RUSSIAN RIVER STREAM CROSSING INVENTORY AND FISH PASSAGE EVALUATION

FINAL REPORT

By

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INTRODUCTION

The inventory and fish passage evaluation of stream crossings within the Russian River watershed was conducted between May, 2001 and March, 2003 under contract with CDFG. The primary objective was to assess passage of juvenile and adult salmonids and develop a project-scheduling document to prioritize corrective treatments to provide unimpeded fish passage at road/stream intersections. The inventory was focused primarily on Sonoma County and Mendocino County-maintained crossings within anadromous stream reaches within the Russian River basin known to historically and/or currently support runs of coho salmon (*Oncorhynchus kisutch*), chinook salmon (*O. tshawytscha*) and/or steelhead (*O. mykiss irideus*). However, a number of crossings within city limits and on private property were included.

The inventory and assessment process included:

1. Locating stream crossings within anadromous stream reaches.
2. Visiting each crossing on an initial site visit to determine the type of crossing and assessment of stream channel as suitable fish habitat.
3. At County-maintained sites with culverts - collecting information regarding culvert specifications and surveying a longitudinal profile.
4. Assessing fish passage using culvert specifications and passage criteria for juvenile and adult salmonids (from scientific literature) by employing a first-phase evaluation filter and then using FishXing computer software on a subset of sites defined as partial/temporal barriers by the filter.
5. Assessing quality and quantity of stream habitat above and below each culvert.

The prioritization process ranked stream crossing sites with culverts by assigning numerical scores for the following criteria:

1. Presumed species diversity within stream reach of interest (and federal listing status).
2. Extent of barrier for each species and lifestage for range of estimated migration flows.
3. Quality and quantity of potential upstream habitat gains.
4. Sizing of current stream crossing (risk of fill failure).
5. Condition of current crossing (life expectancy).

The initial ranking was not intended to provide an exact order of priority, rather produce a first-cut rank in which sites could be grouped as high, medium, or low priority. Professional judgment was a vital component of the ranking process. Site-specific information that was difficult to assign a discrete numerical value was also considered.

Examples included:

1. Streams that currently support runs of coho salmon and steelhead. Treating barriers in these watersheds should result in a high probability of immediate utilization of re-opened habitat.

2. Physical stress or danger to migrating salmonids. Recent studies have revealed several sites where concentrations of migrating salmonids were subjected to decades of predation by birds and mammals or poaching by humans (Taylor 2000 and 2001). Inability to enter cool-water tributaries to escape stressful/lethal mainstem water temperatures during summer months has also been observed. These factors should weigh heavily in priority ranking.

3. Presence (and location) of other stream crossings and other types of migration barriers (such as splashboard diversion dams). In many cases, a single stream was crossed by multiple roads under a variety of management or ownership. In these situations, close communication with other road managers and property owners was important. When multiple stream crossings were identified as migration barriers, a coordinated effort will be required to identify and treat them in a logical manner – generally in an upstream direction starting with the lowermost crossing.

4. Remediation project cost. One should examine the range of treatment options and associated costs when determining the order in which to proceed and what should be implemented at specific sites. In cases where federally listed fish species are present, costs must also be weighed against the consequences of failing to comply with the Endangered Species Act by not providing unimpeded passage.

5. Scheduling of other road maintenance and repair projects. Road managers should consider upgrading all migration barriers during other activities they may perform to the roadway, such as repaving, chip-sealing, or widening. When undersized or older crossings fail during storms, road managers should be prepared to install properly-sized crossings that provide unimpeded passage for all species and life-stages of native fishes.

6. Other factors impacting coho salmon and steelhead. In many cases, other limiting factors besides migration barriers exist that impair salmonid productivity. On a watershed or sub-basin level, restoration decisions must be made after carefully reviewing potential limiting factors, the source of the impacts, and the range of restoration options available, and what restoration activities are actually feasible.

Additional physical, operational, social, and/or economic factors exist that may influence the final order of sites; but these are beyond the scope of this project.

Final Product of Culvert Inventory

Four (4) hard copies and CD's were distributed to the following agencies and groups:

1. Mendocino County Department of Transportation.
2. Sonoma County Department of Transportation..
3. FishNet 4C.
4. CDFG – CCR.

Wider distribution of the report will be made available by CDFG in a PDF (read-only) format.

Final report includes:

1. A count and location of all stream crossings inspected. Locations of crossings with culverts were identified by stream name; road name; road number; road ownership, watershed name; mile marker or distance to nearest named crossroad; Mendocino or Sonoma County road map #; USGS Quad name; Township, Range and Section coordinates; and lat/long coordinates (NAD27 datum). All location data were entered into a spreadsheet for potential database uses.

2. For each site with culverts, the following specifications were collected, including: length, dimensions (diameter, rise-and-span, or height-and-width), type, position relative to flow and stream gradient, amount of fill material, depth of jump pool below culvert, height of leap required to enter culvert, previous modifications (if any) to improve fish passage, and evaluate effectiveness of previous modifications. All site-specific data were entered into a spreadsheet for potential database uses.

3. Information regarding culvert age, wear, and performance was collected, including: overall condition of the pipe and rust line height. Presence or absence and condition of trash racks was also assessed. All culvert specifications were entered into a spreadsheet for potential database uses.

4. An evaluation of fish passage at each culvert location. Fish passage was evaluated by two methods. Initially, fish passage was assessed by employing a first-phase evaluation filter that was developed for Part 10 of the California Department of Fish and Game's (CDFG) *Salmonid Stream Habitat Restoration Manual* (Taylor and Love, 2002). The filter quickly determines if a culvert either meets fish passage criteria for all species and life stages as defined by CDFG and NMFS for the range of migration flows (**GREEN**); fails to meet passage criteria for all species and life stages (**RED**); or is a partial/temporal barrier (**GRAY**). Then FishXing (a computer software program) was used to conduct in-depth passage evaluations on the **GRAY** sites by modeling culvert hydraulics over the range of migration flows and comparing these values with leaping and swimming abilities of the species and life stages of interest.

5. Digital photo documentation of each culvert to provide visual information regarding inlet and outlet configurations; as well as insertion into future reports, proposals, or presentations

6. An evaluation of quantity and quality of fish habitat above and below each culvert location. Most information was obtained from habitat typing surveys recently conducted in numerous tributaries of the Russian River by CDFG personnel. Where feasible, a first-hand inspection and evaluation of stream habitat occurred. Length of potential anadromous habitat was also estimated from USGS topographic maps. In situations where formal habitat typing surveys were not conducted and/or access to stream reaches was not permitted, professional judgment of biologists familiar with watershed conditions was utilized.

7. A ranked list of stream crossings that require treatment to provide unimpeded fish passage to spawning and rearing habitat. On a site-by-site basis, general recommendations for providing unimpeded fish passage were provided.

Project Justification

Migration Barrier Impacts to Salmonids

Fish passage through culverts at stream crossings is an important factor in the recovery of depleted salmonid populations throughout the Pacific Northwest. Although most fish-bearing streams with culverts tend to be relatively small in size with only a couple of miles or less of upstream habitat, thousands of these exist and the cumulative effect of blocked habitat is probably quite significant. Recent research regarding watershed restoration considers the identification, prioritization, and treatment of migration barriers to restore ecological connectivity for salmonids a vital step towards recovering depressed populations (Roni et al. 2002). Culverts often create temporal, partial or complete barriers for anadromous salmonids on their spawning migrations (Table 1) (adapted from Robison et al. 2000).

Typical passage problems created by culverts are:

- Excessive drop at outlet (too high of entry leap required);
- Excessive velocities within culvert;
- Lack of depth within culvert;
- Excessive velocity and/or turbulence at culvert inlet; and
- Debris accumulation at culvert inlet and/or within culvert.

Table 1. Definitions of barrier types and their potential impacts.

Barrier Category	Definition	Potential Impacts
Temporal	Impassable to all fish some of the time	Delay in movement beyond the barrier for some period of time
Partial	Impassable to some fish at all times	Exclusion of certain species and life stages from portions of a watershed
Total	Impassable to all fish at all times	Exclusion of all species from portions of a watershed

Even if culverts are eventually negotiated, excess energy expended by fish may result in their death prior to spawning or reductions in viability of eggs and offspring. Migrating fish concentrated in pools and stream reaches below road crossings are also more vulnerable to predation by a variety of avian and mammalian species, as well as poaching by humans. Culverts which impede adult passage limit the distribution of spawning, often resulting in under seeded headwaters and superimposition of redds in lower stream reaches.

Current guidelines for new culvert installation aim to provide unimpeded passage for both adult and juvenile salmonids (CDFG 2002, NMFS 2001). However many existing culverts on federal, state, county, city, and private roads are barriers to anadromous adults, and more so to resident and juvenile salmonids whose smaller sizes significantly limit their leaping and swimming abilities to negotiate culverts. For decades, "legacy" culverts on established roads have effectively disrupted the spawning and rearing behavior of all four species of anadromous salmonids in California: Chinook salmon, coho salmon, coastal rainbow trout (steelhead are anadromous coastal rainbow trout), and coastal cutthroat trout (*Oncorhynchus clarki clarki*).

In recent years, there has been a growing awareness of the disruption of in-stream migrations of resident and juvenile salmonids caused at road/stream intersections. In-stream movements of juvenile and resident salmonids are highly variable and still poorly understood by biologists. Juvenile coho salmon spend approximately one year in freshwater before migrating to the ocean, and juvenile steelhead may rear in freshwater for up to four years prior to out-migration (one to two years is most common in California). Thus, juveniles of both species are highly dependent on stream habitat.

Many studies indicate that a common strategy for over-wintering juvenile coho is to migrate out of larger river systems into smaller streams during late-fall and early-winter storms to seek refuge from possibly higher flows and potentially higher turbidity levels in mainstem channels (Skeesick 1970; Cederholm and Scarlett 1981; Tripp and McCart 1983; Tschaplinski and Hartman 1983; Scarlett and Cederholm 1984; Sandercock 1991; Nickelson et al. 1992). Recent research conducted in coastal, northern California watersheds suggests that juvenile salmonids migrate into smaller tributaries in the fall and winter to feed on eggs deposited by spawning adults as well as flesh of spawned-out adults (Roelofs, pers. comm). Direct observation at numerous culverts in northern California confirmed similar upstream movements of three year-classes of juvenile steelhead (young-of-year, 1-year old and 2-year old) (Taylor 2001; Taylor 2000). For example, in 1996-2000 at the Sullivan Gulch/Riverside Drive culvert (Humboldt County) observations of failed leap attempts by juvenile salmonids often exceeded 100 attempts per hour. In 1998 and 1999, 47 juvenile salmonids were netted while attempting leaps for the purpose of species identification. Of the 47 fish sampled, 43 (or 91%) were steelhead that comprised at least two age classes (young-of-year and 1+ year-olds) (Taylor, unpublished field notes).

The variable life history of resident coastal rainbow trout is exhibited by seasonal movements in and out of one or more tributaries within a watershed. These smaller tributaries are where most culverts are still located since larger channels tend to be spanned by bridges.

County Planning Efforts to Address Migration Barriers

In response to the 1994 petition to list coho salmon as threatened in northern California under the federal Endangered Species Act, five counties (Humboldt, Del Norte, Trinity, Siskiyou, and Mendocino) formed the Five-Counties Salmon Group to examine various land-use activities conducted or permitted under county jurisdiction that may impact coho salmon habitat. Initial meetings identified causative factors of potential impacts, information gaps, and priority tasks

required to obtain missing information. A high-priority task included conducting culvert inventories on county roads to evaluate fish passage and prioritize treatments.

In 1996, seven counties (Mendocino, Sonoma, Marin, Napa, San Mateo, Alameda, and Santa Cruz) formed the FishNet 4C Group to address many of the same issues that lead to the development of the Five-Counties Group. Initial meetings identified causative factors of potential impacts, information gaps, and priority tasks required to obtain missing information. As within the Five-Counties region, a high-priority task included conducting stream crossing inventories on county-maintained roads to evaluate fish passage and prioritize treatments. Please note that Mendocino County is a participant in both the Five-Counties Group and the FishNet4C because of county boundaries within the Russian River watershed.

Anadromous salmonids will benefit from this planning effort because the final document provides Sonoma and Mendocino Counties' Transportation Departments and Water Agencies with a prioritized list of stream crossings locations to fix that will provide unimpeded passage for all species (and life stages) of salmonids. Report information will assist in proposal development to seek State and Federal money to implement treatments. The inventory will also provide the Counties with a comprehensive status evaluation of the overall condition and sizing of culverts at stream crossings within fish-bearing stream reaches, providing vital information to assist the Counties' general planning and road's maintenance needs.

METHODS AND MATERIALS

Methods for conducting the stream crossing inventory and fish passage evaluation included seven tasks; accomplished generally in the following order:

1. Location of stream crossings.
2. Initial site visits and data collection.
3. Estimation of tributary-specific hydrology and design flows for presumed migration period.
4. Data entry and passage analyses. Passage was first evaluated with a first-phase evaluation filter referred to as the "Green-Gray-Red" filter. Sites determined to be "Gray" then required an in-depth evaluation with FishXing – a computer modeling software.
5. Collection and interpretation of existing habitat information.
6. Prioritization of sites for corrective treatment.
7. Site-specific recommendations for unimpeded passage of both juvenile and adult salmonids.

These methods were fairly consistent with the protocol recently developed for the CDFG *California Salmonid Stream Habitat Restoration Manual* (Taylor and Love, 2002). These methods were developed to be consistent with current state and federal fish passage criteria for anadromous salmonids (CDFG 2002, NMFS 2001).

Several modifications to the original CDFG protocol were made during the Russian River fish passage assessment project, and these included:

- Use of more rigorous criteria (minimum water depths and swimming abilities) for assessing passage of adult salmonids (see page 19).
- Use of habitat typing data to better assess the relative quality of salmonid habitat (see page 26).
- A reduction of the weight of culvert sizing and condition in the ranking score (see page 27).

These modifications to the original CDFG protocol were initiated in response to results generated by the original methods in Five-Counties' assessments. All protocol changes were discussed with CDFG and NMFS personnel prior to their use in the Russian River assessment project. In-depth explanations to the rationale of modifying the methodology are provided at the appropriate places within the Methods and Materials section of this final report.

Location of Stream Crossings

Preliminary project scoping for stream crossings to survey included examination of Mendocino and Sonoma County road system maps and counting road/stream intersections on known (current and historic) anadromous stream reaches. The CDFG Russian River basin planning office in Healdsburg, CA provided data summaries of recently completed habitat typing surveys in which many stream crossings were identified, as well as information regarding the historic and current distribution of coho salmon, chinook salmon, and steelhead within Russian River tributaries.

Approximately 500 county-maintained stream crossings were initially identified within anadromous stream reaches; however it was not clearly known how many of these were bridges

that currently provided unimpeded access. Because the use of maps was considered a rough, first-cut at locating potential stream crossings, additional sites were also investigated once the project started.

Initial Site Visits

The objective of the initial site visits was to collect physical measurements at stream crossings with culverts to utilize with the first-phase evaluation filter and with FishXing passage evaluation software. Notes describing the type and condition of each culvert, as well as qualitative comments describing stream habitat immediately above and below each culvert were also included. Photographs, facing both upstream and downstream (outlet and inlet views at culverts), were taken at each site.

Stream Crossing Type

Potential sites were visited in the field and all crossings were first identified as either: culverts, bridges, or fords. The field measurements were only collected on culverts; however this included some crossings identified on County road maps as bridges because of the length of their span. For example, any structure with a combined span greater than 20 feet was defined by road managers as a bridge – yet from a fish passage perspective if these structures have a smooth concrete floor they were considered concrete box culverts.

Culvert Location

The location of each stream crossing with a culvert was described by: Mendocino or Sonoma County road system map number; road name and number; stream name; watershed name; name of USGS quad map; Township, Range, and Section; latitude and longitude; and mile marker or distance to nearest named cross-road. If more than one road crossed single stream, a number was assigned to the stream name with the #1 crossing located farthest downstream (numbering then proceeded in an upstream direction). Lat/long coordinates were determined using Terrain Navigator (Version 3.01 by MapTech), a geo-referenced mapping software program; or in the field with a handheld GPS unit. For data entry and analyses purposes, all lat/long coordinates were provided in the North American 1927 datum (NAD27).

Longitudinal Survey

A longitudinal survey was shot at each stream crossing with a culvert to provide accurate elevation data for FishXing passage analyses. We utilized an auto-level (Topcon AT-G7) with an accuracy of ± 2.5 mm, a domed-head surveyor's tripod, and a 25' leveling rod in 1/100' increments. All data and information were written on water-proof data sheets with a pencil. Data sheets were photocopied to provide back-ups in case of loss or destruction of originals.

Once a site was located in the field by the two-person survey crew, bright orange safety cones with signs marked "Survey Party" were placed to warn oncoming traffic from both directions. Bright orange vests were also worn by the survey crew to increase one's visibility to traffic. If

sites were close to private residences, or the property was posted - we attempted to contact the property owners to inform them of our survey of the county-maintained stream crossing.

To start the survey, a 300-foot tape (in 1/10' increments) was placed down the approximate center of the stream channel. The tape was started on the upstream side of the culvert, usually in the riffle crest of the first pool or run habitat unit above the culvert. This pool or run was considered the first available resting habitat for fish negotiating the culvert. The tape was set to follow any major changes in channel direction. The tape was set through the culvert and continued downstream to at least the riffle crest (or control) of the pool immediately downstream of the culvert outlet. If several "stair-stepped" pools led up to the culvert outlet, then the tape was set to the riffle crest of the lower-most pool. Extreme caution was used when wading through culverts. A hardhat and flashlight were standard items used during the surveys.

The tripod and mounted auto-level were set in a location to eliminate or minimize the number of turning points required to complete the survey. If possible, a location on the road surface was optimal, allowing a complete survey to be shot from one location. The leveling rod was placed at the thalweg (deepest point of channel cross-section at any given point along the center tape) at various stations along the center tape, generally capturing visually noticeable breaks in slope along the stream channel.

At all sites, a temporary benchmark (TBM) was established in order to allow interested parties to easily re-survey the site to either check the accuracy of our surveys or to conduct a survey prior to implementing a treatment. TBM's were typically established by spray-painting an "X" on a relatively permanent feature such as a concrete wing-wall or head-wall. The locations of all TBM's were clearly marked on the site sketches.

At some sites, a cross-section of the channel was surveyed at the outlet pool's tail-water control. Each cross-section was comprised of approximately eight elevations from the left bank-full channel margin to the right bank-full margin. These cross-sections allowed for a more accurate modeling of changes in tail-water elevations over varying discharges with the FishXing software.

At all sites, five required elevations were measured (Figures 1 and 2):

1. culvert inlet,
2. culvert outlet,
3. maximum pool depth within five feet of the outlet,
4. outlet pool control, and
5. active channel margin between the culvert outlet and the outlet pool control. An active channel discharge is less than a bank-full discharge and is often identified by several features, including (Figure 2):

    - Edge of frequently scoured substrate.
    - Break in rooted vegetation or moss growth on rocks along stream margins.
    - Natural line impressed on the bank.
    - Shelving.
    - Changes in soil character.

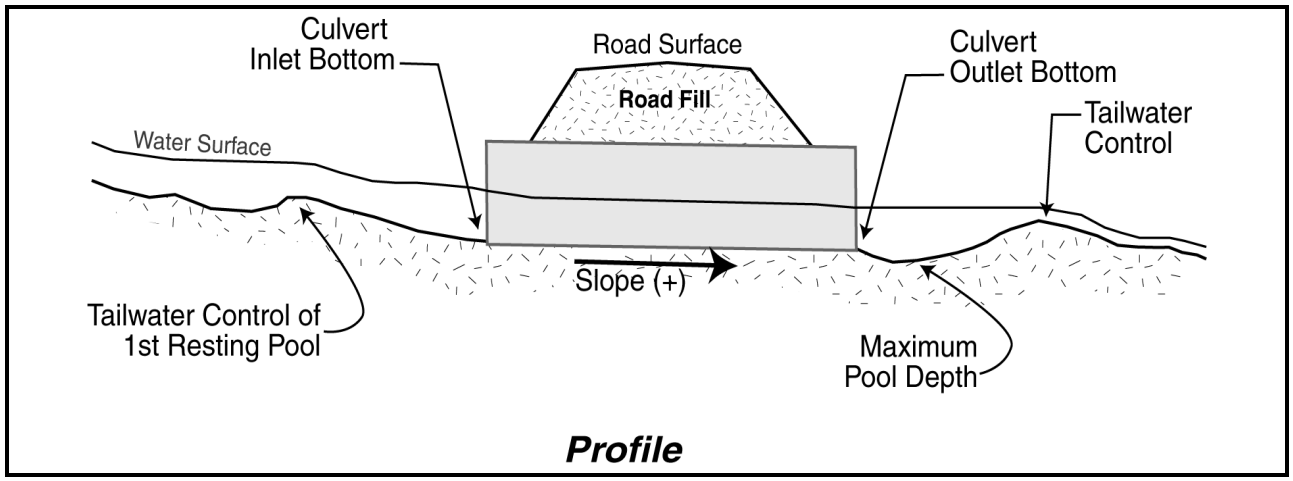


Figure 1. Diagram of required survey points though a culvert at a typical stream crossing.

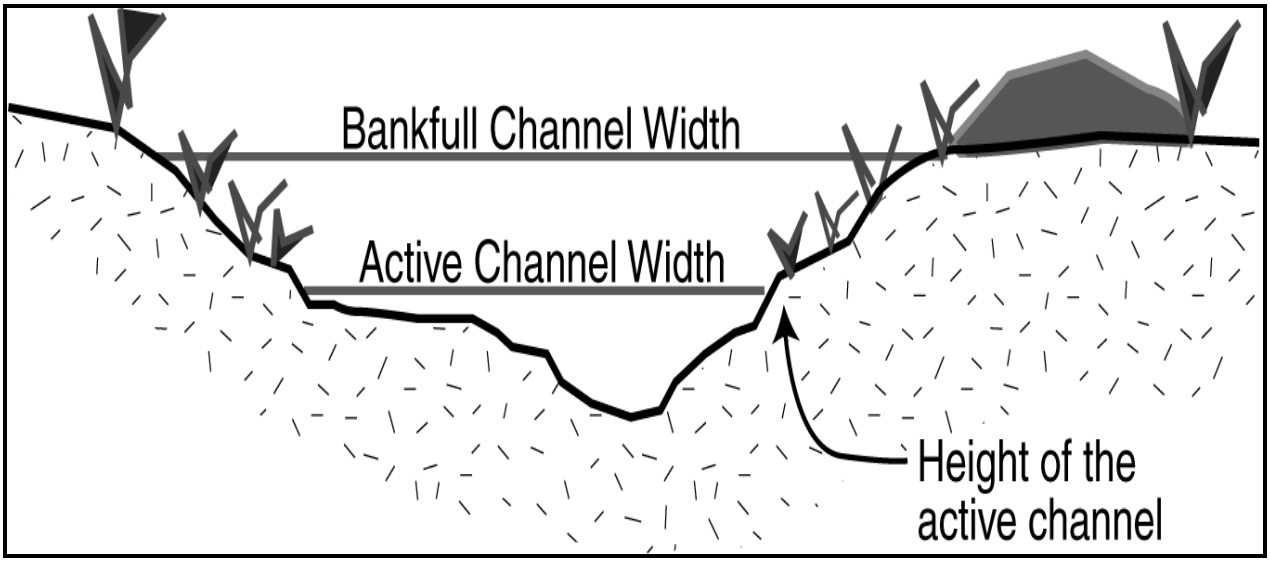


Figure 2. Active channel width versus bankfull channel width.

