolonged absence of stream flows on the 25-mile long Santa Maria River that connects the Sisquoc River to the ocean. While natural conditions likely left the Santa Maria River dry for extended periods before the dam, water releases from Twitchell Dam for groundwater recharge have significantly reduced the connectivity of surface flows to the ocean. The long-term recovery and self-sustainability of the Santa Maria/Sisquoc steelhead population is highly dependant on improved surface flows on the Santa Maria River that provide adequate upstream and downstream migration to and from the Sisquoc River. Improving steelhead migration conditions on the Santa Maria River migration corridor should be the HIGHEST priority for steelhead recovery within the watershed. The upcoming revision of the water control manual (WCM) for Twitchell Dam and Reservoir scheduled for 2005 offers the opportunity to address improved steelhead migration. See the Twitchell Dam write-up for more detail and recommendations.

5.9.2 Garey Bridge Check Dam (SC_2)

Removal of this check dam is a high priority for steelhead recovery because it is a partial barrier that prevents upstream migration during certain water flow conditions. The Army Corp of Engineers has ordered the removal of this illegally built dam. This action should be enforced as soon as possible. Virtually the entire Sisquoc River and all significant tributaries occur upstream from this structure. See the Garey Bridge Check Dam write-up for more detail.

5.9.3 Lower Sisquoc River Culvert Crossings (SC_3, SC_4, SC_5)

All three of these earth fill culvert crossings are designed to blow out during extremely high stream flows, but even these temporary crossings restrict or block upstream steelhead passage during certain flows and delay upstream migration through this flashy section of the Sisquoc River. The Tepusquet Road Culvert Crossing (SC_3) and Private Culvert Crossing (SC_4) are partial barriers to upstream migration and reduce the window of opportunity for upstream migration by impeding passage during low flows and higher flows, prior to blowing out. The next upstream Private Culvert Crossing (SC_5) is a significant impediment and severe barrier during low flows, but the culverts are readily bypassed during moderate and higher flows conditions. All three of these structures provide some degree of impedance for upstream steelhead

migration. Elimination of these structures from the stream channel is highly recommended to ensure unimpeded upstream migration through this lower corridor on the Sisquoc River. See these barrier write-ups for additional detail.

5.9.4 Horse Creek Dam (SC_HE_1)

This obsolete dam near the mouth of Horse Creek, blocks steelhead access to almost 13 miles of habitat. This dam occurs on public land within the San Rafael Wilderness and Sisquoc Wild and Scenic River Corridor. The structure appears to be obsolete and no longer serves any observable purpose. The removal of this dam should be a high priority and a relatively easy project to gain support and permission for. See the Horse Creek Dam write-up for additional detail.

5.9.5 Tepusquet Creek Barriers

A total of 29 structures were identified on Tepusquet Creek and its primary tributary, Colson Creek, and secondary tributary, Tyler Creek. A current population of rainbow trout is reported to exist within this tributary and steelhead are reported to have used it historically for spawning and rearing. Restoring steelhead access to this tributary should be a high priority. Currently the entire tributary is blocked to steelhead access due to a Hauling Road Culvert Crossing (SC_TT_1) at the mouth of Tepusquet Creek. Due to the many barriers that occur throughout this tributary system, fish passage improvement projects should proceed from the most downstream barrier (SC_TT_1) upstream. Due to the many crossing owners and landowners that occur in this canyon, it is recommended that local residents become involved in this process and a Tepusquet Creek Fish Passage Plan be formulated with the community. Excellent potential exist to restore steelhead to over 13 miles of adequate spawning and rearing habitat known to currently support salmonids. In addition, during drier years, restored access to this tributary may benefit steelhead throughout the watershed as they are able to seek refuge up this tributary as the lower reaches of the Sisquoc River begin to dry up. The top priority, and essential first step in allowing access to Tepusquet Creek, is removal of the Hauling Road Culvert Crossing (SC_TT_1). See the Tepusquet Creek barrier write-ups for additional detail.

5.9.6 Manzana Creek Barriers

Two concrete crossings (SC_MA_DB_1 and SC_MA_DB_2) occur on the Davy Brown Creek tributary and one concrete crossing occurs on the Munch Creek tributary to Davy Brown Creek. All three of these partial barriers impede salmonid passage within this productive tributary that supports natural salmonid reproduction and a moderate to high abundance of *O. mykiss*. These crossings present significant impediments to migration during low stream flows due to the shallow water depth across their surface and excessive water velocities during high stream flows. The Munch Creek crossing also has a significant downstream jump height during low and moderate flows. Removal of these structures, especially the obsolete Munch Creek crossing, provided unimpeded migration throughout this important spawning and rearing tributary. Access from Manzana Creek up this tributary during low stream flows is important for fish seeking perennial habitat as Manzana Creek becomes low or dry in late summer near the confluence.

A total of 21 natural bottom, in-stream crossings occur on lower Manzana Creek (SC_MA_1 –SC_MA_19). Two natural bottom in-stream crossings occur on the Dry Creek tributary (SC_MA_DY_1, SC_MA_DY_2). None of these crossings significantly impedes salmonid migration and no physical modifications are recommended, but these sites should be monitored to ensure that they do not become migration barriers in the future. See these barrier write-ups for additional detail.

5.10 Preferred Treatment 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's *California Salmonid Stream Habitat Restoration Manual*, 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 two 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. NMFS and CDFG guidelines also state that upstream juvenile steelhead and rainbow trout passage must be included in fish passage improvement projects and recommended actions for barriers in this report are consistent with these guidelines.

5.10.1 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 advantages to removing the culverts and replacing them with a bridge(s) including:

- Unimpeded migration for steelhead
- Restored streambed and aquatic habitat
- Improve wildlife and riparian connectivity
- Optimal sizing for peak stream flows improves safety
- Bridges last longer and require less maintenance
- Can be cost effective over time
- Aesthetically pleasing
- Elimination of public hazards (i.e. whitewater recreation on the Sisquoc River)
- Can improve a private landowners property value

5.10.2 Avoiding Ineffective Fish Passage Projects

The modification of existing road crossing barriers with baffles, fishways, or other "band-aid" projects that attempt to improve fish passage is highly discouraged for the following reasons:

- Biological 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 to be functional. 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 baffle design, in perfect operating condition, will impose a significant degree of difficulty to upstream passage.

- Safety and Structural Integrity-
  Installing fish passage measures inside of a culvert causes damage to the culvert and can lead to reduced culvert life and cause safety hazards.
  Fishways and baffles can reduce the flow capacity of the culvert and increase the likelihood of debris blockage that could cause failure of the crossing.

- Ongoing Maintenance and Cost-
  During high stream flows, baffles or other internal culvert modification are highly prone to blowing out. This failure prevents upstream steelhead passage during the migration season and causes structural damage to the culvert. Baffles are usually replaced after the steelhead migration season has ended, when flows have subsided and maintenance crews can reinstall them. In order to be effective, baffles require continual culvert maintenance costs, monitoring during the migration season, and replacement costs.

6.0 Additional Recommended Studies and Planning

The following studies are recommended in order to obtain additional information that can aid in effective steelhead recovery planning within the Santa Maria watershed and Sisquoc River.

6.1 Santa Maria River Water Budget and Dedicated Fish Migration Flows

A detailed water budget study for the entire watershed that compares existing conditions to historical records and water abundance should be conducted. The study should take into consideration water releases from Twitchell Dam, groundwater recharge operations, groundwater extraction, surface diversions, and other natural components that influence surface flows. With this information, a management plan to ensure effective steelhead migration between the Sisquoc River and the Ocean along the Santa Maria River should be developed. See the Twitchell Dam write-up (CA_6) for more information on Twitchell Dam water releases and recommended actions. The recovery of the Santa Maria/Sisquoc River steelhead population depends on improved migratory access between the headwater habitat of the Sisquoc River and the ocean.

6.2 Nipomo, Suey, Foxen, and Cat Creek Migration Barrier and Habitat Study

These tributary streams to the Santa Maria River and lower Sisquoc River were not surveyed for migration barriers because they were outside the scope of this project. A steelhead migration barrier and habitat study should be conducted on the Santa Maria River tributaries, Nipomo Creek and Suey Creek. Historic salmonid presence is documented in Suey Creek (see Salmonid Documentation Table) and both streams may currently contain adequate salmonid habitat and/or potential for habitat restoration efforts. In his *Preliminary Report on the Fisheries of the Santa Maria River System, Santa Barbara, San Luis Obispo, Ventura Counties, California*, Shapovalov identifies 9 miles of stream for each of the Nipomo and Suey Creek drainages and 7

miles for Foxen Canyon Creek. On the lower Sisquoc River, Foxen and Cat Creeks were not included in the scope of this project due to time limitations. A course assessment of habitat conditions and identification of migration barriers is recommended for Foxen Creek and possibly Cat Creek.