On a site-specific basis, the following additional survey points provided useful information for evaluating fish passage with FishXing:

- Apparent breaks-in-slope within the crossing. Older culverts often sag when road fills slump, creating steeper sections within a culvert. If only inlet and outlet elevations are measured, the overall slope will predict average velocities less than actual velocities within steeper sections. These breaks-in-slope may act as velocity barriers, which may be masked if only the overall slope of the culvert is measured. The tripod and auto-level were set within the culvert or channel to measure breaks-in-slope.

- Steep drops in the stream channel profile immediately upstream of the culvert inlet. We measured the elevation at the tail-out of the first upstream holding water (where the tape was set) to estimate the channel slope leading into the culvert inlet. In some cases, a fish may negotiate the culvert only to fail at passing through a velocity chute upstream of the inlet entrance. Inlet drops often create highly turbulent conditions during elevated flows.

- Concrete aprons located at culvert inlets and outlets. These surfaces extend past the confinement of the culvert and were typically installed to protect the culvert from scour and erosion. However, aprons are often wide, smooth surfaces (often steeply-sloped) that impede passage from a lack-of-depth and excessive water velocities.

All elevations were measured to the nearest 1/100' and entered with a corresponding station location (distance along center tape) to the nearest 1/10'.

Channel widths

Where feasible, at least five measurements of the active channel width above the culvert (visually beyond any influence the crossing may have on channel width) were taken. Active channel is defined as the portion of channel commonly wetted during and above winter base flows and is identified by a break in rooted vegetation or moss growth on rocks along stream margins. Some culvert design guidelines utilize active channel widths in determining the appropriate widths of new culvert installations (CDFG 2002; NMFS 2001; Robison et al 2000; Bates et al. 1999).

Fill Estimate:

At each culvert, the volume of road fill placed above the stream channel was estimated from field measurements. Fill volume estimates were incorporated into the ranking of sites for treatment and can assist in:

1. Calculating culvert flood capacity at HW/Fill =1 (water surface at top of fill prism).
2. Determining potential volume of sediment delivered to downstream habitat if the stream crossing fails.
3. Developing rough cost estimates for barrier removal by estimating equipment time required for fill removal and disposal site space needed.

Road fill volume was estimated using procedures outlined in Flannigan et al. (1998). The following measurements were taken to calculate the fill volume (Figure 3):

1. Upstream and downstream fill slope lengths (L_d and L_u).
2. Slope (%) of upstream and downstream fill slopes (S_d and S_u).
3. Width of road prism (W_r).
4. Top fill width (W_f).
5. Base fill width (W_c).
6. Culvert Dimensions.

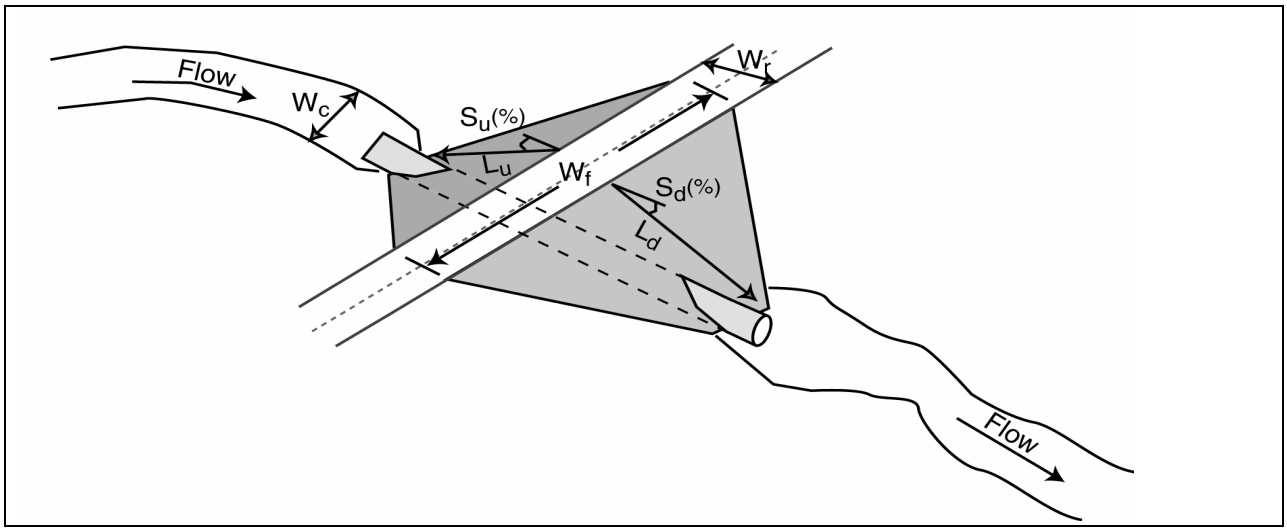


Figure 3. Road fill measurements.

Equations (1) through (4) were used calculate the fill volume.

(1) Upstream prism volume, V_u:

$$V_u = 0.25(W_f + W_c)(L_u \cos S_u)(L_u \sin S_u)$$

(2) Downstream prism volume, V_d:

$$V_d = 0.25(W_f + W_c)(L_d \cos S_d)(L_d \sin S_d)$$

(3) Volume below road surface, V_r:

$$V_r = 0.25(H_u + H_d)(W_f + W_c)\, W_r$$

where: $H_u = L_u \sin S_u$, and

$H_d = L_d \sin S_d$

(4) Culvert Volume, *Vc*:

Formulas for *Vc* vary depending on culvert shape/type

Total fill volume, *V*:

$$V = V_u + V_d + V_r - Vc$$

NOTE: The fill measurements used as part of this inventory protocol were meant to generate rough volumes for comparison between sites while minimizing the amount of time required collecting the information. These volume estimates can contain significant error and should not be used for designing replacement structures.

Other Site-specific Measurements

For each stream crossing with a culvert, the following specifications were collected:

1. Length (to nearest 1/10 of foot);
2. Dimensions: diameter (circular), or height and width (box culverts), or span and rise (pipe arches);
3. Type: corrugated metal pipe (CSP), structural steel plate (SSP), concrete pipe, concrete box, bottomless pipe arch, squashed pipe-arch, or a composite of materials;
4. Overall condition of pipe (good, fair, poor, extremely poor);
5. Height and width of rustline (if present);
6. Position relative to flow and stream gradient;
7. Depth of jump pool below culvert;
8. Height of jump required to enter culvert;
9. Previous modifications (if any) to improve fish passage; and
10. Condition of previous modifications.

Qualitative notes describing stream habitat immediately upstream and downstream of each culvert were taken. Where feasible, variable lengths of the stream channel above and below crossings were walked to detect presence of salmonids and provide additional information regarding habitat conditions.

Data Entry and Passage Analyses

All survey and site visit data were recorded on waterproof data sheets. Then data for each culvert were entered into a spreadsheet (Excel 97). A macro was created to calculate thalweg elevations of longitudinal profiles and compute culvert slopes.

First-phase Passage Evaluation Filter: GREEN-GRAY-RED

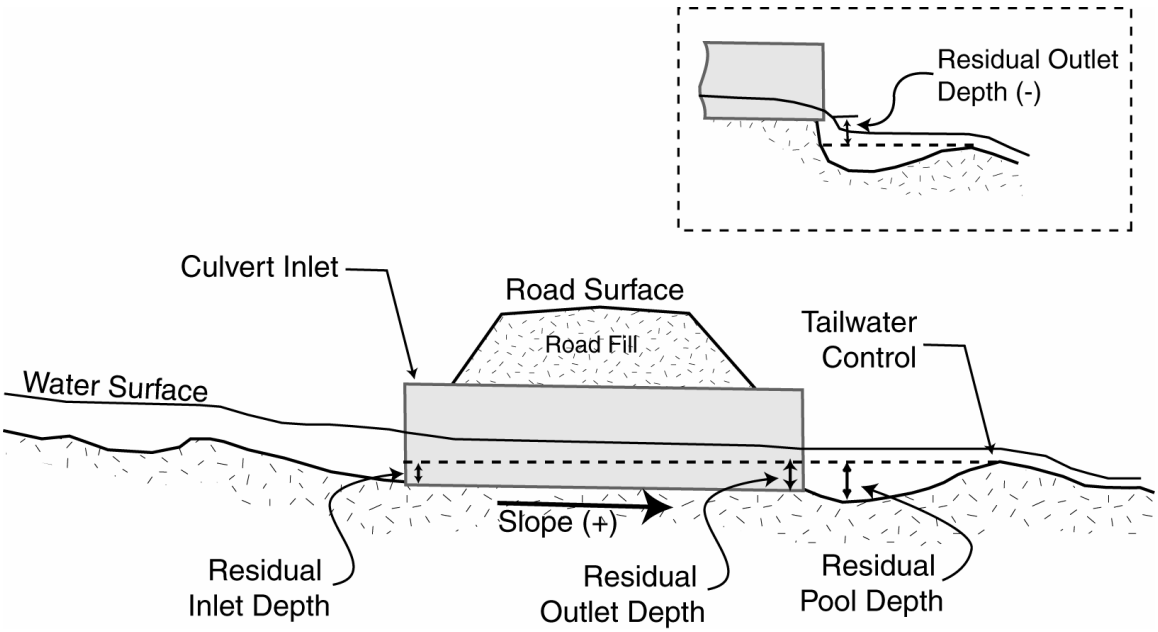
A filtering process was used to assist in identifying sites which either meet, or fail to meet, state and federal fish passage criteria for all fish species and lifestages (CDFG 2002; NMFS 2001). Using the field inventory data, the following parameters were calculated: average active channel width, culvert slope, residual inlet depth and drop at outlet (Figure 4). The first-phase passage evaluation filter was employed to reduce the number of crossings which require an in-depth passage evaluation with FishXing. The filter criteria were designed to quickly classify crossings into one of three categories:

- **GREEN**: Conditions assumed adequate for passage of all salmonids, including the weakest swimming life-stage.

- **GRAY**: Conditions may not be adequate for all salmonid species or lifestages presumed present. Additional analyses required to determine extent of barrier for each species and lifestage.

- **RED**: Conditions do not meet passage criteria at all flows for strongest swimming species presumed present. Assume "no passage" and move to analysis of habitat quantity and quality upstream of the barrier.

Follow the flowchart to determine a stream crossing's status as Green, Gray, or Red (Figure 5). Depending on geographic location within California, species of interest will vary. Within anadromous-bearing watersheds, CDFG has determined that culverts classified as "Green" must meet upstream passage criteria for both adult and over-wintering juvenile salmonids at all expected migration flows.



Residual Pool Depth = (Elev $_{\text{Tailwater Control}}$ – Elev $_{\text{Pool Bottom}}$)

Outlet Depth = (Elev $_{\text{Tailwater Control}}$ – Elev $_{\text{Culvert Outlet}}$) *(No outlet drop if Outlet Depth ≥ 0)*

Residual Inlet Depth = (Elev $_{\text{Tailwater Control}}$ – Elev $_{\text{Culvert Inlet}}$)

Figure 4. Measurements used in GREEN-GREY-RED filtering criteria.

Many stream crossings have unique characteristics which may hinder fish passage, yet they are not recognized in the filtering process. For culverts meeting the "Green" criteria, a review of the inventory data and field notes was necessary to ensure no unique passage problems exist before classifying the stream crossings as "100% passable".

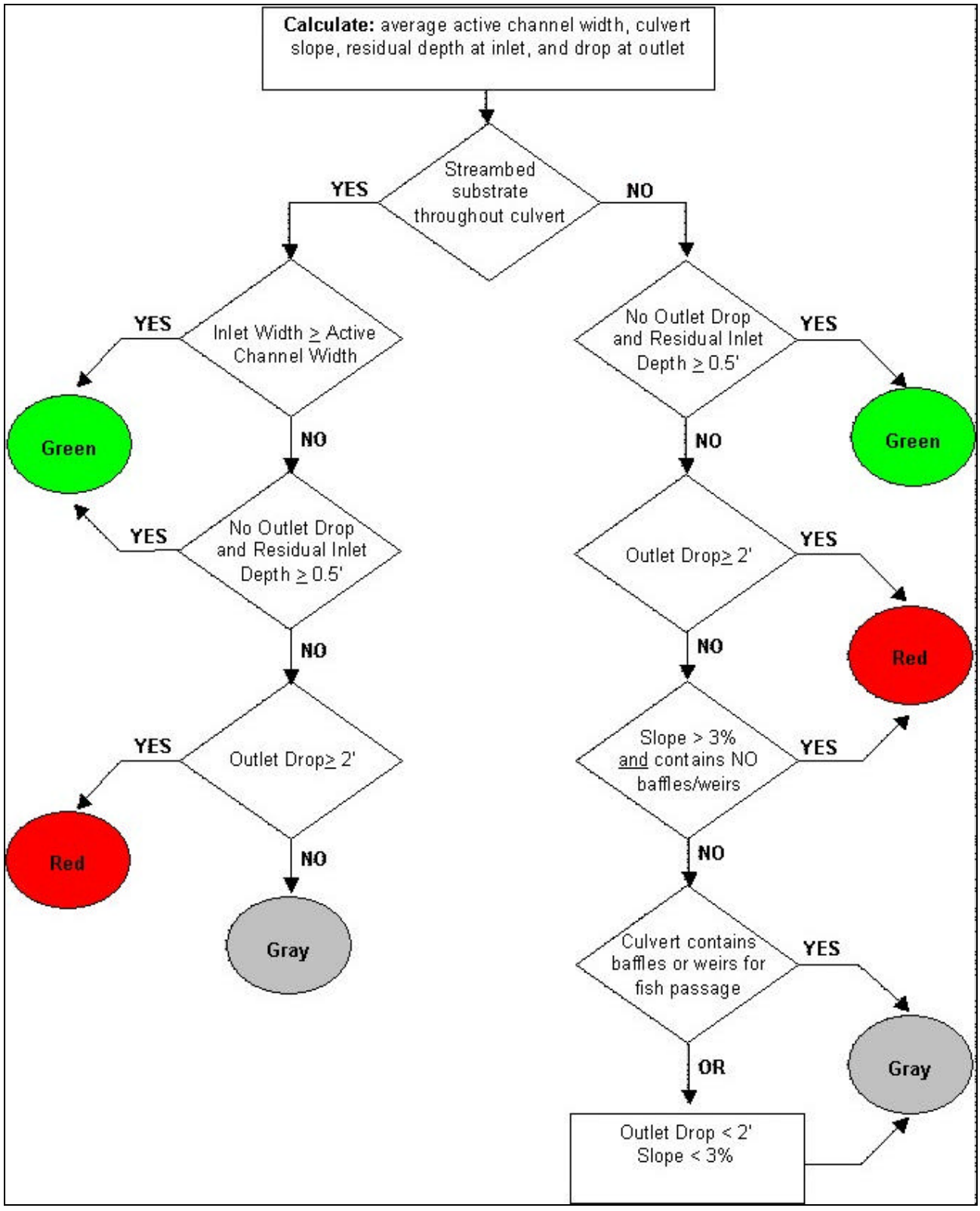


Figure 5. GREEN-GRAY-RED first-phase passage evaluation filter.

NOTE: FishXing Overview, Hydrology and Design Flow, Peak Flow Capacity, and Fish Passage Flows sections were written by Michael Love under a separate contract administered by CDFG (Taylor and Love, 2002).

FishXing Overview

FishXing is a computer software program developed by Six Rivers National Forest's Watershed Interactions Team - a group of scientists with diverse backgrounds in engineering, hydrology, geomorphology, geology and fisheries biology. Mike Furniss, a Forest Service hydrologist for Six Rivers, managed program development. A CD-ROM final version of FishXing was released in March, 2000. In-depth information regarding FishXing (or a copy of the most recent version of the program) may be obtained at the FishXing homepage at (www.stream.fs.fed.us/fishxing).

FishXing is an interactive software package that integrates a culvert design and assessment model for fish passage nested within a multimedia educational setting. Culvert hydraulics are well understood and model output closely resembles reality. FishXing successfully models (predicts) hydraulic conditions throughout the culvert over a wide range of flows for numerous culvert shapes and sizes. The model incorporates fisheries inputs including fish species, life stages, body lengths, and leaping and swimming abilities. FishXing uses the swimming abilities to determine whether the culvert installation (current or proposed) will accommodate fish passage at desired range of migration flows, and identify specific locations within the culvert that impede or prevent passage. Software outputs include water surface profiles and hydraulic variables such as water depths and average velocities displayed in both tabular and graphical formats.

Fish Passage Criteria – First Deviation from CDFG Protocol

FishXing used the survey elevation and culvert specifications to evaluate passage at sites defined as "GRAY" by the first-phase evaluation filter for each species and lifestages of salmonids known to currently or historically reside in the Russian River tributaries of interest. The swimming abilities and passage criteria recommended in the original CDFG fish-passage protocol and the alternate values used in the Russian River project for each species and lifestage are listed Table 2.

The CDFG fish-passage protocol recommended using conservative values for assessment under the assumption that although many individual fish will have swimming abilities surpassing those listed, swim speeds and minimum water depths were selected to ensure stream crossings accommodated passage of weaker individuals within each age class. This assumption is better suited for the *design* of new crossings where being conservative hopefully allows for the passage of all fish. However, for *assessment* purposes, the use of conservative swimming values and minimum water depths generated many "RED" sites that, in fact, were allowing the passage of many adult salmonids. This discrepancy was first noticed during Taylor and Associates' assessment project in Marin County where extensive spawning survey data confirmed adult coho salmon and steelhead consistently spawning upstream of crossings initially assessed as "RED".

If the objective of the passage assessment is to identify crossings that are truly barriers to adult migration, as well as, accurately estimate the percentage of temporal passage to allow a gradation in the scoring matrix; then using conservative values is inappropriate. For example, in Marin County, 90 stream crossings were initially assessed with the conservative criteria and 62 sites (or 69%) were identified as "RED" and received a maximum "extent of barrier" score of 15 points in the ranking matrix. When the more rigorous criteria were utilized, the number of "RED" sites dropped to 46 (or 51%) and a wider range of "extent of barrier" scores were generated for the "GRAY" sites.

FishXing and other hydraulic models report the average cross-sectional water velocity, not accounting for spatial variations. Stream crossings with natural substrate or corrugations will have regions of reduced velocities that can be utilized by migrating fish. These areas are often too small for larger fish to use, but can enhance juvenile passage success. The software allows the use of reduction factors that decrease the calculated water velocities proportionally. As shown in Table 2, velocity reduction factors were used in the passage analysis of resident fish and juveniles with specific types of stream crossing structures.

Table 2. Fish species and lifestages used in the passage assessment along with associated swimming abilities and passage criteria. Values in parentheses are the conservative values recommended in the CDFG protocol. Passage flows are based on current adult salmonid criteria combined with observational data from northern California coastal streams.

Fish Species/Age Class	Adult Coho Salmon and Steelhead	Resident Trout and 2+ Juvenile Steelhead	Young-of-year and 1+ Juvenile Salmonids
Fish Length	>500mm (~ 20")	200mm (~ 8")	80mm (~ 3")
Prolonged Mode			
Swim Speed	(6 ft/sec) **8 ft/sec**	4 ft/sec	1.5 ft/sec
Time to Exhaustion	30 min	30 min	30 min
Burst Mode			
Swim Speed	(10 ft/sec) **16 ft/sec**	5.0 ft/s	3.0 ft/s
Time to Exhaustion	5 sec	5 sec	5 sec
Maximum Leaping Speed	(12.0 ft/sec) **16 ft/sec**	6 ft/sec	3 ft/sec
Velocity Reduction Factors for Corrugated Metal Culverts **	Inlet = 1.0 Barrel = 1.0 Outlet = 1.0	Inlet = 0.8 Barrel = 0.6 Outlet = 0.8	Inlet = 0.8 Barrel = 0.6 Outlet = 0.8
Minimum Required Water Depth	(1 ft) **0.5 ft**	(0.5 ft) 0.4 ft	0.3 ft
Minimum Passage Flow *(Use the larger of the two flows)*	50% exceedance flow or 3 cfs	90% exceedance flow or 2 cfs	95% exceedance flow or 1 cfs
Maximum Passage Flow	1% exceedance flow	5% exceedance flow	10% exceedance flow

** Velocity reduction factors only apply to culverts with corrugated walls, baffles, or natural substrate. All other culverts had reduction factors of 1.0 for all age classes.

Using the FishXing program, the range of flows that meet the depth, velocity, and leaping criteria for each life-stage were identified. The range of flows meeting the passage requirements were then compared to the lower and upper fish passage flows to determine "percent passable".

Hydrology and Design Flow

When examining stream crossings that require fish passage, three specific flows are considered: peak flow capacity of the stream crossing, the upper fish passage flow, and the lower fish passage flow. Because flow is not gauged on most small streams, it must be estimated using techniques that required hydrologic information about the stream crossing's contributing watershed, including:

- Drainage area;
- Mean annual precipitation;
- Mean annual potential evapotranspiration; and
- Average basin elevation.

Drainage area and basin elevations were calculated from a 1:24,000 USGS topographic map. Mean annual precipitation (MAP) was estimated by using color shaded average annual precipitation PRISM (parameter-elevation regressions on independent slopes model) climate mapping developed by Oregon State Universities Spatial Climate Analysis Service (SCAS). Potential evapotranspiration (PET) was estimated from regional maps produced by Rantz (1968).

Calculation of Peak Flow Capacity

Peak flows are typically defined in terms of a recurrence interval, but reported as a quantity; often as cubic feet per second (c.f.s.). Current guidelines recommend all stream crossings pass the flow associated with the 100-year flood without damage to the stream crossing (NMFS, 2001). Additionally, infrequently maintained crossings with culverts should accommodate the 100-year flood without overtopping the culvert's inlet.

The primary purpose in determining each crossing's flood capacity was to estimate the risk of failure, which in turn, assisted in ranking sites for remediation. Undersized crossings have a higher risk of failure, which often results in the immediate delivery of sediment from the road-fill into the downstream channel. Depending on the amount of road-fill, this pulse of sediment may have a minor-to-catastrophic impact on downstream rearing and spawning habitat. Undersized crossings can also adversely affect sediment transport and downstream channel stability, creating conditions that hinder fish passage, degrade habitat, and may cause damage to other stream crossings, adjacent roadways, and/or private property.

The first step was to estimate hydraulic capacity of each inventoried stream crossing. Capacity is generally a function of the shape and cross-sectional area of the inlet. Capacity was calculated for two different headwater elevations: water ponded to the top of the culvert inlet (HW/D = 1) and water ponded to the top of the road surface (HW/F=1). Nomograph equations developed by Piehl et. al (1988) were used to calculate capacity of circular culverts. Federal Highways nomographs presented in Norman et al. (1995) were used for pipe-arches, open bottom arches, oval pipes and box culverts. Capacities of embedded culverts were determined using two hydraulic computer models, FishXing and HydroCulv.

The second step was to estimate peak flows at each crossing. This required estimating the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year peak flows. Regional flood estimation equations developed by Waananen and Crippen (1977) were used to estimate peak flows for the various recurrence intervals (Figure 6). The equations incorporate drainage area, MAP, and mean basin elevation as variables to predict peak flow in Northwestern California streams.

The third step was to compare the stream crossing capacity to peak flow estimates. Risk of failure was assessed by comparing a stream crossing's hydraulic capacity with the estimated peak flow for each recurrence interval. Each crossing was placed into one of six "sizing" categories:

1. equal to or greater than the 100-year flow,
2. between the 50-year and 100-year flows,
3. between the 25-year and 50-year flows,
4. between the 10-year and 25-year flows,
5. between the 10-year and 5-year flows.
6. less than the 5-year storm flow.

These six categories were utilized in the ranking matrix.

Fish Passage Flows

It is widely agreed that designing stream crossings to pass fish at all flows is impractical (CDFG 2002; NMFS 2000; Robison et al. 2000; SSHEAR 1998). Although anadromous salmonids typically migrate upstream during higher flows triggered by hydrologic events, it is presumed that migration is naturally delayed during larger flood events. Conversely, during low flow periods on many smaller streams, water depths within the channel can become impassable for both adult and juvenile salmonids. To identify the range of flows that stream crossings should accommodate for fish passage, lower and upper flow limits have been defined specifically for streams within California (CDFG 2002; NMFS 2001).

The NMFS guidelines designated the **lower fish passage flow (Q_{lp})** for adult, resident, and juvenile fish as the 95% exceedence flow (the flow equaled or exceeded 95% of the time) during the migration period. The **upper fish passage flow for adult salmonids ($Q_{hp\text{-}adult}$)** was defined as the 1% exceedence flow. The **upper fish passage flow for resident trout/2+ juveniles** was defined as the 5% exceedence flow. The **upper fish passage flow for 1+/young-of-year juveniles** was defined as the 10% exceedence flow.

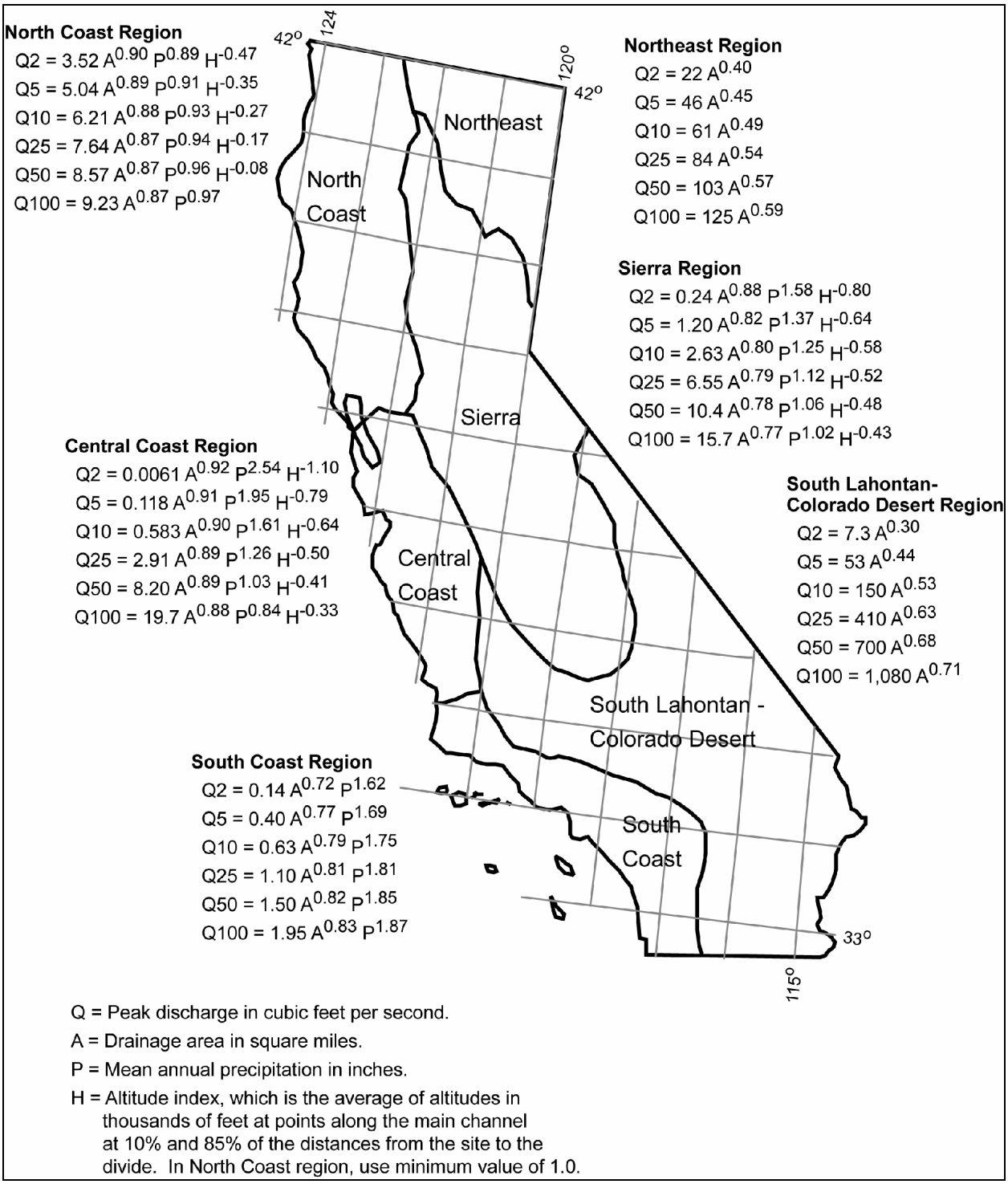


Figure 6. California regional regression equations for estimating peak flows associated with a 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year recurrence interval (Waananen and Crippen, 1977).

To evaluate the extent to which a crossing is a barrier, passage was assessed between the lower and upper passage flows for each fish species and lifestage of concern. Identifying the 1% and 95% exceedence flows required obtaining average daily stream flow data from nearby gauged basins.

The following steps were followed to estimate upper and lower passage flows:

1. Obtained flow records from local stream gauges that met the following requirements:
   - At least five years of recorded daily average flows (do not need to be consecutive years);
   - A drainage area less than 100 square miles, and preferably less than 10 square miles; and,
   - Unregulated flows (no upstream impoundments or water diversions) during the migration season is desired.

2. Divided survey area (the Russian River basin) into distinct hydrologic regions based on topography, elevation, rainfall patterns, geology and access to flow data. (Figure 7).

3. Divided the flows (Q) for each gauged stream by its drainage area (A), resulting in units of cfs/mi^2.

4. Created regional flow duration curve by taking the median of the exceedence flows (Q/A) of the gauged streams (Appendix C).

5. Determined the upper and lower passage flows for each stream crossing using the regional flow duration curve and the drainage area upstream of a given stream crossing.

When analyzing fish passage with FishXing, these flows were used to determine the extent to which the crossing is a barrier. The stream crossing must meet water velocity and depth criteria between Q_{lp} and Q_{hp} to be considered 100% passable (NMFS 2001). For the ranking matrix, at each road crossing, the extent of the migration barrier was determined for each salmonid species and lifestage presumed present.

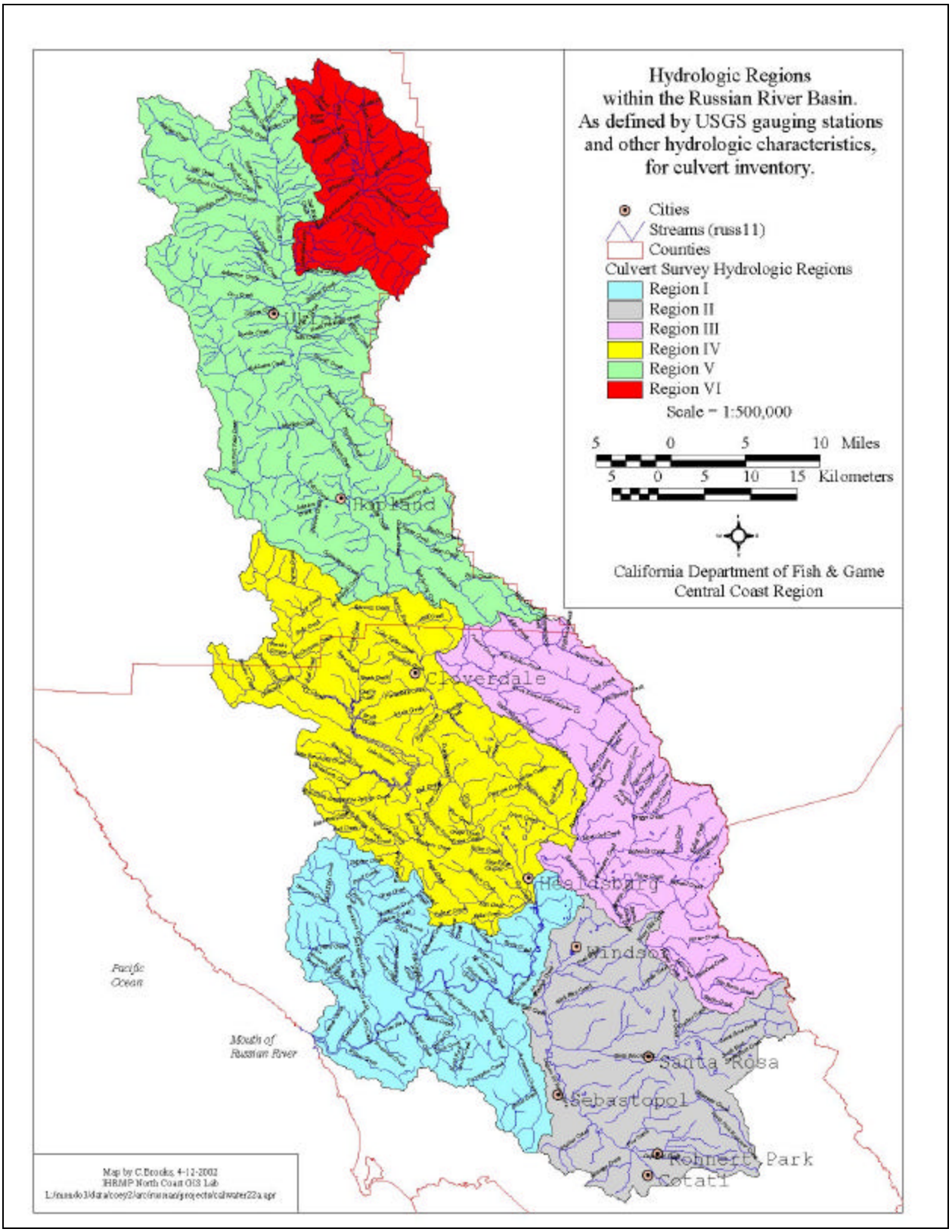


Figure 7. Hydrologic regions within the Russian River basin developed for estimating exceedence flows for fish passage evaluations with FishXing.

Habitat Information

Because this project assessed fish passage at crossings in over 100 tributaries within the Russian River watershed, habitat analysis was based primarily on prior assessment and evaluation. Habitat conditions upstream and downstream of the crossing locations relied on habitat typing surveys recently conducted by CDFG on approximately 63 major tributaries. Within some of these major tributaries, additional habitat surveys were completed for smaller tributaries too.

The completed habitat typing reports provided information to:

- Assess the quantity and quality of habitat associated with the crossings.
- Determine salmonid species-diversity and distribution data.
- Identify the number, location, and status of additional stream crossings and other types of potential migration impediments – such as flashboard dams.
- Assess past, present, and future land uses within sub-watersheds of interest.

Professional judgment from on-site inspection of the stream habitat adjacent to each crossing also aided habitat assessment and evaluation – especially for streams that had not been recently surveyed. In some cases, with landowner permission, longer reaches of stream were walked to better assess quality of habitat above and below the crossings.

Habitat Quantity

Lengths of potential anadromous salmonid habitat upstream of each crossing were estimated by several methods:

1. Lengths measured in the field with a hip-chain during the CDFG habitat typing surveys. If access was permitted, these surveys were terminated where the field crew thought the limit of anadromy was located. The surveys were often terminated at obvious features such as natural waterfalls, extremely steep-sloped boulder cascades, or at permanent human-made structures such as dams.

2. Measured off of digitized USGS 7.5 Minute Series topographic maps (Terrain Navigator, Version 3.01by MapTech). The upper limit of anadromous habitat was considered when the channel exceeded an eight percent slope for at least a 300-foot channel reach.

3. Measured off of CDFG's GIS database for the Russian River watershed. The upper limit of anadromous habitat was considered when the channel exceeded a five percent slope for at least a 100-meter channel reach. The GIS system's roads layer also provided distances in-between crossings when multiple sites were surveyed within a single tributary.

The habitat quantity value used in the ranking matrix varied, but usually if the habitat typing survey identified an obvious feature where anadromy was terminated – this was the value used. In other instances, the eight-percent slope was used if only steelhead were present in the watershed and the five-percent slope was used if coho salmon were presumed present (either currently or historically).

Habitat Quality – Second Deviation from CDFG Protocol

The CDFG fish passage assessment protocol developed a qualitative means to assign a habitat quality score to the stream reach upstream of each assessed crossing. First of all, the reason for attempting to develop a total habitat score that included quality was to prevent sites associated with large amounts of poor-quality habitat from being consistently ranked higher than sites with moderate amounts of high-quality habitat upstream.

The rationale of developing a qualitative means of assessing habitat quality was that many, if not most streams in California, lack recent habitat typing surveys from which to draw data to utilize in a more quantitative manner. As described on page 28, the CDFG method requires categorizing the habitat upstream of each crossing as either in: pristine, good, fair, or poor condition based on applying the best available professional judgment to a suite of parameters.

Because CDFG has completed a significant number of habitat typing surveys within the Russian River basin, it was decided that these data should be utilized to better quantify habitat quality. The habitat quality scores were based on four parameters measured during the habitat typing surveys that provided an indication of quality – summer water temperature, percent canopy cover, pool frequency, and embeddedness of stream-bed substrate at pool-tails. Each of the four parameters was normalized on a scale of 0.0 to 1.0, where 1.0 represented the most desirable condition and 0.0 represented the least desirable. The normalized scores were then averaged to compute an overall score for the stream reach. Overall scores were only calculated for stream reaches where measurements of all four parameters were available.

For Russian River streams that have not been habitat typed by CDFG, the qualitative scores were applied as recommended in the CDFG fish passage assessment protocol. These scores were assigned by reviewing the field notes taken by Taylor and Associates' survey crew and the professional judgment of CDFG's Russian River Basin planners (Acomb and Coey, pers. comm.).

Additional Crossings and other Human-related Impediments to Migration

The presence of additional stream crossings, above and below each county-maintained site, was also considered when evaluating potential habitat gains. In many cases, additional stream crossings existed that were either private, city, state, or federal. Many of the city-maintained crossings and a smaller portion of the private crossings were surveyed, evaluated, and included in the ranking process to provide a more holistic watershed-level approach to addressing fish passage concerns.

The completed habitat typing reports also identified the number, location, and status of stream crossings and flashboard dams located on private property. The on-the-ground habitat typing surveys were more accurate than attempting to determine these additional features off of USGS topographic maps and/or County Department of Transportation road maps.

Initial Ranking of Stream Crossings for Treatment

The objective of the ranking matrix was to arrange the sites in an order from high to low priority using a suite of site-specific information. However, the "scores" generated were not intended to be absolute in deciding the exact order of scheduling treatments. Once the first-cut ranking was completed, professional judgment played an important part in deciding the order of treatment. As noted by Robison et al. (2000), numerous social and economic factors influenced the exact order of treated sites.

Because Mendocino and Sonoma Counties intend on treating stream crossings identified as "high-priority" by submitting proposals to various fisheries restoration funding sources, additional opportunities for re-evaluating the biological merit of potential projects will occur through proposal review committees composed of biologists from CDFG and other agencies. The stream crossing assessment protocol developed for the CDFG *Restoration Manual* acknowledged that the methods for ranking stream crossing locations was a developing process and would undoubtedly require refinement as additional information was obtained.

This report also acknowledges (but makes no attempt to quantify or prioritize) that other potentially high-priority restoration projects exist throughout California, and these must all be considered when deciding where and how to best spend limited restoration funds. However, recent research regarding watershed restoration considers the identification, prioritization, and treatment of migration barriers to restore ecological connectivity for salmonids as a vital (and often initial) step towards recovering depressed populations (Roni et al. 2002).

Ranking Criteria

The criteria and scoring for ranking stream crossings were relatively consistent with those developed for Part 10 of CDFG's *Salmonid Stream Habitat Restoration Manual* (Taylor and Love, 2002), except for two aspects. As already discussed, data from completed habitat typing reports were utilized to assign habitat quality values for some streams.

The third, and final, deviation from the CDFG protocol entailed reducing the weight of the current crossing's sizing and condition scores on the site's total score. Again, this modification to the CDFG protocol resulted from carefully analyzing data sets from previously completed assessment projects. The ranking matrix developed for the *Restoration Manual* can generate a maximum possible score of 39 points, with a maximum of 10 points (25.6%) associated with crossing condition and sizing. In some instances, crossings with very little upstream habitat (<1,000') and/or met the adult passage criteria on 100% of the range of migration flows were ranking near the top due primarily to poor condition and under-sizing.

Undersized crossings that are in poor condition should be of concern to road managers. However, if the primary purpose of the ranking matrix is to identify sites to treat with fisheries restoration funding, then more weight should be put on the biological-related criteria so that crossings which are serious impediments to migration with significant reaches of potential upstream habitat rank higher.

Thus, for the Russian River, Marin County, Santa Cruz County, and the Morro Bay watershed fish passage assessment projects Taylor and Associates has reduced the weight of the sizing and condition criteria by utilizing the average of the two values. This resulted in a maximum possible total score of 34 points, with sizing and condition criteria comprising a weight of 14.7% of the maximum total score.

The method utilized for the Russian River assessment assigned a score or value for the following criteria at each crossing location. The total score was the sum of four criteria: species diversity, extent of barrier, average value of crossing sizing and current condition, and total habitat score.

1. **Species diversity:** number of salmonid species known to occur (or historically occurred) within the stream reach at the crossing location. **Score:** Because of ESA listing status as threatened coho salmon = **2** points and steelhead = **2** points. **Maximum score = 4 points.**

2. **Extent of barrier:** for three age classes of salmonids (adults, resident trout/2+, and 1+/young-of-year), over the range of estimated migration flows, assign one of the following values. **Score: 0** = meets passage criteria on 80-100% of migration flows; **1** = meets passage criteria on 60-80% of migration flows; **2** = meets passage criteria on 40-60% of migration flows; **3** = meets passage criteria on 20-40% of migration flows; **4** = meets passage criteria on less than 20% of migration flows; **5** = fails to meet passage criteria (RED by first-phase evaluation filter). For a total score, sum scores given for each age-class of salmonids. **Maximum score = 15 points.**

3. **Sizing (risk of failure):** for each crossing, assign one of the following values as related to flow capacity. **Score: 0 =** sized to NMFS standards of passing 100-year flow at less than inlet height. **1** = sized for at least a 50-year flow, low risk. **2** = sized for at least a 25-year flow, moderate risk. **3** = sized for less than a 25-year flow, moderate to high risk of failure. **4** = sized for less than a 10-year event, high risk of failure. **5** = sized for less than a five-year event, high risk of failure.

4. **Current condition:** for each crossing, assign one of the following values. **Score: 0** = good condition. **1** = fair, showing signs of wear. **3** = poor, floor rusting through, crushed by roadbase, etc. **5** = extremely poor, floor rotted-out, severely crushed, damaged inlets, collapsing wingwalls, slumping roadbase, etc.

5. **Crossing Score:** for each crossing, combine the sizing and condition values and compute the average value. **Maximum score = 5 points.**

6. **Habitat quantity:** above each crossing, length in feet to sustained 8% gradient, or to the limit of anadromy identified in a recent habitat typing survey. **Score:** Starting at a 500' minimum; 0.5 points for each 500' length class (**example**: **0** points for <500'; **1** point for 1,000'; **2** points for 2,000'; **3.5** points for 3,500'; and so on). **Maximum score = 10 points.**

7. **Habitat quality:** for each stream, assign a "multiplier" of quality (relative to other streams in inventory) after reviewing available habitat information.

- **Score: 1.0 = Excellent-** Relatively undeveloped, "pristine" watershed conditions. Habitat features include dense riparian zones with mix of mature native species, frequent pools, high-quality spawning areas, cool summer water temperatures, complex in-channel habitat, and/or channel floodplain relatively intact. High likelihood of no future human development. Presence of migration barrier(s) is obviously the watershed's limiting factor.

- **0.75 = Good-** Habitat is fairly intact, but human activities have altered the watershed with likelihood of continued activities. Habitat still includes dense riparian zones of native species, frequent pools, spawning gravels, cool summer water temperatures, complex in-channel habitat, and/or channel floodplain relatively intact. Presence of migration barrier(s) is most likely one of the watershed's primary limiting factor.

- **0.5 = Fair-** Human activities have altered the watershed with likelihood of continued (or increased) activities, with apparent effects to watershed processes and features. Habitat impacts include riparian zone present but lack of mature conifers and/or presence of non-native species, infrequent pools, sedimentation evident in spawning areas (pool tails and riffle crests), summer water temperatures periodically exceed stressful levels for salmonids, sparse in-channel complex habitat, floodplain intact or slightly modified). Presence of migration barrier(s) may be one of the watershed's limiting factor (out of several factors).

- **0.25 = Poor-** Human activities have drastically altered the watershed with high likelihood of continued (or increased) activities, with apparent effects to watershed processes. Habitat impacts include riparian zones absent or severely degraded, little or no pool formations, excessive sedimentation evident in spawning areas (pool tails and riffle crests), stressful to lethal summer water temperatures common, lack of in-channel habitat, floodplain severely modified with levees, riprap, and/or residential or commercial development. Other limiting factors within watershed are most likely of a higher priority for restoration than remediation of migration barriers.

8. **Total habitat score:** Multiply #5 by #6 for habitat "score". A multiplier assigned for habitat quality, weighs the final score more on quality than sheer quantity of upstream habitat. **Maximum score = 10 points.**For each stream crossing location, the ranking criteria were entered into a spreadsheet and total scores computed. Then the list was sorted by "Total Score" in a descending order to determine an initial ranking. On closer review of the rank, some professional judgment was used to slightly adjust the rank of several sites. The list was then divided subjectively into groups defined as "high", "medium", or "low" priority.

The high-priority sites were generally characterized as serious impediments to migration with significant amounts of upstream habitat for anadromous salmonids. Medium-priority sites were characterized as limited in upstream habitat gains, limited species diversity, and/or were only significant impediments to juvenile migration. Low-priority sites were either limited in upstream habitat, habitat condition was poor, and/or the site allowed passage of adults and most juveniles.

Remediation of crossings identified as "high-priority" should be accomplished by submitting proposals to various fisheries restoration funding sources. The information provided in this report should be used to document the logical process employed to identify, evaluate, and rank these migration barriers.