6.3 Lower La Brea Creek Migration Barrier Study

Permission was not obtained to conduct ground surveying on the Sisquoc Ranch or private property along lower La Brea Creek and the downstream ends of the North and South Forks of La Brea. Aerial Surveying of the private stream reaches of the lower Sisquoc River provided adequate identification of barriers due to the relative lack of riparian vegetation and good visibility of the entire streambed. Migration barriers may have been missed because thick riparian vegetation limited aerial observations of the private stream reaches on La Brea Creek. While no migration barriers were observed on La Brea Creek from the air, a more detailed ground survey of privately owned stream reaches on La Brea Creek is recommended in order to ensure that steelhead access is not being restricted to this important tributary. The many natural bottom in-stream road crossings on La Brea Creek do not appear to seriously impede upstream fish passage, but should also be assessed from the ground. Ensuring adequate fish passage to the La Brea Creek headwaters should be a high priority for steelhead recovery efforts on the Sisquoc River due to it's large size, perennial headwater habitat, and documentation of steelhead and rainbow trout use.

6.4 Exotic Fish Management/Eradication Plan

At least one introduced fish species, the Black Bullhead (*Ameiurus melas*), was observed in the Sisquoc River and others may occur. Historic stocking records exist for the planting of bass and perch species within Santa Maria River tributaries, including the Sisquoc River and Manzana Creek (Donna Toth files, LPNF). Black Bullhead were observed on the Sisquoc River from Wellman Creek upstream to Sycamore Campsite during December 2002. Red-eye bass, *Micropterus coosae*, were reportedly introduced in the 1950s or 60s and could be adversely affecting salmonids by preying on the young ones. Swift reported that bass have not been observed for a long time in the Sisquoc River and they may not have survived (pers. comm. Swift). These exotic species compete with, and prey upon, salmonids and a plan to eradicate them and prevent further planting of any fish, including rainbow trout, should be formulated. Reservoir and stocking ponds within the watershed may be harboring these species.

6.5 Changes to the CDFG Fishing Regulations

Current CDFG Fishing Regulations allow a 5 fish (including all trout) per day per person take for the "Sisquoc River and all tributaries". This regulation must be an oversight. Adult steelhead still migrate into the upper reaches of the Sisquoc River when stream flows and water releases reach the ocean. The native southern California steelhead genotype is still present within the system. This river and its tributaries provide habitat for an existing anadromous steelhead and rainbow trout population and are part of the designated Southern California ESU "Critical Habitat". Several of the smaller tributaries to the Sisquoc River and Manzana Creek were observed to have less than 5 trout in their short reach that could be fished out in one day by one person. While changes in the regulations need to occur quickly, it is recommended that catch and release trout fishing, and potentially even limited catch and release steelhead fishing be allowed to occur in a manner that preserves the fishery while promoting community involvement in the watershed and recreational use. A limited take fishery for rainbow trout under a given length may

even be appropriate for short stream reaches on the Sisquoc and Manzana. Suggested changes to the regulations include:

1) Closing all fishing on tributaries to Manzana Creek and to all tributaries to the Sisquoc River.
2) Trout Fishing: Catch and release, barbless, single artificial hook, bait-ban, fishing allowed on the Sisquoc River and Manzana Creek, during regular trout season only.
3) Steelhead Fishing (if allowable): Catch and release, barbless, single artificial hook, bait-ban, fishing allowed on the Sisquoc River downstream from approximately the Foresters Leap area from approximately December to the end of February. The Santa Maria River estuary should remain closed to fishing until the steelhead population recovers significantly.

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Appendix A

The following Southern Steelhead Ecology and Life History section has been modified from Stoecker 2002.

Southern Steelhead Ecology and Life History

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 resident 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, blocked, 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 ascended streams from northwestern Mexico up to the Kuskokwim River, Alaska and across the Bering Sea to the Kamchatka Peninsula and Okhostk Sea drainage's of the Western Pacific (Barnhart, 1986). The current southern limit of steelhead and coastal rainbow trout distribution occurs somewhere in northern Mexico. Populations of southern steelhead existed in almost all of the significant watersheds within Santa Barbara and Ventura Counties, 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 minimal amount of technical data, it has been widely observed that southern steelhead do indeed 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 well described by McEwan (2001) and should be references for additional information about the polymorphic life history behavior of rainbow trout/steelhead. This perspective is critical for resource managers to understand for successful long-term recovery planning. Noting the flexibility of the steelhead to environmental conditions Shapovalov and Taft (1954) stated 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. 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.

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 the 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 their dark oval parr marks along there 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 off the coast of Japan. Steelhead are also know to have short oceanic or only 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). Documentation collected and reported in this study 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 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 streams 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 recolinize watersheds where steelhead 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 higher 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 the 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. To minimize energy outputs steelhead follow the path of least resistance upstream. 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 bright pink 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.