Mendocino and Sonoma County Departments of Transportation should consider ranking medium and low-priority sites a second time focusing mainly on crossing condition, sizing, and amount of fill material within the road prism. A risk assessment may be conducted to determine the consequence of potential sediment delivery to the downstream channel if or when a crossing failed. Most medium and low-priority sites should not be considered candidates for treatment via limited restoration funding sources, unless an imminent site failure would deliver a significant amount of sediment to downstream salmonid spawning and rearing habitat.

However, this information will provide Mendocino and Sonoma County Public Works a list of sites in need of future replacement with county road maintenance funds. When these replacements are implemented, this report should provide guidance on treatments with properly-sized crossings conducive to adequate flow conveyance and unimpeded fish passage.

Additional Considerations for Final Ranking

On a site-specific basis, some or all of these factors were considered in rearranging the first-cut ranking to develop a final list for project scheduling:

1. Stocks of fish presumed present. Streams currently supporting populations of coho salmon were given a higher priority. This included streams in Sonoma County such as Dutch Bill and Green Valley Creeks and their smaller tributaries.

2. Amount of road fill. At stream crossings that were undersized and/or in poor condition, the volume of fill material within the road prism potentially deliverable to the stream channel if the culvert were to fail was considered.

3. Presence, location, and barrier status of other stream crossings. In many cases, an individual stream was crossed by multiple roads under a variety of management or ownership. In these situations, close communication with other road managers was important. If multiple crossings are migration barriers a coordinated effort is required to identify and treat them in a logical manner – generally in an upstream direction starting with the lowermost crossing. In some cases the lowermost crossing was Sonoma or Mendocino County-maintained and these sites were raised slightly in the final ranking. Conversely, the Counties also maintain crossings above state or federal-maintained crossings that are currently impeding and/or blocking fish migration – these county sites were lowered in the final ranking.

4. Remediation project cost. The range of treatment options and associated costs were examined when determining the order in which to proceed and the type of treatment to implement at specific sites. In cases where Federally-listed fish species were present, costs were weighed against the consequences of failing to comply with the Endangered Species Act by not providing unimpeded passage.

5. Scheduling of other road maintenance and improvement projects. The upgrading of migration barriers during other scheduled road maintenance and/or improvement activities should be considered by the Counties – even if the crossings were of a moderate to low priority. When undersized or older crossings fail during storms, the Counties should be prepared to install properly-sized crossings that provide unimpeded passage for all species and life stages of ESA-listed salmonids.

RESULTS

Initial Site Visits

Basin-wide, initial site visits were conducted at 545 stream crossings – 408 crossings in Sonoma County and 137 crossings in Mendocino County. Of these 545 crossings – 240 sites were determined to be bridges with the natural stream channel running underneath, 122 sites were dropped from the assessment, and 183 sites were surveyed and included in the passage assessment and ranking process. Because many of the crossings were comprised of multiple bay box culverts or multiple pipes, a total of 245 longitudinal surveys were conducted at the 183 stream crossings.

Sonoma County

Within Sonoma County, initial site visits were conducted at a total of 408 stream crossings, and the following was determined:

- 199 sites had bridges at the stream crossings and provided unimpeded fish passage.
- 84 sites were dropped from the survey because of either lack-of-access to private property or the stream channel was considered non-fish bearing (too small or too steep).
- 125 crossings were surveyed and included in the fish passage evaluation and priority ranking.

Although the project was originally focused on County-maintained crossings, the 125 crossings were located on roads with a variety of ownership:

- 80 crossings were County-maintained.
- 24 crossings were within Santa Rosa city limits.
- 12 crossings were on private road.
- 3 crossings were within Rohnert Park city limits.
- 3 crossings were within Cloverdale city limits.
- 2 crossings were within Windsor city limits.
- 1 crossing was on a State-maintained highway.

The entire list of the 408 sites initially visited and the status of the initial visit is provided in Appendix A.

In Sonoma County, the 125 surveyed sites were each given a unique ID number that was determined in an upstream direction starting at the mouth of the Russian River near Jenner and moving in generally a south to north direction up to the Sonoma/Mendocino County line (Table 3). Spreadsheets of the 125 stream crossings with culverts inventoried and their location information and physical characteristics are also provided in Appendix A.

The location information, site-specific characteristics, site photographs, maps, and habitat descriptions for the 125 Sonoma County stream crossings with culverts were assembled in a separate document, titled "Catalog of Sonoma County Stream Crossings with Culverts in the Russian River Watershed". The following list is an overview of the stream crossing inventory:

1. A variety of crossing configurations and materials were discovered, however the majority of crossings (103 sites or 82.4%) were constructed of concrete, mostly in the form of box culverts.

2. Most crossings were in good condition (68 sites or 54.5%), however some crossings were in poor condition (12 sites or 9.6%) and are due for replacement – most of these were SSP or CSP metal pipes. Another 45 crossings (36%) were described as in "fair" condition, and were starting to show signs of deterioration.

3. Most crossings (76 sites or 60.8%) were properly-sized when compared to recently released NMFS guidelines that recommend stream crossings pass the 100-year storm flow at less than 100% of inlet height (Table 4). Another eight crossings (6.4%) were sized to convey more than a 50-year storm flow and are probably at a low risk of failure.

   Twenty-six crossings (20.8%) were extremely undersized and were estimated to overtop on less than a ten-year storm flow (Table 4). Of these 26 crossings, 18 sites (14.4%) were estimated to overtop on a storm flow of less than five years - these sites should be of concern from a road's maintenance and safety point of view (red shading on Table 4).

Table 3. Site ID numbers for 125 Sonoma County stream crossings with culverts in the Russian River Basin.

SITE ID #	STREAM NAME	ROAD NAME
S-001	Unnamed Trib to Willow Creek	Willow Creek Road
S-002	Kohute Gulch	Austin Creek Road
S-003	Pole Mountain Creek - 2 pipes	Fort Ross Road
S-004	Tyrone Gulch - 2 pipes	Tyrone Road
S-005	Devoul Creek	Bohemian Highway
S-006	Grub Creek	Bohemian Highway
S-007	Dutch Bill Creek #1	Market Street
S-008	Dutch Bill Creek #2	Footbridge over Dam
S-009	Lancel Creek	Occidental Camp Meeker Road
S-010	Mission Creek #1 - 2 culverts	Camino Del Arroyo
S-011	Mission Creek #2	Old Cazadero Road
S-012	Fife Creek	Watson Road
S-013	Redwood Creek	Armstrong Woods Road
S-014	Sweetwater Creek	Sweetwater Springs Road
S-015	Mays Canyon	Neeley Road
S-016	Pocket Canyon	Mays Canyon Road
S-017	Korbel Tributary	River Road
S-018	Hobson Creek	Westside Road
S-019	Jonive Creek #1	Bodega Highway
S-020	Jonive Creek #2	Bodega Highway
S-021	Jonive Creek #3	Furlong Road
S-022	Un-named Jonive Branch #1	Furlong Road
S-023	Un-named Jonive Branch #2	Furlong Road
S-024	Jonive Creek #4	Bodega Highway
S-025	Jonive Creek #5	Wagnon Road
S-026	Purrington Creek #1	Graton Road
S-027	Purrington Creek #2	Private Driveway
S-028	Green Valley Creek	Green Valley Road
S-029	Harrison Grade Creek #1	Green Valley Road
S-030	Harrison Grade Creek #2	Harrison Grade Road
S-031	Pool Creek	Chalk Hill Road
S-032	Windsor Creek #1 - 2 pipes	Natalie Road
S-033	Windsor Creek #2	Brooks Road
S-034	Windsor Creek #3	Brooks Road
S-035	Pauline Creek #1	Marlow Road
S-036	Pauline Creek #2 - 2 pipes	Steele Lane
S-037	Pauline Creek #3 - 2 pipes	Apache Way
S-038	Pauline Creek #4	Coffey Lane
S-039	Pauline Creek #5	Mardie's Lane
S-040	Pauline Creek #6	Range Avenue
S-041	Pauline Creek #7	McBride Lane
S-042	Pauline Creek #8	Cleveland Avenue

Table 3. Site ID numbers for 125 Sonoma County stream crossings with culverts in the Russian River Basin.

SITE ID #	STREAM NAME	ROAD NAME
S-043	Pauline Creek #9	Chanate Road
S-044	Pauline Creek #10	Chanate Road
S-045	Pauline Creek #11	County Farm Road
S-046	Pauline Creek #12	Chanate Road
S-047	Piner Creek #1	Valdes Drive
S-048	Piner Creek #2	Marlow Road
S-049	Piner Creek #3	Coffey Lane
S-050	Piner Creek #4	Hopper Avenue
S-051	Spring Creek #1	Summerfield Road
S-052	Spring Creek #2	Stone Hedge Drive
S-053	Matanzas Creek	Bethnards Drive
S-054	Ducker Creek #1 - 2 pipes	Benicia Drive
S-055	Ducker Creek #2 - 2 pipes	Rinconada Drive
S-056	Rincon Creek aka Brush Cr #1 - 2 pipes	Montecito Blvd
S-057	Rincon Creek aka Brush Cr #2	Brush Creek Road
S-058	Rincon Creek aka Brush Cr #3	Deer Trail Road
S-059	Rincon Creek aka Brush Cr #4 - 2 pipes	Amber Lane
S-060	Unnamed trib to Rincon Cr aka Brush Cr	Wallace Road
S-061	Rincon Creek aka Brush Cr #5	Riebli Road
S-062	Blucher Creek #1	Bloomfield Road
S-063	Blucher Creek #2	Blucher Valley Road
S-064	Hinebaugh Creek #1 - 4 bays	Commerce Boulevard
S-065	Crane Creek #1 - 2 pipes	Snyder Lane
S-066	Crane Creek #2	Petaluma Hill Road
S-067	Crane Creek #3	Pressley Road
S-068	Copeland Creek - 3 pipes	Snyder Lane
S-069	Linda Creek #1	Mark West Springs Road
S-070	Linda Creek #2	Riebli Road
S-071	Porter Creek trib to Mark West #1	Porter Creek Road
S-072	Porter Creek trib to Mark West #2 - 2 pipes	Calistoga Road
S-073	Mark West Creek - 2 bays	Roehmer Road
S-074	Weeks Creek - 2 bays	Calistoga Road
S-075	Alpine Creek	St.Helena Road
S-076	Van Buren Creek	St.Helena Road
S-077	Un-named trib to Mark West Ck #1	St.Helena Road
S-078	Un-named trib to Mark West Ck #2	St.Helena Road
S-079	Press Creek	Sweetwater Springs Road
S-080	Porter Creek #1 - 2 bays	Sweetwater Springs Road
S-081	Porter Creek #2 - 2 pipes	Hendren Driveway
S-082	Turtle Creek	West Side Road
S-083	Wallace Creek	Mill Creek Road
S-084	Mill Creek	Mill Creek Road

Table 3. Site ID numbers for 125 Sonoma County stream crossings with culverts in the Russian River Basin.

SITE ID #	STREAM NAME	ROAD NAME
S-085	Boyd Creek	Mill Creek Road
S-086	Kelley Creek	West Dry Creek Road
S-087	Lytton Springs Creek - 2 bays	Dry Creek Road
S-088	Crane Creek trib to Dry Creek	West Dry Creek Road
S-089	Grape Creek #1	West Dry Creek Road
S-090	Wine Creek #1	Wine Creek Road
S-091	Wine Creek #2	Koch Road
S-092	Wine Creek #3	Koch Road
S-093	Grape Creek #2	Wine Creek Road
S-094	Un-named Tributary #1 to Dry Creek	West Dry Creek Road
S-095	Un-named Tributary #2 to Dry Creek	Dry Creek Road
S-096	Un-named Tributary #3 to Dry Creek	Dry Creek Road
S-097	Canyon Creek	Dry Creek Road
S-098	Dutcher Creek #1	Dry Creek Road
S-099	Dutcher Creek #2	Dutcher Creek Road
S-100	Dutcher Creek #3 - 3 pipes	Private Driveway
S-101	Dutcher Creek #4	Dutcher Creek Road
S-102	Dutcher Creek #5	Dutcher Creek Road
S-103	Dutcher Creek #6	Dutcher Creek Road
S-104	Schoolhouse Creek	Dry Creek Road
S-105	Brooks Creek	Spurgeon Road
S-106	Martin Creek	Private Drive off Spurgeon Road
S-107	Unnamed tributary to Barnes Creek - 3 pipes	Private Driveway
S-108	Little Briggs Creek - 5 pipes	Santa Angelina Ranch
S-109	Coon Creek - 4 pipes	Santa Angelina Ranch
S-110	Gird Creek #1	Geysers Road
S-111	Gird Creek #2	Wilson Road
S-112	Gird Creek #3	Geysers Road
S-113	Indian Creek	Hwy 128
S-114	Crocker Creek	River Road
S-115	Barrelli Creek	Dutcher Creek Road
S-116	Un-named tributary #1 on River Road	River Road
S-117	Icaria Creek	Asti Road
S-118	Un-named tributary #2 on River Road	River Road
S-119	Porterfield Creek	South Cloverdale Blvd
S-120	North Branch	Cherry Creek Road
S-121	Cloverdale Creek #1	East First Street
S-122	Cloverdale Creek #2 - 2 bays	Vista View Drive
S-123	Un-named tributary to Big Sulphur Creek	Geysers Road
S-124	Anna Belcher Creek	Pine Flat Road
S-125	Hurley Creek	Pine Flat Road

Table 4. Hydraulic capacities estimated for 125 Sonoma County stream crossings. Capacity is expressed as both a discharge (c.f.s.) and a return-interval (years) for flows overtopping culvert inlet (HW/D=1) and overtopping road prism (HW/F=1).

Site ID #	Stream Name	Road Name	Capacity at HW/D=1 (c.f.s.)	Capacity at HW/F=1 (c.f.s.)	Return Interval to Overtop Culvert (years)	Return Interval to Overtop Road Prism (years)
S-001	Unnamed Trib to Willow Ck	Willow Creek Road	176.6	251.9	84	>250
S-002	Kohute Gulch	Austin Creek Road	190.0	280.0	**3**	**9**
S-003	Pole Mountain Ck - 2 pipes	Fort Ross Road	973.9	1812.0	32	>250
S-004	Tyrone Gulch - 2 pipes	Tyrone Road	77.1	128.4	**2**	**5**
S-005	Devoul Creek	Bohemian Highway	270.0	690.0	7	>250
S-006	Grub Creek	Bohemian Highway	264.0	660.0	135	>250
S-007	Dutch Bill Creek #1	Market Street	3125.0	7500.0	>250	>250
S-008	Dutch Bill Creek #2	Footbridge over Dam	630.0	750.0	10	18
S-009	Lancel Creek	Occidental Camp Meeker Rd	472.0	1040.0	29	>250
S-010	Mission Creek #1 - 2 culverts	Camino Del Arroyo	271.6	475.6	**4**	**23**
S-011	Mission Creek #2	Old Cazadero Road	1094.8	1690.5	>250	>250
S-012	Fife Creek	Watson Road	2194.8	2714.0	158	>250
S-013	Redwood Creek	Armstrong Woods Road	1632.0	2520.0	>250	>250
S-014	Sweetwater Creek	Sweetwater Springs Road	1277.5	1934.5	>250	>250
S-015	Mays Canyon	Neeley Road	950.4	1782.0	**5**	**36**
S-016	Pocket Canyon	Mays Canyon Road	380.0	940.0	**1**	**8**
S-017	Korbel Tributary	River Road	1180.2	1545.5	>250	>250
S-018	Hobson Creek	Westside Road	1212.0	2400.0	>250	>250
S-019	Jonive Creek #1	Bodega Highway	2557.3	2987.5	>250	>250
S-020	Jonive Creek #2	Bodega Highway	2448.0	3120.0	>250	>250
S-021	Jonive Creek #3	Furlong Road	996.0	1308.0	>250	>250
S-022	Un-named Jonive Branch #1	Furlong Road	850.0	880.0	>250	>250
S-023	Un-named Jonive Branch #2	Furlong Road	203.0	329.0	19	193
S-024	Jonive Creek #4	Bodega Highway	440.0	720.0	182	>250
S-025	Jonive Creek #5	Wagnon Road	352.0	824.0	123	>250

Table 4 (continued). Hydraulic capacities estimated for 125 Sonoma County stream crossings. Capacity is expressed as both a discharge (cfs) and a return-interval (years) for flows overtopping culvert inlet (HW/D=1) and overtopping road prism (HW/F=1).

Site ID #	Stream Name	Road Name	Capacity at HW/D=1 (cfs)	Capacity at HW/F=1 (cfs)	Return Interval to Overtop Culvert (years)	Return Interval to Overtop Road Prism (years)
S-026	Purrington Creek #1	Graton Road	803.0	1435.5	>250	>250
S-027	Purrington Creek #2	Private Driveway	1097.0	1065.0	>250	>250
S-028	Green Valley Creek	Green Valley Road	950.0	1350.0	48	>250
S-029	Harrison Grade Creek #1	Green Valley Road	275.0	500.0	54	>250
S-030	Harrison Grade Creek #2	Harrison Grade Road	176.6	280.4	13	93
S-031	Pool Creek	Chalk Hill Road	320.0	1000.0	17	>250
S-032	Windsor Creek #1 - 2 pipes	Natalie Road	1368.0	1944.0	>250	>250
S-033	Windsor Creek #2	Brooks Road	972.0	1488.0	>250	>250
S-034	Windsor Creek #3	Brooks Road	1476.0	1524.0	>250	>250
S-035	Pauline Creek #1	Marlow Road	1046.0	2200.0	>250	>250
S-036	Pauline Creek #2 - 2 pipes	Steele Lane	1080.0	1880.0	>250	>250
S-037	Pauline Creek #3 - 2 pipes	Apache Way	1040.0	1560.0	>250	>250
S-038	Pauline Creek #4	Coffey Lane	1080.0	1780.0	>250	>250
S-039	Pauline Creek #5	Mardie's Lane	880.0	1440.0	210	>250
S-040	Pauline Creek #6	Range Avenue	864.0	1424.0	199	>250
S-041	Pauline Creek #7	McBride Lane	688.0	1248.0	61	>250
S-042	Pauline Creek #8	Cleveland Avenue	688.6	1364.0	63	>250
S-043	Pauline Creek #9	Chanate Road	280.0	658.0	**3**	**66**
S-044	Pauline Creek #10	Chanate Road	578.5	961.2	44	>250
S-045	Pauline Creek #11	County Farm Road	837.0	837.0	>250	>250
S-046	Pauline Creek #12	Chanate Road	809.2	1118.6	>250	>250
S-047	Piner Creek #1	Valdes Drive	1610.0	2200.0	>250	>250
S-048	Piner Creek #2	Marlow Road	1134.0	1995.0	>250	>250
S-049	Piner Creek #3	Coffey Lane	1080.0	1620.0	>250	>250

Table 4 (continued). Hydraulic capacities estimated for 125 Sonoma County stream crossings. Capacity is expressed as both a discharge (cfs) and a return-interval (years) for flows overtopping culvert inlet (HW/D=1) and overtopping road prism (HW/F=1).

Site ID #	Stream Name	Road Name	Capacity at HW/D=1 (cfs)	Capacity at HW/F=1 (cfs)	Return Interval to Overtop Culvert (years)	Return Interval to Overtop Road Prism (years)
S-050	Piner Creek #4	Hopper Avenue	540.0	760.0	>250	>250
S-051	Spring Creek #1	Summerfield Road	94.8	202.2	**1**	**2**
S-052	Spring Creek #2	Stone Hedge Drive	50.0	96.0	**1**	**1**
S-053	Matanzas Creek	Bethnards Drive	2560.0	3200.0	51	174
S-054	Ducker Creek #1 - 2 pipes	Benicia Drive	704.0	928.0	>250	>250
S-055	Ducker Creek #2 - 2 pipes	Rinconada Drive	544.0	960.0	>250	>250
S-056	Rincon Cr / Brush Cr #1 - 2 pipes	Montecito Blvd	1643.4	2128.5	>250	>250
S-057	Rincon Cr aka Brush Cr #2	Brush Creek Road	1116.0	1800.0	>250	>250
S-058	Rincon Cr aka Brush Cr #3	Deer Trail Road	1128.9	1908.0	>250	>250
S-059	Rincon Cr aka Brush Cr #4 - 2 pipes	Amber Lane	1144.8	1404.0	>250	>250
S-060	Unnamed trib to Rincon Cr aka Brush Cr	Wallace Road	330.0	550.0	162	>250
S-061	Rincon Cr aka Brush Cr #5	Riebli Road	472.0	720.0	>250	>250
S-062	Blucher Creek #1	Bloomfield Road	624.0	1024.0	>250	>250
S-063	Blucher Creek #2	Blucher Valley Road	64.1	146.4	**2**	**23**
S-064	Hinebaugh Creek #1 - 4 bays	Commerce Boulevard	5302.0	5720.0	>250	>250
S-065	Crane Creek #1 - 2 pipes	Snyder Lane	1428.0	2616.0	>250	>250
S-066	Crane Creek #2	Petaluma Hill Road	1712.0	2752.0	>250	>250
S-067	Crane Creek #3	Pressley Road	276.0	456.0	8	60
S-068	Copeland Creek - 3 pipes	Snyder Lane	3141.6	4158.0	>250	>250
S-069	Linda Creek #1	Mark West Springs Road	930.0	2100.0	212	>250
S-070	Linda Creek #2	Riebli Road	516.0	1140.0	>250	>250
S-071	Porter Creek trib to Mark West #1	Porter Creek Road	1757.0	4743.9	109	>250
S-072	Porter Ck trib to M k West #2 - 2 pipes	Calistoga Road	2520.0	6240.0	>250	>250
S-073	Mark West Creek - 2 bays	Roehmer Road	4044.6	4922.0	>250	>250
S-074	Weeks Creek - 2 bays	Calistoga Road	1108.4	1630.0	>250	>250

Table 4 (continued). Hydraulic capacities estimated for 125 Sonoma County stream crossings. Capacity is expressed as both a discharge (cfs) and a return-interval (years) for flows overtopping culvert inlet (HW/D=1) and overtopping road prism (HW/F=1).

Site ID #	Stream Name	Road Name	Capacity at HW/D=1 (cfs)	Capacity at HW/F=1 (cfs)	Return Interval to Overtop Culvert (years)	Return Interval to Overtop Road Prism (years)
S-075	Alpine Creek	St.Helena Road	210.6	315.9	10	41
S-076	Van Buren Creek	St.Helena Road	319.5	591.8	9	65
S-077	Un-named trib to Mark West Ck #1	St.Helena Road	200.0	420.0	>250	>250
S-078	Un-named trib to Mark West Ck #2	St.Helena Road	212.7	436.8	6	35
S-079	Press Creek	Sweetwater Springs Road	472.0	720.0	>250	>250
S-080	Porter Creek #1 - 2 bays	Sweetwater Springs Road	353.3	609.6	**3**	**14**
S-081	Porter Creek #2 - 2 pipes	Hendren Driveway	100.0	160.0	**1**	**3**
S-082	Turtle Creek	West Side Road	680.0	950.0	>250	>250
S-083	Wallace Creek	Mill Creek Road	1448.0	2443.5	61	>250
S-084	Mill Creek	Mill Creek Road	250.0	320.0	**2**	**2**
S-085	Boyd Creek	Mill Creek Road	231.0	420.0	124	>250
S-086	Kelley Creek	West Dry Creek Road	454.5	828.2	103	>250
S-087	Lytton Springs Creek - 2 bays	Dry Creek Road	660.0	1940.0	>250	>250
S-088	Crane Creek trib to Dry Creek	West Dry Creek Road	1440.0	1656.0	>250	>250
S-089	Grape Creek #1	West Dry Creek Road	1927.1	2835.2	>250	>250
S-090	Wine Creek #1	Wine Creek Road	199.7	375.1	**4**	**29**
S-091	Wine Creek #2	Koch Road	362.6	507.6	34	190
S-092	Wine Creek #3	Koch Road	77.2	144.1	**1**	**3**
S-093	Grape Creek #2	Wine Creek Road	440.0	832.0	150	>250
S-094	Un-named Tributary #1 to Dry Creek	West Dry Creek Road	96.0	184.0	12	222
S-095	Un-named Tributary #2 to Dry Creek	Dry Creek Road	136.5	304.5	9	>250
S-096	Un-named Tributary #3 to Dry Creek	Dry Creek Road	170.0	250.0	177	>250
S-097	Canyon Creek	Dry Creek Road	1442.0	2492.6	>250	>250
S-098	Dutcher Creek #1	Dry Creek Road	2058.4	3348.0	>250	>250
S-099	Dutcher Creek #2	Dutcher Creek Road	1086.8	1753.7	>250	>250

Table 4 (continued). Hydraulic capacities estimated for 125 Sonoma County stream crossings. Capacity is expressed as both a discharge (cfs) and a return-interval (years) for flows overtopping culvert inlet (HW/D=1) and overtopping road prism (HW/F=1).

Site ID #	Stream Name	Road Name	Capacity at HW/D=1 (cfs)	Capacity at HW/F=1 (cfs)	Return Interval to Overtop Culvert (years)	Return Interval to Overtop Road Prism (years)
S-100	Dutcher Creek #3 - 3 pipes	Private Driveway	231.5	429.0	**2**	**6**
S-101	Dutcher Creek #4	Dutcher Creek Road	418.0	760.0	12	191
S-102	Dutcher Creek #5	Dutcher Creek Road	522.0	1102.0	32	>250
S-103	Dutcher Creek #6	Dutcher Creek Road	520.3	907.5	196	>250
S-104	Schoolhouse Creek	Dry Creek Road	67.9	191.6	**2**	**49**
S-105	Brooks Creek	Spurgeon Road	558.8	698.5	>250	>250
S-106	Martin Creek	Private Drive off Spurgeon Road	636.5	1140.0	60	>250
S-107	Unnamed tributary to Barnes Creek - 3 pipes	Private Driveway	112.8	219.2	**3**	**24**
S-108	Little Briggs Creek - 5 pipes	Santa Angelina Ranch	782.7	1535.0	126	>250
S-109	Coon Creek - 4 pipes	Santa Angelina Ranch	778.7	1515.9	111	>250
S-110	Gird Creek #1	Geysers Road	1120.0	1920.0	>250	>250
S-111	Gird Creek #2	Wilson Road	1132.9	1428.0	>250	>250
S-112	Gird Creek #3	Geysers Road	720.0	1400.0	>250	>250
S-113	Indian Creek	Hwy 128	347.6	568.8	>250	>250
S-114	Crocker Creek	River Road	170.0	330.0	**1**	**3**
S-115	Barrelli Creek	Dutcher Creek Road	468.0	1572.0	>250	>250
S-116	Un-named tributary #1 on River Road	River Road	64.1	133.8	**3**	**19**
S-117	Icaria Creek	Asti Road	1173.0	1734.0	42	>250
S-118	Un-named tributary #2 on River Road	River Road	186.3	307.8	13	118
S-119	Porterfield Creek	South Cloverdale Blvd	810.0	1180.0	>250	>250
S-120	North Branch	Cherry Creek Road	64.1	89.6	**6**	**15**
S-121	Cloverdale Creek #1	East First Street	1116.0	2580.0	>250	>250
S-122	Cloverdale Creek #2 - 2 bays	Vista View Drive	528.0	900.0	81	>250
S-123	Un-named trib. to Big Sulphur Creek	Geysers Road	82.0	158.8	**5**	**32**
S-124	Anna Belcher Creek	Pine Flat Road	1274.1	2041.3	>250	>250
S-125	Hurley Creek	Pine Flat Road	640.0	820.0	>250	>250

Mendocino County

Within Mendocino County, initial site visits were conducted at a total of 137 stream crossings, and the following was determined:

- 41 sites had bridges at the stream crossings and provided unimpeded fish passage.

- 38 sites were dropped from the survey because of either lack-of-access to private property or the stream channel was considered non-fish bearing (too small or too steep).

- 58 crossings were surveyed and included in the fish passage evaluation and priority ranking.

Although the project was originally focused on County-maintained crossings, the 58 crossings were located on roads with a variety of ownership:

- 32 crossings were County-maintained.
- 21 crossings were within Ukiah city limits.
- 2 crossings were on private road.
- 2 crossings were on a State-maintained highway.
- 1 crossing was on the Northern Pacific Railroad.

The entire list of the 137 sites initially visited and the status of the initial visit is provided in Appendix B.

In Mendocino County, the 58 surveyed sites were each given a unique ID number that was determined in an upstream direction starting at the Sonoma/Mendocino County line moving in generally a south to north direction to the upper portion of the Russian River still accessible to anadromous salmonids (Table 5). Spreadsheets of the 58 stream crossings with culverts inventoried and their location information and physical characteristics are provided in Appendix B.

The location information, site-specific characteristics, site photographs, maps, and habitat descriptions for the 58 Mendocino County stream crossings with culverts were assembled in a separate document, titled "Catalog of Mendocino County Stream Crossings with Culverts in the Russian River Watershed". The following list is an overview of the stream crossing inventory:

1. A variety of crossing configurations and materials were discovered, however the majority of crossings (40 sites or 68.9%) were constructed of concrete, mostly in the form of box culverts.

2. A fair number of crossings were in good condition (23 sites or 39.6%), however some crossings were in poor condition (nine sites or 15.5%) and are due for replacement – most of these were SSP or CSP metal pipes. The remaining 26 crossings (44.8%) were described as in "fair" condition, and starting to show signs of deterioration.

3. Some crossings (10 sites or 17.2%) were properly-sized when compared to recently released NMFS guidelines that recommend stream crossings pass the 100-year storm flow at less than 100% of inlet height (Table 6). Another nine crossings (15.5%) were sized to convey more than a 50-year storm flow and are probably at a low risk of failure.

   Of more concern, were the 31 crossings (53.4%) determined to be extremely undersized and estimated to overtop on less than a ten-year storm flow (Table 6). Of these 31 crossings, 22 sites (37.9%) were estimated to overtop on a storm flow of less than five years - these sites should be of concern from a road's maintenance and safety point of view (red shading on Table 6).

Table 5. Site ID numbers for 58 Mendocino County stream crossings culverts in the Russian River Basin.

SITE ID #	STREAM NAME	ROAD NAME
M-001	Un-named tributary #1 on Mtn House Rd	Mountain House road
M-002	La Franchi Creek	Mountain House road
M-003	Un-named tributary to Feliz Cr	Feliz Creek Road
M-004	Un-named Trib#1 on East Side Rd	East Side Road
M-005	Pratt Ranch Creek #1	Pratt Ranch Road
M-006	Pratt Ranch Creek #2	Pratt Ranch Road
M-007	McDowell Creek #1	Hooper Ranch Road
M-008	McDowell Creek #2	HWY 175
M-009	Un-named trib #2 on East Side Rd	East Side Road
M-010	Romers Dairy Creek	Romers Dairy Rd
M-011	Un-named trib to Howell Creek - 2 culverts	East Side Road
M-012	Howell Creek - 2 culverts	East Side Road
M-013	Un-named trib #1 to Robinson Cr	Robinson Creek Road
M-014	Un-named trib #2 to Robinson Cr - 3 culverts	Robinson Creek Road
M-015	Robinson Creek	Pine Ridge Road
M-016	Cleland Mountain Creek	South State Street
M-017	Mill Creek #1	Private Road-Parnum Paving Co.
M-018	McClure Creek #1 - 2 culverts	Sanford Ranch Road
M-019	McClure Creek #2 – 2 culverts	Sanford Ranch Road
M-020	Mill Creek #2	HWY 222
M-021	North Fork Mill Creek	Guidiville road
M-022	Mill Creek #3	Mill Creek Road
M-023	Doolin Creek #1 - 2 culverts	Babcock Lane
M-024	Doolin Creek #2	Lorraine Street
M-025	Doolin Creek #3	Betty Street
M-026	Doolin Creek #4	Cunningham Street
M-027	Doolin Creek #5	Talmage Road
M-028	Doolin Creek #6	Wabash Ave
M-029	Doolin Creek #7	Laurel Ave
M-030	Gibson Creek #1	Orchard Road
M-031	Gibson Creek #2	Warren Drive
M-032	Gibson Creek #3	Leslie Street

Table 5. Site ID numbers for 58 Mendocino County stream crossings culverts in the Russian River Basin.

SITE ID #	STREAM NAME	ROAD NAME
M-033	Gibson Creek #4	East Perkins Street
M-034	Gibson Creek #5	Mason Street
M-035	Gibson Creek #6 - 2 culverts	North State Street
M-036	Gibson Creek #7 - 2 culverts	School Street
M-037	Gibson Creek #8 - 2 culverts	Oak Street
M-038	Gibson Creek #9	Pine Street
M-039	Gibson Creek #10	Bush Street
M-040	Gibson Creek #11	North Dora Street
M-043	Gibson Creek #14	Standley Street
M-044	Orr Creek - 3 culverts	Oak Street
M-045	Un-named Trib #1 to Orrs Creek	Pine Ridge Road
M-046	Un-named Trib #2 to Orrs Creek	Pine Ridge Road
M-047	Un-named Trib #3 to Orrs Creek	Pine Ridge Road
M-048	Sulphur Creek #1	Vichy Springs Road
M-049	Sulphur Creek #2	Vichy Springs Road
M-050	Un-named trib on Redemeyer Rd.	Redemeyer Road
M-051	Howard Creek	Redemeyer Road
M-052	Calpella Creek	North State Street
M-053	Bakers Creek - 2 culverts	Northwestern Pacific RR
M-054	Forsytyhe Creek - 4 culverts	Black Bart Road
M-055	North Fork Salt Hollow Creek	Road B
M-056	Salt Hollow Creek #1	Road B
M-057	Salt Hollow Creek #2	Road B
M-058	Mariposa Creek	Tomki Road

Table 6. Hydraulic capacities estimated for 58 Mendocino County stream crossings. Capacity is expressed as both a discharge (cfs) and a return-interval (years) for flows overtopping culvert inlet (HW/D=1) and overtopping road prism (HW/F=1).

Site ID #	Stream Name	Road Name	Capacity at HW/D=1 (cfs)	Capacity at HW/F=1 (cfs)	Return Interval to Overtop Culvert (years)	Return Interval to Overtop Road Prism (years)
M-001	Un-named tributary #1 on Mtn House Rd	Mountain House road	246.0	552.0	42	>250
M-002	La Franchi Creek	Mountain House road	200.0	320.0	5	14
M-003	Un-named tributary to Feliz Cr	Feliz Creek Road	103.6	253.2	**2**	**13**
M-004	Un-named Trib#1 on East Side Rd	East Side Road	408.0	558.0	69	>250
M-005	Pratt Ranch Creek #1	Pratt Ranch Road	142.2	530.4	**3**	**50**
M-006	Pratt Ranch Creek #2	Pratt Ranch Road	85.9	163.2	6	28
M-007	McDowell Creek #1	Hooper Ranch Road	230.0	318.0	**3**	**5**
M-008	McDowell Creek #2	HWY 175	631.0	1550.0	41	>250
M-009	Un-named trib #2 on East Side Rd	East Side Road	77.2	164.9	**3**	**26**
M-010	Romers Dairy Creek	Romers Dairy Rd	234.0	408.0	>250	>250
M-011	Un-named trib to Howell Creek - 2 culverts	East Side Road	232.0	240.0	39	45
M-012	Howell Creek - 2 culverts	East Side Road	944.0	960.0	243	>250
M-013	Un-named trib #1 to Robinson Cr	Robinson Creek Road	545.6	1012.0	42	>250
M-014	Un-named trib #2 to Robinson Cr - 3 culverts	Robinson Creek Road	2448.0	2556.0	>250	>250
M-015	Robinson Creek	Pine Ridge Road	212.7	305.1	>250	>250
M-016	Cleland Mountain Creek	South State Street	212.7	221.5	17	20
M-017	Mill Creek #1	Private Road-Parnum Paving Co.	320.0	650.0	**1**	**1**
M-018	McClure Creek #1 - 2 culverts	Sanford Ranch Road	1088.0	1168.0	13	16
M-019	McClure Creek #2 – 2 culverts	Sanford Ranch Road	1072.0	1280.0	15	25
M-020	Mill Creek #2	HWY 222	444.7	834.9	**2**	**4**
M-021	North Fork Mill Creek	Guidiville road	615.0	990.0	9	33
M-022	Mill Creek #3	Mill Creek Road	816.0	1320.0	29	247
M-023	Doolin Creek #1 - 2 culverts	Babcock Lane	240.0	456.0	**2**	**4**
M-024	Doolin Creek #2	Lorraine Street	266.0	406.0	**2**	**5**
M-025	Doolin Creek #3	Betty Street	239.4	392.0	**2**	**5**
M-026	Doolin Creek #4	Cunningham Street	347.3	257.5	**4**	**2**
M-027	Doolin Creek #5	Talmage Road	187.5	362.5	**2**	**5**
M-028	Doolin Creek #6	Wabash Ave	300.8	498.2	5	20

Table 6 (continued). Hydraulic capacities estimated for 58 Mendocino County stream crossings. Capacity is expressed as both a discharge (cfs) and a return-interval (years) for flows overtopping culvert inlet (HW/D=1) and overtopping road prism (HW/F=1).

Site ID #	Stream Name	Road Name	Capacity at HW/D=1 (cfs)	Capacity at HW/F=1 (cfs)	Return Interval to Overtop Culvert (years)	Return Interval to Overtop Road Prism (years)
M-029	Doolin Creek #7	Laurel Ave	288.3	585.9	**4**	**39**
M-030	Gibson Creek #1	Orchard Road	540.0	960.0	16	189
M-031	Gibson Creek #2	Warren Drive	290.0	570.0	**4**	**21**
M-032	Gibson Creek #3	Leslie Street	73.2	216.0	**1**	**3**
M-033	Gibson Creek #4	East Perkins Street	270.4	546.0	**4**	**21**
M-034	Gibson Creek #5	Mason Street	500.0	900.0	17	211
M-035	Gibson Creek #6 - 2 culverts	North State Street	368.0	608.0	9	44
M-036	Gibson Creek #7 - 2 culverts	School Street	245.0	406.0	**4**	**12**
M-037	Gibson Creek #8 - 2 culverts	Oak Street	253.0	451.0	**4**	**17**
M-038	Gibson Creek #9	Pine Street	271.4	460.2	5	18
M-039	Gibson Creek #10	Bush Street	284.2	588.0	5	45
M-040	Gibson Creek #11	North Dora Street	290.0	540.0	5	32
M-043	Gibson Creek #14	Standley Street	550.0	682.0	36	92
M-044	Orr Creek - 3 culverts	Oak Street	350.0	550.0	9	36
M-045	Un-named Trib #1 to Orrs Creek	Pine Ridge Road	390.0	680.0	19	218
M-046	Un-named Trib #2 to Orrs Creek	Pine Ridge Road	2700.0	3900.0	179	>250
M-047	Un-named Trib #3 to Orrs Creek	Pine Ridge Road	77.2	154.9	17	>250
M-048	Sulphur Creek #1	Vichy Springs Road	103.6	164.6	6	14
M-049	Sulphur Creek #2	Vichy Springs Road	528.0	756.0	>250	>250
M-050	Un-named trib on Redemeyer Rd.	Redemeyer Road	1004.4	1522.8	13	52
M-051	Howard Creek	Redemeyer Road	666.0	917.6	7	14
M-052	Calpella Creek	North State Street	896.0	1448.0	>250	>250
M-053	Bakers Creek - 2 culverts	Northwestern Pacific RR	1412.0	1765.0	>250	>250
M-054	Forsytyhe Creek - 4 culverts	Black Bart Road	270.0	870.0	73	>250
M-055	North Fork Salt Hollow Creek	Road B	64.1	359.2	**2**	**23**
M-056	Salt Hollow Creek #1	Road B	190.0	534.7	13	13
M-057	Salt Hollow Creek #2	Road B	77.2	94.7	**3**	**4**
M-058	Mariposa Creek	Tomki Road	794.8	1105.0	115	>250

Passage Analyses

Sonoma County

The **GREEN**-**GRAY**-**RED** first-phase evaluation filter reduced the number of sites requiring in-depth analyses with FishXing. The initial use of the first-phase filter was followed by FishXing evaluations utilizing the conservative swimming abilities and minimum depth requirement as recommended in the CDFG assessment protocol. This initial analysis resulted in 62 of the 125 crossings (49.6% of the sites) defined as **RED**, or failing to meet CDFG's fish passage criteria for adult and juvenile salmonids throughout the entire range of migration flows (CDFG 2002). Examination of the site photos and electro-fishing data from recent surveys suggested adult steelhead were migrating through many of these **RED** crossings.

When the more rigorous swimming abilities of 8-16-16 ft/sec and a minimum water depth of 0.5 feet were used in a second round of FishXing analyses, the number of **RED** crossings dropped to 28 sites (or 22.4% of the sites). The range of migration values for **GRAY** sites also increased and resulted in a wider distribution of the ranking scores.

It is important to note that crossings which failed to meet the more rigorous criteria may still actually provide partial or temporal passage during certain flow conditions, especially if FishXing identified the only violation of the passage criteria as a lack-of-depth. However, all **RED** sites were given a "total barrier" score in the ranking matrix.

Twenty stream crossings (16% of the sites) were defined as **GREEN** with the first-phase evaluation filter and were assumed to provide unimpeded passage for all age classes of coho salmon and/or steelhead. These crossings were typically concrete box culverts that spanned at least the average active channel width and were fully embedded with streambed substrate. Due to natural variations in channel morphology, it is recommended that these sites are still periodically inspected to ensure they remain embedded with substrate.

FishXing proved an extremely useful tool in estimating the extent of passage at the 105 **GRAY** and **RED** sites and identifying the probable causes of blockages. However, like most models which attempt to predict complex physical and biological processes with mathematics, there were limitations and assumptions that must be acknowledged.

Over the past six winters, repeated visits to numerous culverts within northern California during migration flows revealed some confounding results generated by FishXing (Taylor 2000 and 2001; Love pers. comm.):

1. Adult salmonids having great difficulties entering culverts which FishXing suggested were easily within the species' leaping and swimming capabilities.

2. Adult salmonids successfully migrating through water depths defined as "too shallow" by both the conservative criteria of a minimum depth = 1.0 foot and even with a minimum depth = 0.5 feet.

3. The behavior and abilities of fish are too varied and complex to be summed up with an equation or number taken from a published article. Even a single fishes' leaping and swimming abilities at a culvert may change as numerous attempts are made. Six seasons of extensive winter-time observations at stream crossings with culverts in the Five-Counties region have documented individual fish become fatigued over repetitive attempts, and conversely documented other fish gaining access to culverts after numerous failed attempts (Taylor 2000 and 2001; Love pers. comm.).

Due to these factors, passage evaluation results generated by FishXing were used conservatively in the ranking matrix by lumping "percent passable" into large (20%) categories. Adult steelhead and coho salmon were lumped as the "adult" run, resident coastal rainbow trout and two-year old (2+) steelhead were grouped as the "resident trout" run, and one-year old (1+) and young-of-the-year (y-o-y) steelhead and coho salmon were grouped as the "juvenile" run.

Passage results generated by FishXing are displayed as "percent passable" for the range of migration flows calculated for each stream crossing location within the seven sub-watershed categories or areas of the Sonoma County section of the Russian River basin (Figures 8-14). For each site, by age-classes, the Sonoma County FishXing evaluation results are provided in Appendix C. The "Comments" column in Appendix C lists assumptions made concerning specific sites while running FishXing.

Most crossings were some form of barrier to juvenile salmonids, more so for young-of-year (y-o-y) and one-year old (1+) juveniles than two-year old fish (2+). For y-o-y and 1+ fish, 92 of 125 (or 73.6%) of the crossings were total barriers. For the resident trout/2+ juveniles, 82 of 125 (or 65.6%) of the crossings were total barriers.

For both age classes of juveniles, their smaller body sizes (relative to adults) renders them most vulnerable to perched culverts or those with velocities during migration flows exceeding two to four feet per second. Passage evaluation scores are provided in the Stream Crossing Ranking Matrix (Appendix E).

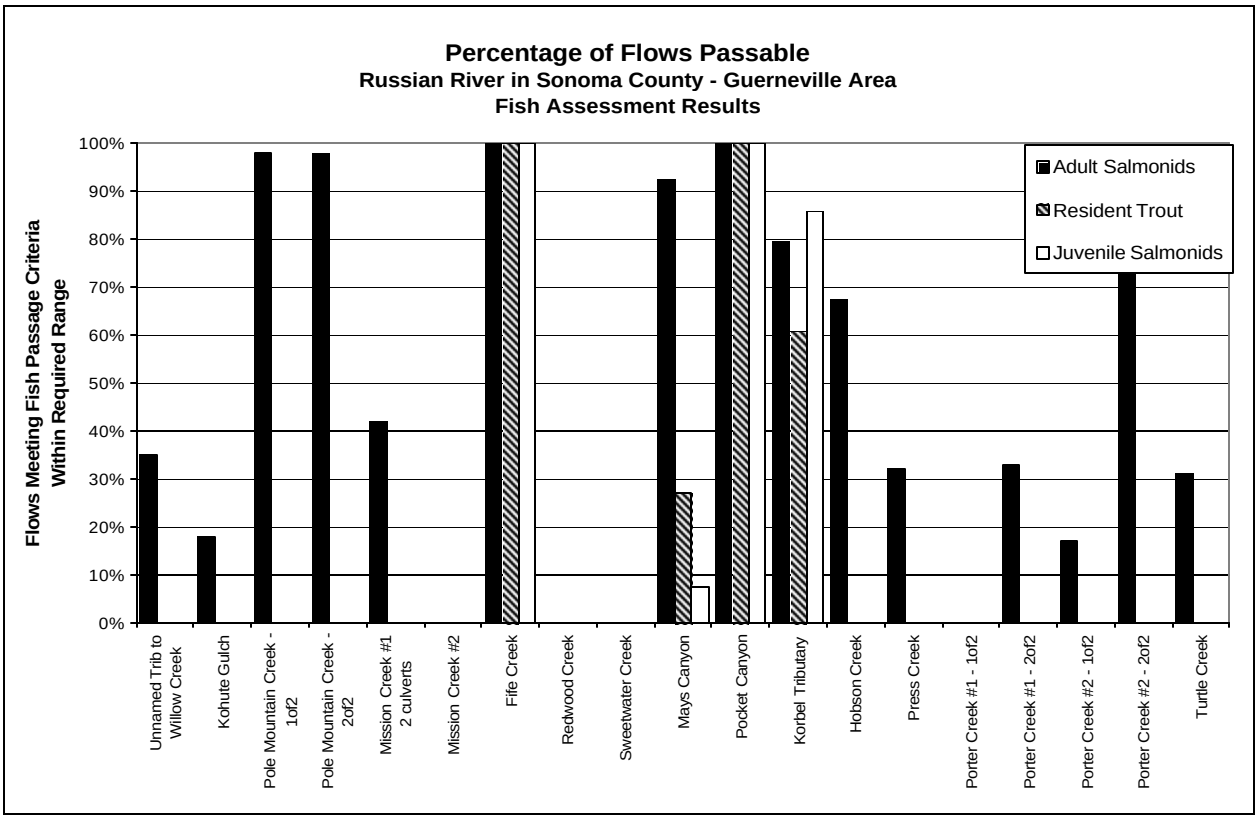


Figure 8. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 16 Sonoma County stream crossings within the Guerneville area, by three groups of life-stages.

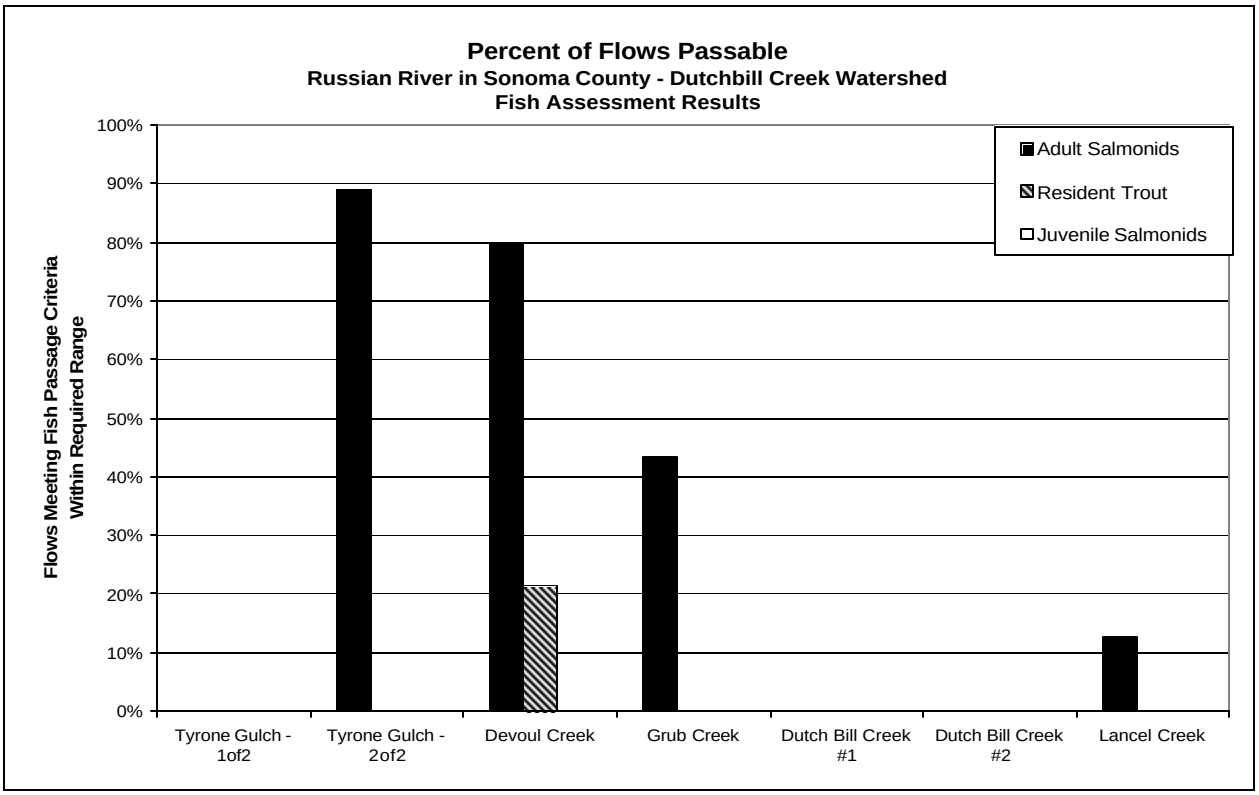


Figure 9. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for six Sonoma County stream crossings within the Dutch Bill Creek sub-basin, by three groups of life-stages.

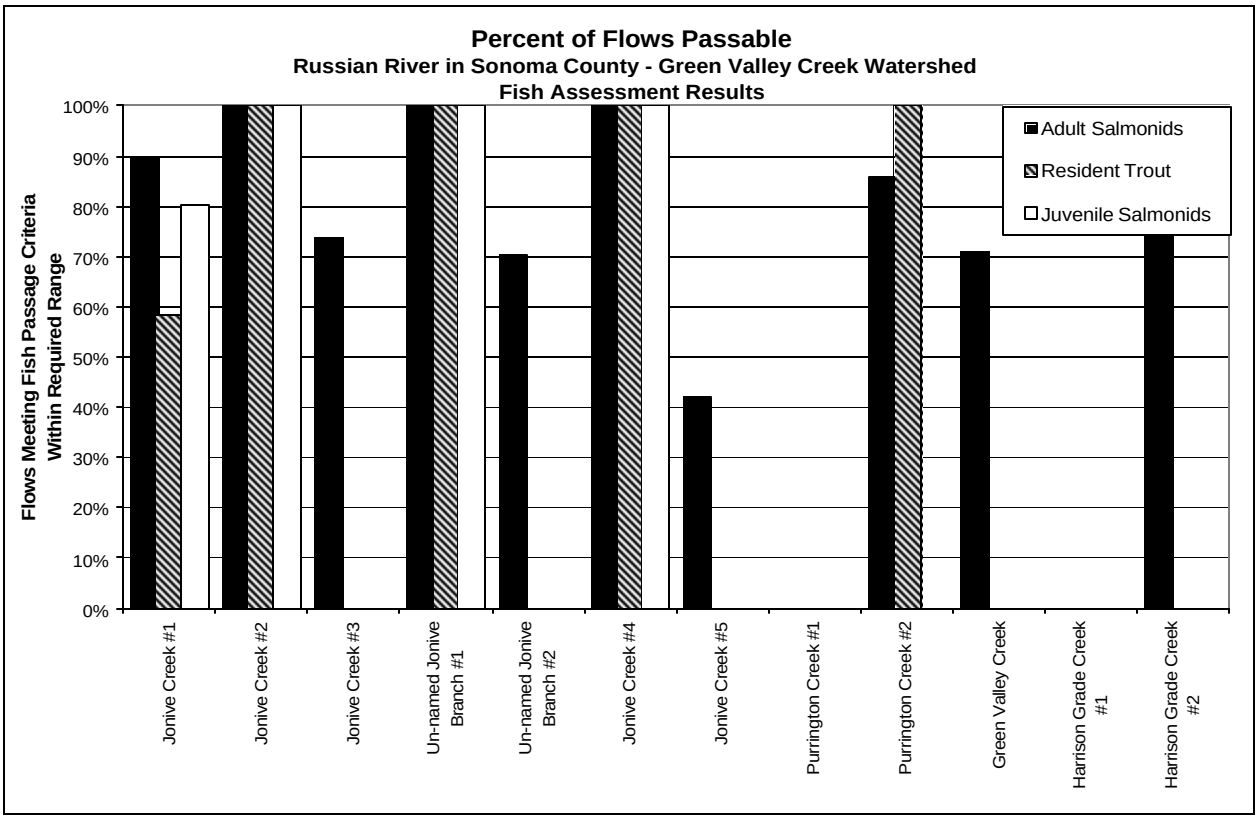


Figure 10. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 12 Sonoma County stream crossings within the Green Valley Creek sub-basin, by three groups of life-stages.

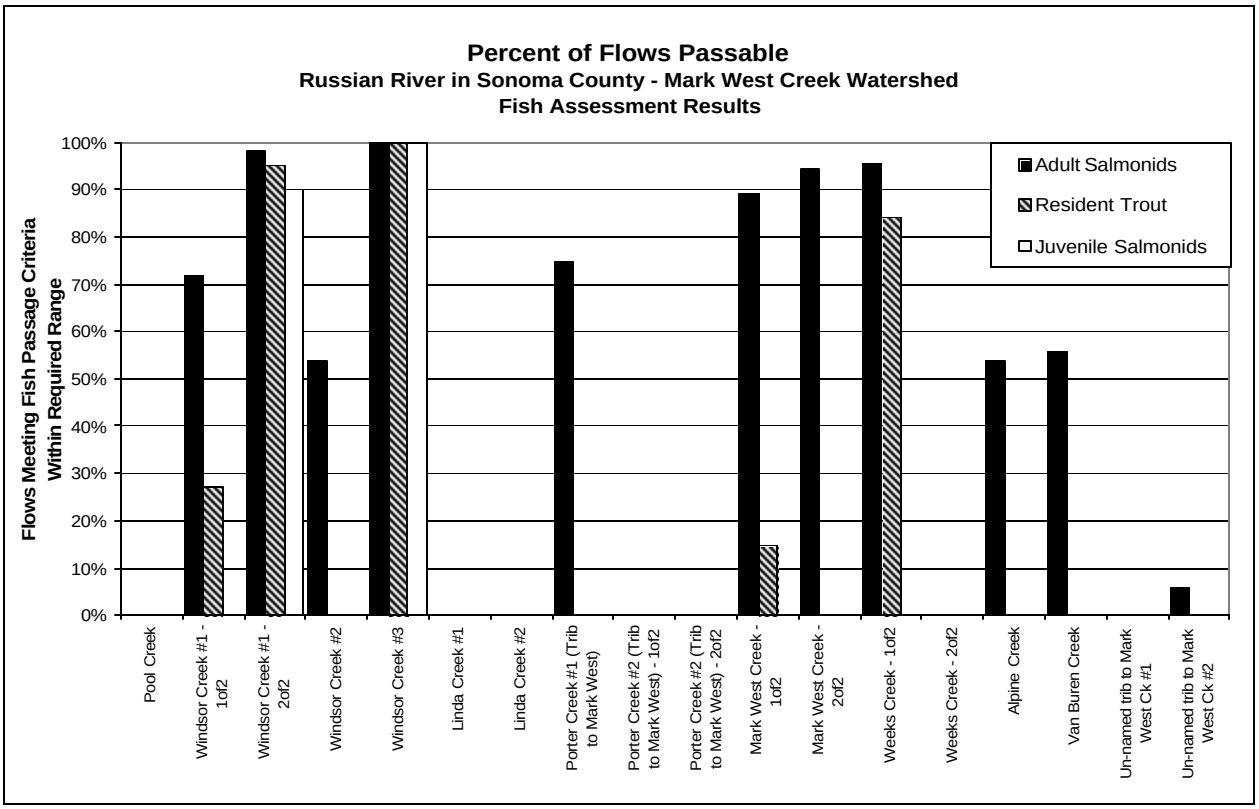


Figure 11. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 15 Sonoma County stream crossings within the Mark West Creek sub-basin, by three groups of life-stages.

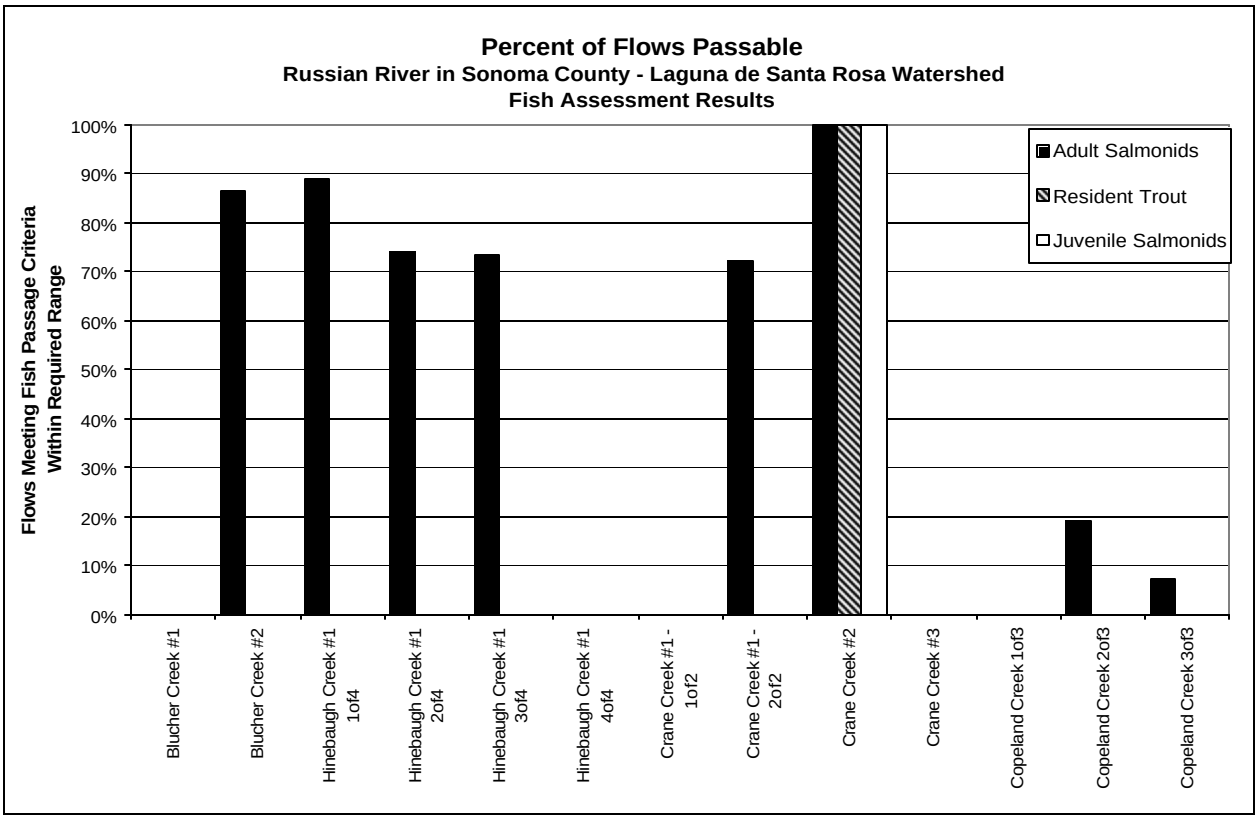


Figure 12. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for seven Sonoma County stream crossings within the Laguna de Santa Rosa sub-basin, by three groups of life-stages.

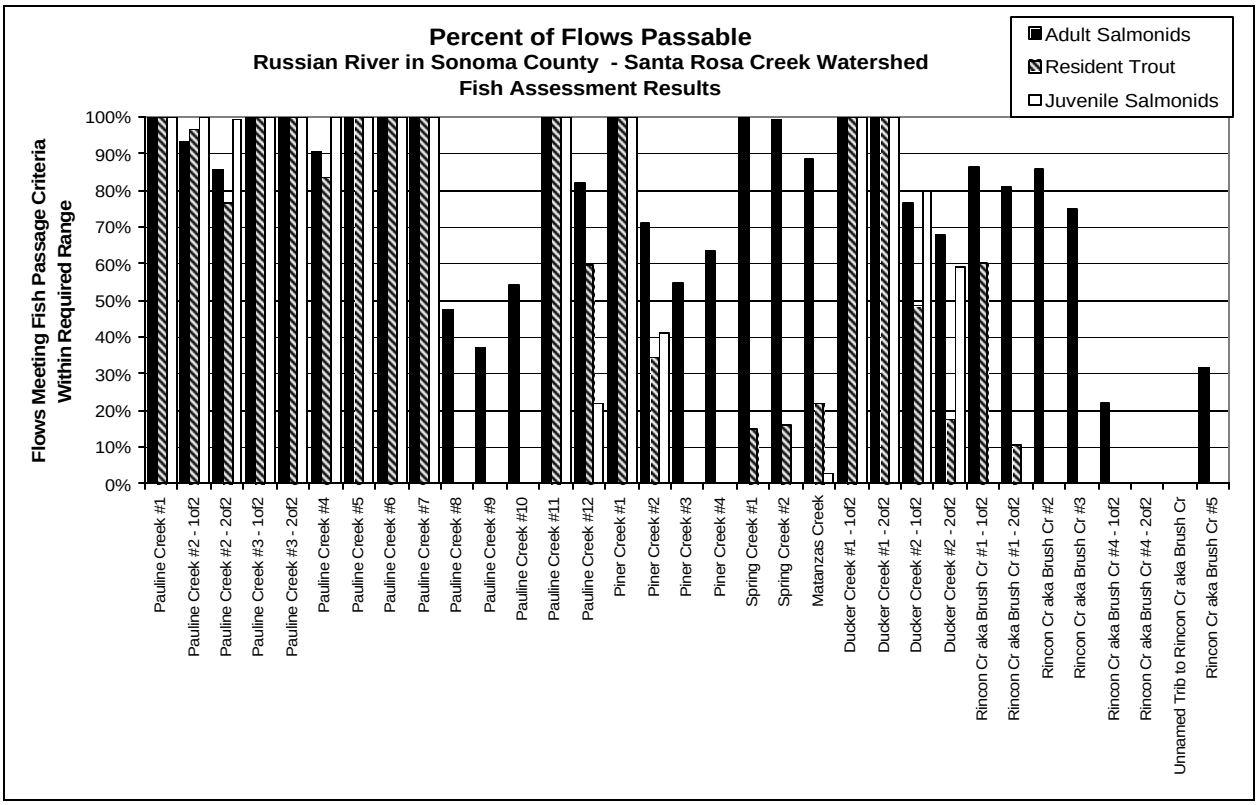


Figure 13. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 27 Sonoma County stream crossings within the Santa Rosa Creek sub-basin, by three groups of life-stages.

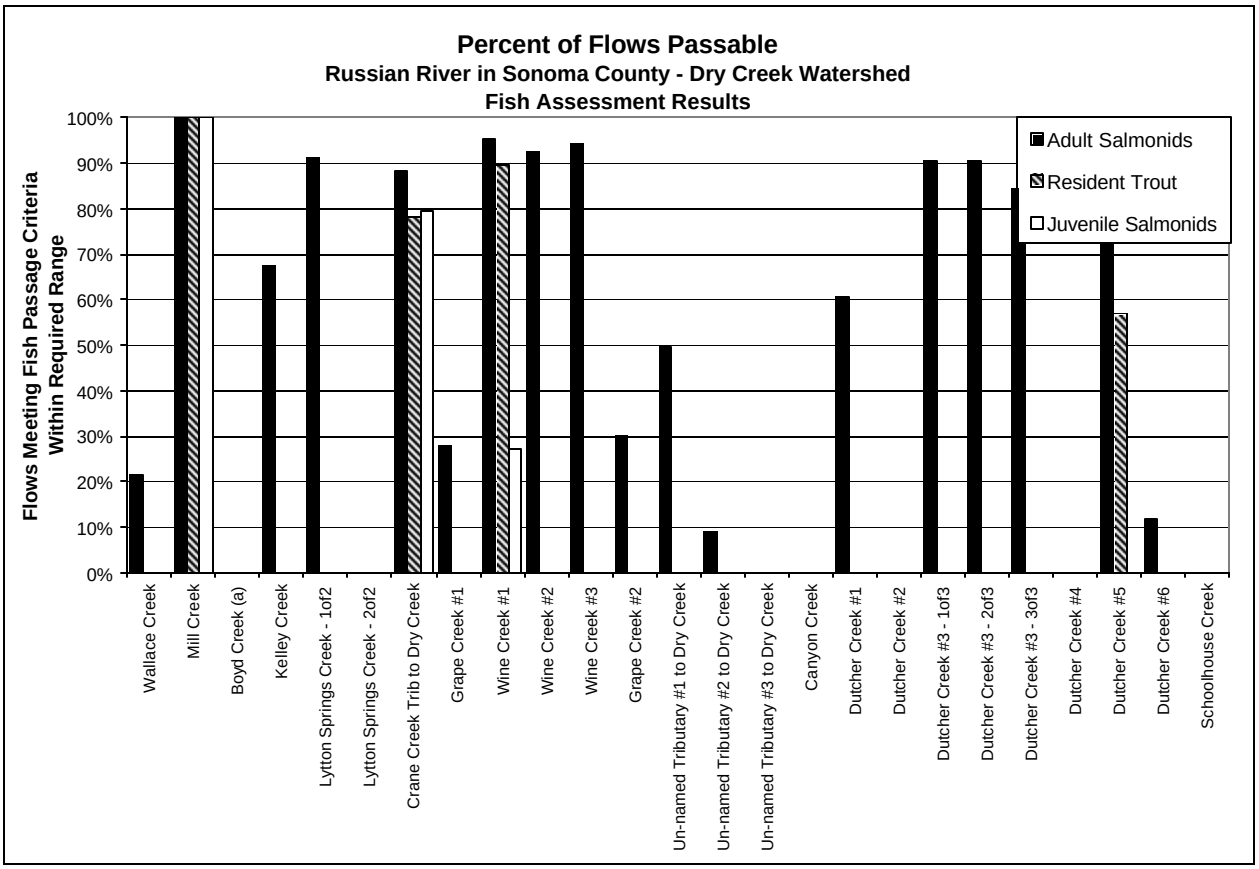


Figure 14. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 22 Sonoma County stream crossings within the Dry Creek sub-basin, by three groups of life-stages.

Mendocino County

The **GREEN-GRAY-RED** first-phase evaluation filter reduced the number of sites requiring in-depth analyses with FishXing. The initial use of the first-phase filter was followed by FishXing evaluations utilizing the conservative swimming abilities and minimum depth requirement as recommended in the CDFG assessment protocol. This initial analysis resulted in 31 of the 58 crossings (53.4% of the sites) defined as **RED**, or failing to meet CDFG's fish passage criteria for adult and juvenile salmonids throughout the entire range of migration flows (CDFG 2001). Examination of the site photos and electro-fishing data from recent surveys suggested adult steelhead were migrating through some of these **RED** crossings.

When the more rigorous swimming abilities of 8-16-16 ft/sec and a minimum water depth of 0.5 feet were used in a second round of FishXing analyses, the number of **RED** crossings dropped to 14 sites (or 24.1% of the sites). The range of migration values for **GRAY** sites also increased and resulted in a wider distribution of the ranking scores.

It is important to note that crossings which failed to meet the more rigorous criteria may still actually provide partial or temporal passage during certain flow conditions, especially if FishXing identified the only violation of the passage criteria as a lack-of-depth. However, all **RED** sites were given a "total barrier" score in the ranking matrix.

Seven stream crossings (12% of the sites) were defined as **GREEN** with the first-phase evaluation filter and were assumed to provide unimpeded passage for all age classes of coho salmon and/or steelhead. These crossings were typically concrete box culverts that spanned at least the average active channel width and were fully embedded with streambed substrate. Due to natural variations in channel morphology, it is recommended that these sites are still periodically inspected to ensure they remain embedded with substrate.

FishXing proved an extremely useful tool in estimating the extent of passage at the 51 **GRAY** and **RED** sites and identifying the probable causes of blockages. However, like most models which attempt to predict complex physical and biological processes with mathematics, the same limitations and assumptions listed in the Sonoma County results must still be acknowledged.

Due to these factors, passage evaluation results generated by FishXing were used conservatively in the ranking matrix by lumping "percent passable" into large (20%) categories. Adult steelhead and coho salmon were lumped as the "adult" run, resident coastal rainbow trout and two-year old (2+) steelhead were grouped as the "resident trout" run, and one-year old (1+) and young-of-the-year (y-o-y) steelhead and coho salmon were grouped as the "juvenile" run.

Passage results generated by FishXing are displayed as "percent passable" for the range of migration flows calculated for each stream crossing location within the four sub-watershed categories or areas of the Mendocino County section of the Russian River basin (Figures 15-18). For each site, by age-classes, the Mendocino County FishXing evaluation results are provided in Appendix D. The "Comments" column in Appendix D lists assumptions made concerning specific sites while running FishXing.

Most crossings were some form of barrier to juvenile salmonids, more so for young-of-year (y-o-y) and one-year old (1+) juveniles than two-year old fish (2+). For y-o-y and 1+ fish, 43 of 58 (or 74.1%) of the crossings were total barriers. For the resident trout/2+ juveniles, 39 of 58 (or 67.2%) of the crossings were total barriers.

For both age classes of juveniles, their small body sizes (relative to adults) renders them most vulnerable to perched culverts or those with velocities during migration flows exceeding two to four feet per second. Passage evaluation scores are provided in the Stream Crossing Ranking Matrix (Appendix E).

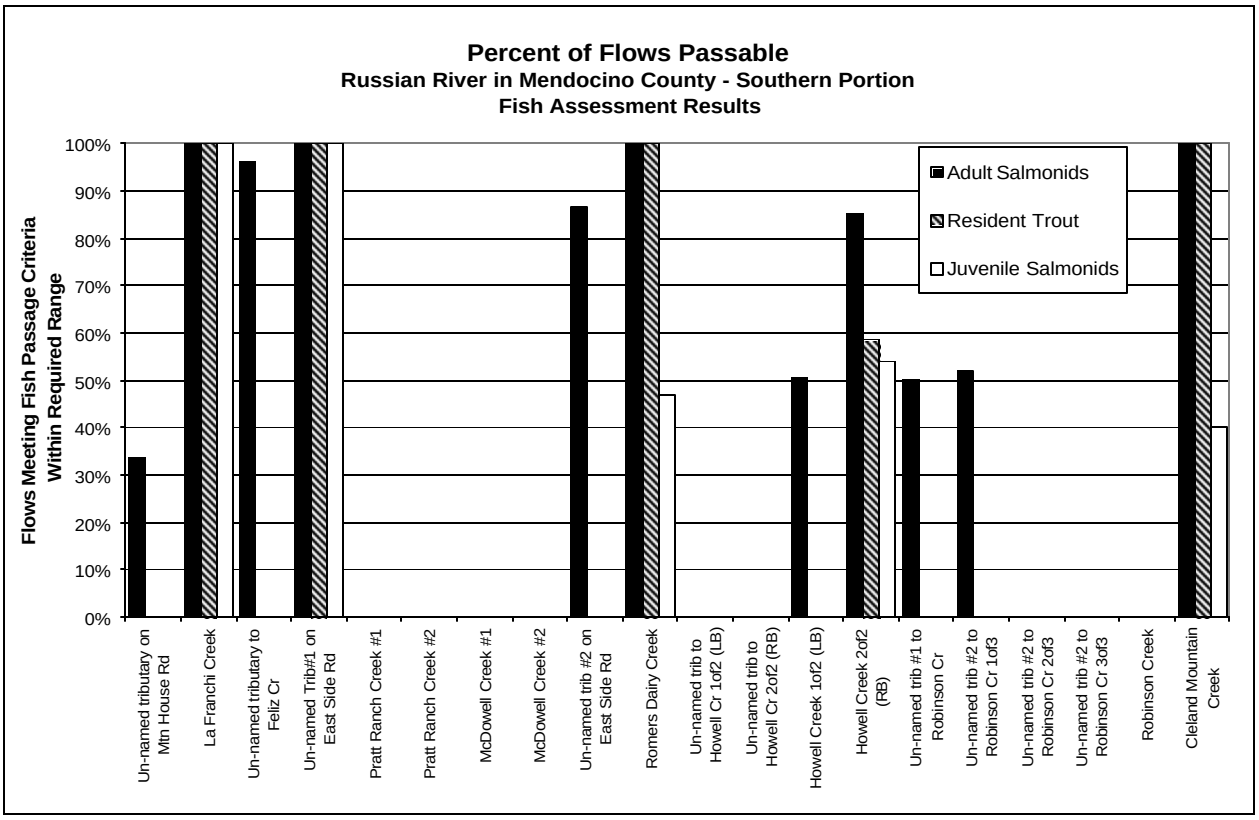


Figure 15. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 16 Mendocino Co. stream crossings within the southern portion of Russian basin, by three groups of life-stages.

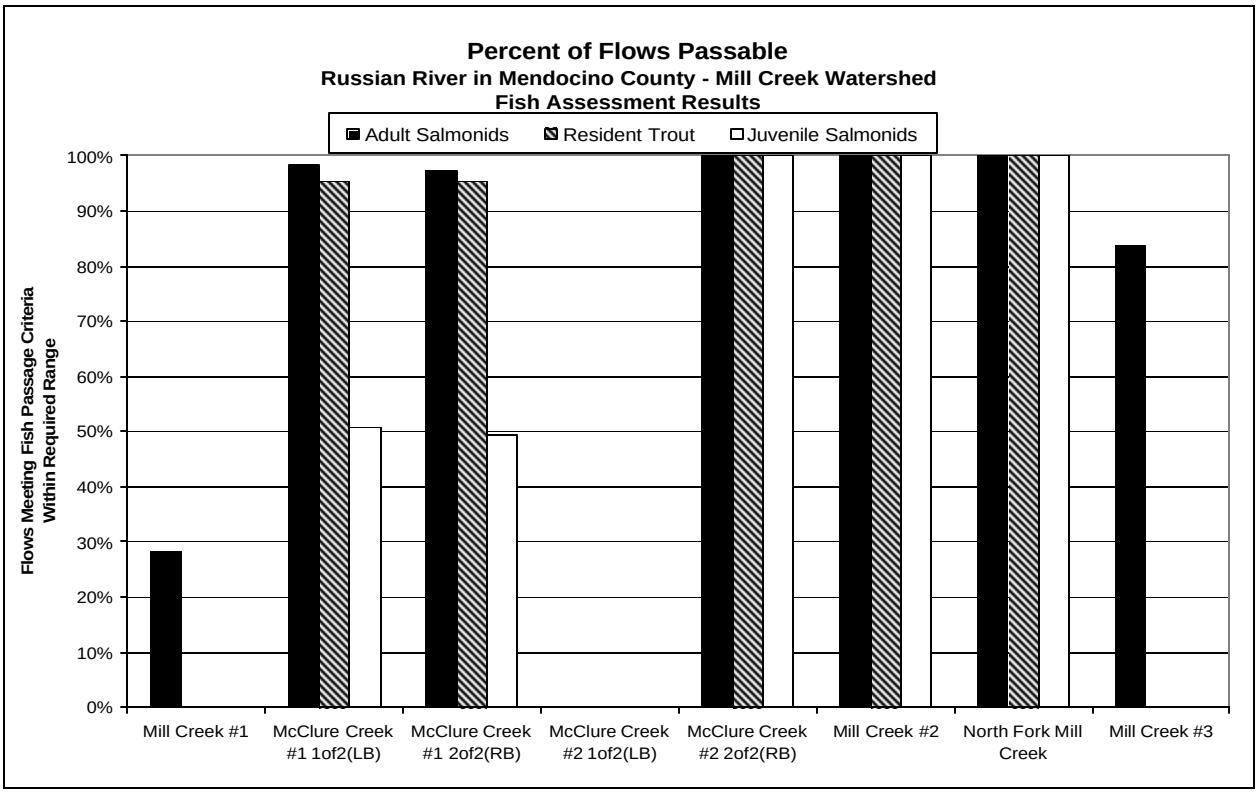


Figure 16. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for six Mendocino County stream crossings within the Mill Creek sub-basin, by three groups of life-stages.

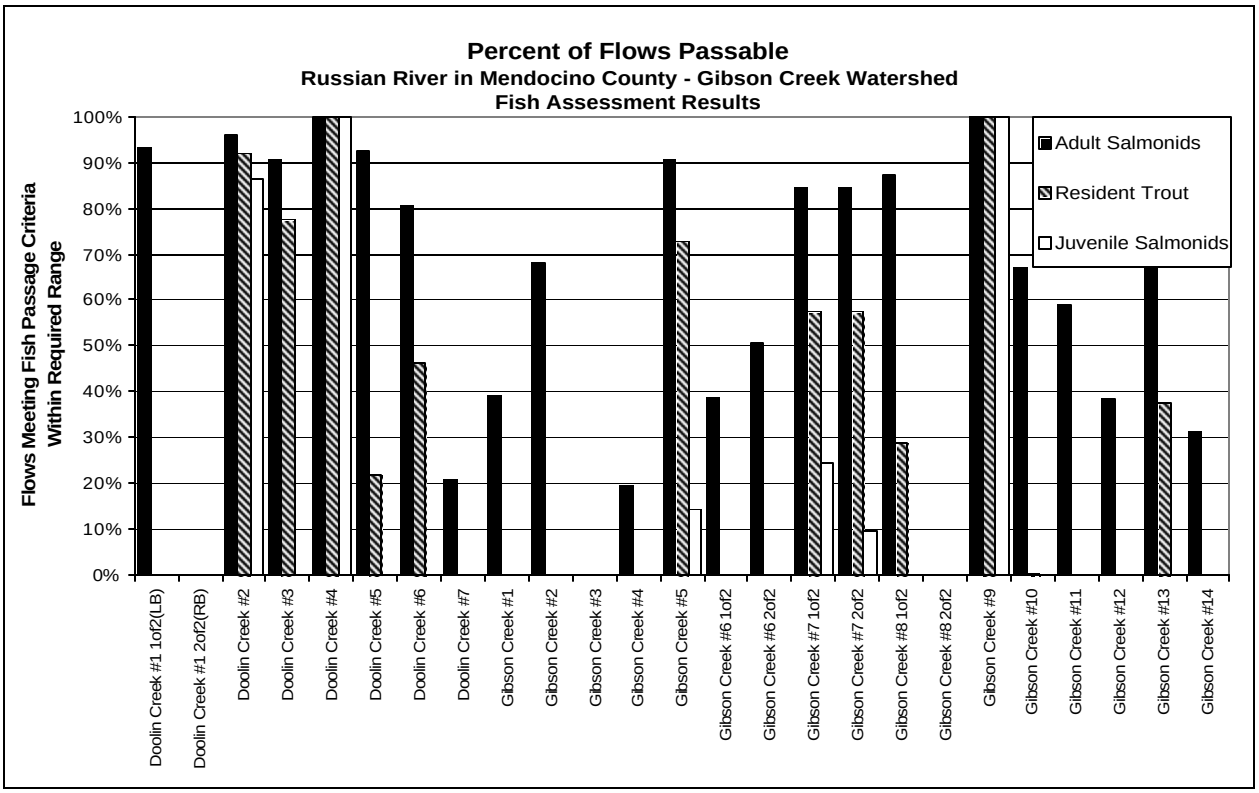


Figure 17. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 21 Mendocino County stream crossings within the Gibson Creek sub-basin, by three groups of life-stages.

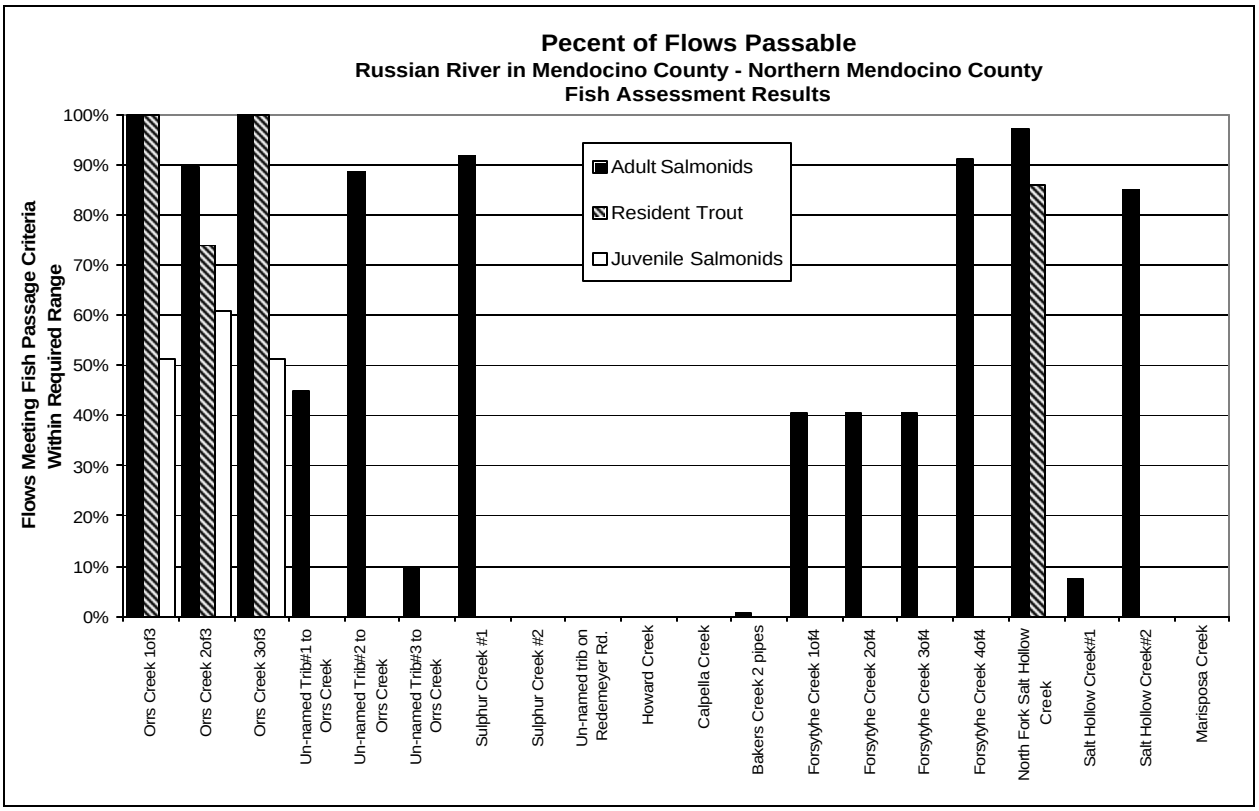


Figure 18. Percent passable as estimated by the Green-Gray-Red evaluation filter and FishXing for 15 Mendocino County stream crossings within the northern portion of Russian River basin, by three groups of life-stages.

Ranking Matrix

The 183 Russian River stream crossings included in this assessment project were ranked for treatment in three separate matrices:

- Sonoma County.
- Mendocino County.
- Sites from both Counties with ranking scores of at least 20.0 points.

The first two lists of ranked sites were developed to provide each County with a comprehensive ranking of all of the crossings assessed within their portion of the Russian River, based on the assumption that each County's DOT will focus primarily on passage issues within the geographic scope of their jurisdictional boundaries.

The ranked list of sites from both Counties was generated to provide CDFG basin planners with a watershed-level ranking of sites throughout the Russian River to provide a broader perspective to assist in the scheduling of treatments at higher-priority crossings. Only sites that scored a minimum of 20.0 points were included in the combined ranked list because this cut-off appeared to capture all of the high-priority sites and a portion of the moderate-priority crossings that would be suitable candidates for treatment with fisheries restoration funding.

Sonoma County

The 125 Sonoma County stream crossings with culverts were sorted in descending order by "Total Score", the sum of the five ranking criteria (Appendix E). This Appendix provides detailed information regarding the numeric score assigned to each criterion that when totaled, resulted in a site's score and rank. The final list of the Sonoma County stream crossings includes a column listing suggested changes to the recommended scheduling of treatments based on professional judgment (Table 7).

Mendocino County

The 58 Sonoma County stream crossings with culverts were sorted in descending order by "Total Score", the sum of the five ranking criteria (Appendix E). This Appendix provides detailed information regarding the numeric score assigned to each criterion that when totaled, resulted in a site's score and rank. The final list of the Mendocino County stream crossings includes a column listing suggested changes to the recommended scheduling of treatments based on professional judgment (Table 8).

Both Counties – Sites with a Minimum Score of 20.0 Points

When 39 sites from both Counties (with scores of at least 20.0 points) were combined into a single ranking list, the top eight crossings were located Sonoma County (Table 9). This is most likely due to the presence of coho salmon in these watersheds.

Table 7. Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Site and any Adjustments made to Final Rank
#1	S-080	Porter Creek #1 (Russian River) - 2 circular pipes	Sweetwater Springs Road	Steelhead	14	11,800	27.3	A replacement is recommended, the current crossing is undersized and in poor condition. Slightly perched, both pipes steep = 3.3% and 7.9%.
#2	S-008	Dutch Bill Creek#2	Footbridge over Dam	Coho, Steelhead	15	17,750	26.2	Still "RED" because of excessive drop over lowermost weir. Recommend complete removal of dam as the best long-term solution.
#3	S-101	Dutcher Creek #4	Dutcher Creek Road	Steelhead	15	19,500	25.2	Used CDFG values for habitat length. Perched outlet (5ft) with lots of riprap at toe of outlet is major migration impediment. Treat downstream migration barriers prior to this site – **drop in ranking.**
#4	S-009	Lancel Creek	Occidental Camp Meeker Road	Coho, Steelhead	14	12,250	24.8	Consider the construction of two downstream boulder weirs to raise tail-water elevation. Corner baffles within the culvert would increase depths and decrease velocities, however consider the potential impacts of the reduction of storm flow conveyance through a moderately undersized culvert. Consider treatment of the two sites located downstream of Lancel Creek - Dutch Bill #1 and #2 prior to treating this site.
#5	S-007	Dutch Bill Creek#1	Market Street	Coho, Steelhead	15	17,950	24.7	Consider the feasibility of constructing a series of eight to ten concrete weirs attached to the culvert's outlet, designed to function as a fishway. It may be appropriate to divert lower flows into one of the bays with a weir across the inlet of one of the bays.
#6	S-010	Mission Creek #1 - 2 circular concrete pipes	Camino Del Arroyo	Coho(historic) Steelhead	13	9,150	24.5	A replacement with an open-bottom arch set on concrete footings or a bridge is recommended. Treat concurrently with Mission Creek #2.
#7	S-103	Dutcher Creek #6	Dutcher Creek Road	Steelhead	14	10,350	24.0	Used CDFG values for habitat length. Treat downstream migration barriers prior to this site – **drop in ranking.**
#8	S-011	Mission Creek #2	Old Cazadero Road	Coho(historic) Steelhead	15	8,450	23.6	A retrofit of the existing box culvert is recommended. Treat concurrently with Mission Creek #2.
#9	S-069	Linda Creek #1	Mark West Springs Road	Steelhead	15	13,050	22.5	Because the crossing is properly sized, a retrofit is recommended. Four to five boulder weirs downstream of the culvert will raise tail-water elevation and corner baffles will increase depths and decrease velocities. Recommend fish passage evaluations at the eight private crossings prior to treatment of this site.
#10	S-099	Dutcher Creek #2	Dutcher Creek Road	Steelhead	15	32,150	22.4	Because the current crossing is properly sized, four to five downstream boulders weirs would raise the tail-water elevation. Corner baffles within the culvert would increase depths and decrease velocities. Consider a beam across one of the inlets to concentrate lower migration flows into a single bay. Treat prior to other Dutcher Creek sites – **raise in rank.**
#11	S-100	Dutcher Creek #3 - 3 pipes	Private Driveway	Steelhead	10	31,900	21.8	Because the current crossing is extremely undersized, the placement of downstream boulders weirs to raise the tail-water elevation is not recommended. Recommend replacement with a flatcar bridge. Also recommend treatment of downstream sites prior to treating this site.
#12	S-079	Press Creek	Sweetwater Springs Road	Steelhead	13	9,800	21.7	Used CDFG habitat length estimate. Good-quality habitat. Site would be a good retrofit project. Inlet plugged with LWD - impediment too.

Table 7 (continued). Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
#13	S-031	Pool Creek	Chalk Hill Road	Steelhead	15	11,600	21.5	Severely perched outlet impedes passage = 4.1 feet. A series of four to five boulder weirs downstream of the crossing will raise the tail-water elevation and cost-effectively improve fish passage. The offset baffles already within the culvert should increase depths and decrease velocities.
#14	S-089	Grape Creek #1	West Dry Creek Road	Steelhead	13	15,950	21.4	Used CDFG habitat length estimate. Slightly perched outlet and lack-of-depth, probably provides some passage. Needs further modification.
#15	S-029	Harrison Grade Creek #1	Green Valley Road	Coho, Steelhead	15	5,300	21.3	A full replacement with a properly sized SSP circular culvert is the best long-term solution for this crossing. Because of the extremely perched of the nature of the current culvert, grade-control structures may be required to minimize headcutting. CDFG sampled juvenile coho in 1995. Local has seen adult steelhead during the winter. Outlet perched nearly 7ft.
Tie #16	S-082	Turtle Creek	West Side Road	Coho, Steelhead	13	10,200	21.1	Because the current crossing is properly sized and in good condition, a retrofit is recommended. Two downstream boulder weirs will raise tailwater elevation (possibly back-water the culvert) and corner baffles within the box culvert will increase depths and decrease velocities. An assessment of the eight-foot diameter private culvert is recommended prior to treating this site.
Tie #16	S-003	Pole Mountain Creek - 2 pipes	Fort Ross Road	Steelhead	12	8,300	21.1	There is a 10% sloped channel reach below the culvert- fish probably do not get past this steep reach of channel – **drop in ranking.**
Tie #16	S-026	Purrington Creek #1	Graton Road	Coho(historic) Steelhead	15	4,700	21.1	Used CDFG habitat length estimate. NOTE: 11,000' downstream there is a splashboard dam approximately five-feet high.
Tie #17	S-104	Schoolhouse Creek	Dry Creek Road	Steelhead	15	1,750	20.8	Used the greater value for habitat length. Crossing is severely undersized - inlet overtops on approximately a three-year storm flow.
Tie #17	S-107	Unnamed Tributary to Barnes Creek - 3 pipes	Private Driveway-Lawton Shurtleff	Steelhead	15	3,100	20.8	Lesser habitat length goes to base of upstream dam/reservoir. Habitat value score based on culvert survey crew's field notes.
#18	S-062	Blucher Creek #1 - 2 bays	Bloomfield Road	Steelhead	15	6,300	20.7	Downstream habitat = 3.6 miles to confluence with Laguna de Santa Rosa. Barrier at the 3.8ft outlet drop - cascade over riprap.
#19	S-083	Wallace Creek	Mill Creek Road	Steelhead	13	26,050	20.6	Used CDFG habitat length estimate. Steeply sloped outlet apron = 52% over four feet. Would be a good site for retrofit project.
Tie #20	S-028	Green Valley Creek	Green Valley Road	Coho, Steelhead	11	11,550	20.5	Two or three downstream boulder weirs and corner baffles within the culvert would cost-effectively improve passage conditions for both adults and juveniles. Other barriers should be addressed by CDFG.
Tie #20	S-002	Kohute Gulch	Austin Creek Road	Steelhead	14	3,000	20.5	Because the current culvert is extremely undersized a full replacement is the only option to improve fish passage and increase storm flow conveyance. Replace with a properly sized open-bottom arch on concrete footings or with a bridge.
Tie #21	S-043	Pauline Creek #9	Chanate Road	Steelhead	13	10,300	20.0	Sized for less than a 5-yr storm flow. . A full replacement is the best long-term solution for improving fish passage and storm flow conveyance, but this is probably cost-prohibitive due to the poor quality of the habitat in Pauline Creek. **Drop in ranking.**
Tie #21	S-097	Canyon Creek	Dry Creek Road	Steelhead	15	28,000	20.0	A local told survey crew there is a migration barrier prior to the Canyon Road crossing. Culver t is severely perched outlet.

Table 7 (continued). Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tie #21	S-067	Crane Creek #3	Pressley Road	Steelhead	15	1,150	20.0	Severely perched outlet (5ft) w/concrete/rock apron. Hardened ford located 30ft upstream appears to impede passage.
#22	S-072	Porter Ck (trib to Mark West) #2 - 2 bays	Calistoga Road	Steelhead	13	15,350	19.9	Culvert is severely perched and has a fish ladder installed in LB bay - not able to model w/FishXing - assumed partial adult passage.
Tie #23	S-092	Wine Creek #3	Koch Road	Coho, Steelhead	10	1,350	19.7	Limited upstream habitat, but this culvert is overdue for a replacement – flatcar bridge recommended. Coho recently observed in creek.
Tie #23	S-014	Sweetwater Creek	Sweetwater Springs Road	Steelhead	15	5,350	19.7	Because the current box culvert is sized for more than a 250-year discharge, the construction of three or four downstream boulder weirs to raise tail-water elevation is a feasible treatment option. Corner baffles or sloped, v-notched concrete weirs within the culvert would also increase depths and decrease velocities. A thorough assessment of the three private crossings on Sweetwater Creek is recommended prior to treating
Tie #23	S-124	Anna Belcher Creek	Pine Flat Road	Steelhead	15	4,350	19.7	Not sure why CDFG length habitat was estimated at 850'. Lack-of-depth in box culvert and 3.5% slope, but probably allows some passage.
Tie #23	S-123	Un-named Tributary to Big Sulphur Creek	Geysers Road	Steelhead	15	650	19.7	Habitat quality of 0.25 based on culvert survey crew's field notes. Creek may not support salmonids. **Drop in ranking.**
Tie #24	S-013	Redwood Creek	Armstrong Woods Road	Steelhead	15	16,550	19.5	Perched concrete box culvert with a 0.4% slope.
Tie #24	S-115	Barrelli Creek	Dutcher Creek Road	Steelhead	15	13,200	19.5	Used CDFG values for habitat length. Box culvert has 2.2% slope over 111ft and lack-of-depth, may allow some passage for adults.
Tie #24	S-033	Windsor Creek #2	Brooks Road	Steelhead	15	32,500	19.5	Outlet drop over riprap actually appears passable for at least adult steelhead. Raising tail-water with weirs would improve conditions.
#25	S-059	Rincon Cr aka Brush Cr #4 - 2 bays	Amber Lane	Steelhead	14	11,700	19.0	Partially remove the concrete floor in the channel – if this does not affect the structural integrity of the crossing. Treat downstream partial/temporal barriers before addressing this crossing.
#26	S-095	Un-named Tributary #2 to Dry Creek	Dry Creek Road	Steelhead	14	3,400	18.9	Used greater value for length of upstream habitat. Habitat quality rating of "poor" = 0.25 based on steepness and small size of channel.
#27	S-125	Hurley Creek	Pine Flat Road	Steelhead	15	5,200	18.8	Used lesser length value. Site is very high in Little Sulphur Creek. Small window of passage flows.
Tie #28	S-098	Dutcher Creek #1	Dry Creek Road	Steelhead	11	32,700	18.7	Because the current crossing is properly sized, two to three downstream boulders weirs would raise the tail-water elevation. Corner baffles within the culvert would increase depths and decrease velocities. Consider a beam across one of the inlets to concentrate lower migration flows into a single bay.
Tie #28	S-071	Porter Ck (trib to Mark West) #1 - 2 bays.	Porter Creek Road	Steelhead	11	23,250	18.7	Used lesser habitat length value. Culvert is slightly perched and has lack-of-depth - probably allows some passage.
Tie #28	S-118	Un-named Tributary #2 on River Road	River Road	Steelhead	15	800	18.7	Used CDFG values for habitat length. Box culvert has 3.9% slope and lack-of-depth, probably allows temporal passage for some adults.
Tie #29	S-093	Grape Creek #2	Wine Creek Road	Steelhead	13	6,200	18.6	Lack-of-depth, probably provides better window of passage than estimated by FishXing.
Tie #29	S-078	Un-named trib to Mark West Ck #2	St.Helena Road	Steelhead	14	550	18.6	Might not be a fish-bearing stream reach - due to extremely steep channel gradient. **Drop in ranking.**

Table 7 (continued). Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tie #29	S-077	Un-named trib to Mark West Ck #1	St.Helena Road	Steelhead	15	550	18.6	Habitat quality rating of "poor" based on a limited length of steep channel available for steelhead spawning and rearing. **Drop in ranking.**
#30	S-068	Copeland Creek - 3 bays	Snyder Lane	Steelhead	14	22,200	18.5	Used lesser habitat length value - one upper trib is not fish-bearing. Lack-of-depth, crossing probably allows for passage of most fish (all life stages).
Tie #31	S-070	Linda Creek #2	Riebli Road	Steelhead	15	3,700	18.4	Slightly perched outlet, probably lack-of-depth - allows some adult passage. Survey noted probable private barrier 100' upstream.
Tie #31	S-102	Dutcher Creek #5	Dutcher Creek Road	Steelhead	8	18,600	18.4	Used CDFG values for habitat length. Survey crew took photo of a dam 30' upstream of Dutcher #5 that is a migration barrier.
Tie #32	S-120	North Branch of Porterfield Creek	Cherry Creek Road	Steelhead	12	3,100	18.3	Used lesser value for length of habitat estimate. Poor habitat quality based on culvert survey crew's field notes. Perched outlet and downstream weir.
Tie #32	S-113	Indian Creek	Hwy 128	Steelhead	15	3,050	18.3	Cattle exclusion gate (board) hanging at perched outlet. Culvert crew described downstream habitat as poor - channelized.
Tie #32	S-060	Unnamed Trib to Rincon Cr aka Brush Cr	Wallace Road	Steelhead	15	3,050	18.3	Probable barrier due primarily to 3ft perched outlet and 3% slope but also probable lack-of-depth and velocity too for juveniles.
#33	S-085	Boyd Creek (a)	Mill Creek Road	Steelhead	15	1,100	18.1	Extremely perched outlet that is a 100% barrier. From steep channel slope off of USGS map - recommend a lower quality score (.25).
Tie #34	S-119	Porterfield Creek	South Cloverdale Blvd	Steelhead	11	9,050	18.0	Use lesser value for length of habitat estimate. Habitat quality of 0.5 based on culvert survey crew's field notes.
Tie #34	S-021	Jonive Creek #3	Furlong Road	Steelhead	11	14,750	18.0	None recommended because current box culvert provides adequate adult passage, is in good condition, and is properly sized. One or two downstream boulder weirs and corner baffles within the culvert would cost-effectively improve passage conditions for juveniles if CDFG deemed this a vital concern.
Tie #34	S-030	Harrison Grade Creek #2	Harrison Grade Road	Coho, Steelhead	10	3,900	18.0	Survey crew talked to local landowner that has seen adult steelhead during the winter below Harrison Grade Creek #1.
#35	S-025	Jonive Creek #5	Wagnon Road	Steelhead	13	5,750	17.9	Used CDFG habitat length estimate.
#36	S-096	Un-named Tributary #3 to Dry Creek	Dry Creek Road	Steelhead	15	3,250	17.8	Used greater value for length of upstream habitat. Habitat quality rating of "poor" = 0.25 based on field assessment by culvert crew.
#37	S-081	Porter Creek #2 (Russian R) - 2 oval pipes	Hendren Driveway	Steelhead	11	1,050	17.6	Used CDFG habitat length. Undersized and in poor condition, but has limited upstream habitat.
Tie #38	S-073	Mark West Creek - 2 bays	Roehmer Road	Steelhead	9	53,600	17.5	None recommended because the crossing provides adequate adult passage and probably allows some juvenile passage too.
Tie #38	S-076	Van Buren Creek	St.Helena Road	Steelhead	12	2,800	17.5	CDFG estimate of habitat length seemed too generous. Off of USGS map there is a 13% slope less than 3,000' upstream of St. Helena Road.
#39	S-116	Un-named Tributary #1 on River Road	River Road	Steelhead	12	1,450	17.4	Used lesser value for habitat length estimate. Habitat quality of 0.25 based on culvert survey crew's notes.
#40	S-091	Wine Creek #2	Koch Road	Coho, Steelhead	10	2,400	17.1	Probably allows for some passage of juvenile steelhead too.

Table 7 (continued). Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tie #41	S-018	Hobson Creek	Westside Road	Steelhead	11	10,750	17.0	Used CDFG length estimate. A bridge is 2600' upstream of Westside Road and then 3100' more to next xing - status unknown.
Tie #41	S-042	Pauline Creek #8	Cleveland Avenue	Steelhead	12	13,250	17.0	Use CDFG habitat lengths.
Tie #41	S-058	Rincon Cr aka Brush Cr #3	Deer Trail Road	Steelhead	12	16,050	17.0	Probably is more passable than FishXing estimates - lack of depth. Xing is new bridge - barrier is remnant slab of old box culvert in channel - remove.
#42	S-063	Blucher Creek #2	Blucher Valley Road	Steelhead	10	1,700	16.9	Although provides adult passage, culvert is sized for <5yr flow and in poor condition.
#43	S-006	Grub Creek	Bohemian Highway	Coho, Steelhead	13	3,950	16.8	Taylor and Associates stopped habitat measurement when channel slope exceeded 10% on the USGS topographic map.
#44	S-001	Unnamed Trib to Willow Creek	Willow Creek Road	Steelhead	13	2,050	16.7	Used CDFG habitat length estimate.
#45	S-061	Rincon Cr aka Brush Cr #5	Riebli Road	Steelhead	13	4,200	16.6	Probably is more passable than FishXing estimates - lack of depth is the only violation of the passage criteria.
#46	S-105	Brooks Creek	Spurgeon Road	Steelhead	13	1,600	16.3	Limit of anadromy is a dam/reservoir.
#47	S-049	Piner Creek #3	Coffey Lane	Steelhead	12	8,700	16.2	None recommended because crossing provides adequate passage (regardless of FishXing output), is properly sized, and is in good condition.
#48	S-051	Spring Creek #1	Summerfield Road	Steelhead	9	8,200	16.1	Severely undersized - inlet overtops on less than a 1-yr flow!
Tie #49	S-052	Spring Creek #2	Stone Hedge Drive	Steelhead	9	7,250	15.8	Use lesser of two length estimates. Severely undersized - inlet overtops on less than a 1-yr flow! Habitat appears poor in site photos.
Tie #49	S-075	Alpine Creek	St.Helena Road	Steelhead	12	1,250	15.8	USGS map indicates a dam/reservoir on Alpine Creek. CDFG habitat length extends upstream of reservoir.
Tie #49	S-004	Tyrone Gulch - 2 pipes	Tyrone Road	Steelhead	10	1,050	15.8	Because both culverts are extremely undersized and the inverts are starting to rust-through, this crossing is probably due for a full replacement with a properly sized open-bottom arch on concrete footings or with a bridge. The limited reach of upstream salmonid habitat makes this site a poor candidate for treatment with fisheries restoration funding.
#50	S-122	Cloverdale Creek #2 - 2 bays	Vista View Drive	Steelhead	11	8,400	15.6	May consider raising quality score to 0.5 based on culvert crew's field notes and presence of y-o-y salmonids. Looks like provides some passage.
Tie #51	S-023	Un-named Jonive Branch #2	Furlong Road	Steelhead	11	2,050	15.5	Used Taylor and Associates habitat length estimate. There appears to be a private crossing about 400' upstream - status unknown.
Tie #51	S-094	Un-named Tributary #1 to Dry Creek	West Dry Creek Road	Steelhead	12	100	15.5	Used lesser value for length of upstream habitat. Habitat quality rating of "poor" = 0.25 based on steepness and small size of channel.
Tie #51	S-065	Crane Creek #1 - 2 bays	Snyder Lane	Steelhead	11	22,300	15.5	None recommended because crossing provides adequate adult passage, is properly sized, and is in good condition. The poor quality habitat also makes this a low-priority site for fisheries habitat restoration.
Tie #51	S-121	Cloverdale Creek #1	East First Street	Steelhead	11	11,800	15.5	May consider raising quality score to 0.5 based on culvert crew's field notes and presence of y-o-y salmonids. Slightly perched box.

Table 7 (continued). Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tie #51	S-074	Weeks Creek - 2 bays	Calistoga Road	Steelhead	10	9,500	15.5	Left Bank bay meets adult criteria on 95% of migration flows. Hardware cloth fencing across inlet could lead to plugging and flooding of crossing.
#52	S-086	Kelley Creek	West Dry Creek Road	Steelhead	11	8,650	15.2	Use lesser value for length of habitat. Lack-of-depth, probably provides better window of passage than estimated by FishXing.
Tie #53	S-044	Pauline Creek #10	Chanate Road	Steelhead	10	8,100	15.0	Use CDFG habitat lengths. Three planks across culvert inlet could cause debris plugging.
Tie #53	S-106	Martin Creek	Private Drive off Spurgeon Road	Steelhead	7	8,050	15.0	Use lesser value for habitat length estimate = to dam/reservoir. Crossing probably provides adequate juvenile passage too.
Tie #53	S-087	Lytton Springs Creek - 2 bays	Dry Creek Road	Steelhead	10	20,650	15.0	Use lesser value for length of habitat - numerous upstream tribs, that may, or may not be fish-bearing.
Tie #54	S-057	Rincon Cr aka Brush Cr #2	Brush Creek Road	Steelhead	10	18,300	14.5	Probably only a partial barrier to adults - slightly perched outlet that spills onto riprap.
Tie #54	S-064	Hinebaugh Creek - 4 bays	Commerce Boulevard	Steelhead	10	54,250	14.5	Probably provides for some juvenile passage too - all four bays are at stream grade. Only 8100' of hab is in mainstem Hinebaugh Ck.
Tie #54	S-005	Devoul Creek	Bohemian Highway	Coho, Steelhead	8	650	14.5	
#55	S-050	Piner Creek #4	Hopper Avenue	Steelhead	11	3,400	13.9	Lack-of-depth is the only violation of the passage criteria - crossing probably provides better passage - juveniles too.
#56	S-015	Mays Canyon	Neeley Road	Steelhead	7	45,900	13.5	None recommended because current box culvert provides adequate passage. However, the culvert is extremely undersized and should eventually be replaced with a properly sized bridge.
#57	S-053	Matanzas Creek	Bethnards Drive	Steelhead	7	14,700	13.2	Used CDFG habitat length estimate. Culvert is backwatered at low-flows - crossing probably allows for juvenile passage too.
#58	S-108	Little Briggs Creek - 5 pipes	Santa Angelina Ranch	Steelhead	8	3,600	12.3	None recommended because current crossing allows adequate adult passage and some juvenile passage. Crossing is also adequately sized and conveys more than a 100-year storm flow.
#59	S-090	Wine Creek #1	Wine Creek Road	Coho, Steelhead	3	4,700	12.0	For all Wine Creek sites - used CDFG habitat length estimates.
#60	S-109	Coon Creek - 4 pipes	Santa Angelina Ranch	Steelhead	7	2,300	11.9	Used CDFG values for habitat length. At least one of the four pipes provides decent passage (two are extremely perched) for all life stages.
#61	S-019	Jonive Creek #1	Bodega Highway	Steelhead	3	28,850	11.5	None recommended because crossing provides adequate passage, is properly sized, and is in good condition.
Tie #62	S-056	Rincon Cr aka Brush Cr #1 - 2 bays	Montecito Blvd	Steelhead	6	36,800	10.5	None recommended because crossing provides adequate passage for most life-stages of steelhead. The crossing can convey more than a 250-year storm-flow and is in good condition.
Tie #62	S-048	Piner Creek #2	Marlow Road	Steelhead	6	23,350	10.5	None recommended because crossing provides adequate passage, is properly sized, and is in good condition.
#63	S-027	Purrington Creek #2	Private Driveway	Coho(historic), Steelhead	5	3,700	10.4	None recommended because the current crossing provides ample fish passage, is in fair condition, and is properly sized for storm flow conveyance.

Table 7 (continued). Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tie #64	S-084	Mill Creek	Mill Creek Road	Steelhead	0	16,200	9.9	Used CDFG habitat length estimate. At stream grade with natural channel-bed through crossing.
Tie #64	S-114	Crocker Creek	River Road	Steelhead	3	4,600	9.9	Used lesser value for habitat length -13% slope over 600' reach at 4600ft. Highly aggraded box culvert, probably from KOA dam's 1995 blow-out.
#65	S-088	Crane Creek (tributary to Dry Cr)	West Dry Creek Road	Steelhead	2	14,950	9.8	None recommended because the current box culvert provides nearly unimpeded passage for all age classes of steelhead, is properly sized for more than a 100-year storm flow, and is in good condition.
#66	S-017	Korbel Tributary	River Road	Steelhead	3	9,350	9.7	Three crossings located upstream of River Road - status unknown.
#67	S-117	Icaria Creek	Asti Road	Steelhead	4	42,250	9.5	Used lesser value for length of habitat estimate. Upstream = 7 private crossings not surveyed and downstream = 3 crossings not surveyed (one under Railroad and two at Airport).
#68	S-111	Gird Creek #2	Wilson Road	Steelhead	5	6,150	8.5	Use CDFG values for habitat length. Not sure if the tributary that has 1100' of habitat upstream of site #3 can support anadromous fish.
Tie #69	S-055	Ducker Creek #2 - 2 bays	Rinconada Drive	Steelhead	4	7,250	7.8	None recommended because crossing provides adequate passage for all life-stages of steelhead. The crossing can convey more than a 250-year storm-flow and is in good condition.
Tie #69	S-046	Pauline Creek #12	Chanate Road	Steelhead	4	3,550	7.8	Use CDFG habitat lengths.
#70	S-012	Fife Creek	Watson Road	Steelhead	0	32,350	7.3	CDFG listed is the "upstream potential", not length surveyed. Any clue to what the State Park xings are like?
Tie #71	S-016	Pocket Canyon	Mays Canyon Road	Steelhead	0	34,800	7.0	At stream grade with natural channel-bed through crossing.
Tie #71	S-020	Jonive Creek #2	Bodega Highway	Steelhead	0	16,000	7.0	At stream grade with natural channel-bed through crossing.
Tie #71	S-066	Crane Creek #2	Petaluma Hill Road	Steelhead	0	15,600	7.0	At stream grade with natural channel-bed through crossing.
Tie #71	S-032	Windsor Creek #1 - 2 bays	Natalie Road	Steelhead	0	34,550	7.0	At stream grade with natural channel-bed through crossing.
#72	S-110	Gird Creek #1	Geysers Road	Steelhead	0	10,550	6.0	Used CDFG values for habitat length. Not sure if the two tributaries that total 5100' of habitat upstream of site #1 can support anadromous fish.
#73	S-024	Jonive Creek #4	Bodega Highway	Steelhead	0	7,450	5.7	Used CDFG habitat length estimate. At stream grade with natural channel-bed through crossing.
#74	S-041	Pauline Creek #7	McBride Lane	Steelhead	0	13,800	5.0	Used CDFG habitat lengths. At stream grade with natural channel-bed through crossing.
#75	S-022	Un-named Jonive Branch #1	Furlong Road	Steelhead	0	5,100	4.6	Used Taylor and Associates habitat length estimate. Habitat appears fairly good in site photos.
Tie #76	S-034	Windsor Creek #3	Brooks Road	Steelhead	0	26,350	4.5	At channel grade = 100% passage.

Table 7 (continued). Ranked list of 125 stream crossings located in the Sonoma County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tie #76	S-035	Pauline Creek #1	Marlow Road	Steelhead	0	21,050	4.5	Used CDFG habitat lengths. At channel grade = 100% passage.
Tie #76	S-036	Pauline Creek #2 - 2 bays	Steele Lane	Steelhead	0	19,350	4.5	Used CDFG habitat lengths. At channel grade = 100% passage.
Tie #76	S-037	Pauline Creek #3 - 2 pipes	Apache Way	Steelhead	0	18,150	4.5	Used CDFG habitat lengths. At channel grade = 100% passage.
Tie #76	S-038	Pauline Creek #4	Coffey Lane	Steelhead	0	17,100	4.5	Used CDFG habitat lengths. At channel grade = 100% passage.
Tie #76	S-039	Pauline Creek #5	Mardie's Lane	Steelhead	0	15,200	4.5	Used CDFG habitat lengths. At channel grade = 100% passage.
Tie #76	S-040	Pauline Creek #6	Range Avenue	Steelhead	0	14,450	4.5	Used CDFG habitat lengths. At channel grade = 100% passage.
Tie #76	S-047	Piner Creek #1	Valdes Drive	Steelhead	0	28,100	4.5	Use lesser of two length estimates. Habitat appears poor.
#77	S-054	Ducker Creek #1 - 2 bays	Benicia Drive	Steelhead	0	7,600	3.9	Use lesser habitat length estimate. At channel grade = 100% passage.
Tie #78	S-045	Pauline Creek #11	County Farm Road	Steelhead	0	4,450	3.1	Use CDFG habitat lengths. At channel grade = 100% passage.
Tie #78	S-112	Gird Creek #3	Geysers Road	Steelhead	0	4,250	3.1	Use CDFG values for habitat length. Not sure if the tributary that has 1100' of habitat upstream of site #3 can support anadromous fish. At channel grade = 100% passage.

Table 8. Ranked list of 58 stream crossings located in the Mendocino County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
#1	M-007	McDowell Creek #1	Hooper Ranch Road	Steelhead	15	5,900	23.4	Severely perched outlet that spills over apron of concrete and riprap. Poor sizing and condition of current crossing warrant a full replacement as the only feasible treatment option.
#2	M-005	Pratt Ranch Creek #1	Pratt Ranch Road	Steelhead	15	8,900	23.2	Severely perched outlet. Culvert was occupied by local guy who wants no Gov't agency on his property - said he sees adult steelhead every year trying to migrate upstream.
#3	M-053	Bakers Creek 2 pipes	Northwestern Pacific RR	Steelhead	15	3,100	22.6	Really funky crossing! Sized to overtop on less than a 5-yr storm and is in poor condition. More than 30,000 cubic yards of fill material in road prism – failure would have major impacts to downstream channel.
#4	M-033	Gibson Creek #4	East Perkins Street	Steelhead	14	8,800	22.5	Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge.
#5	M-058	Mariposa Creek	Tomki Road	Steelhead, coho (historic)	15	7,600	22.3	Culvert is extremely perched. A dam 750ft above culvert limits habitat gain to 2,750 ft (2000' in RB trib). Do not treat this site until landowner agrees to modify upstream dam to allow for fish passage.
#6	M-049	Sulphur Creek #2	Vichy Springs Road	Steelhead	15	15,600	22.0	Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge. Projecting concrete apron at the outlet. Need to assess passage at downstream private crossings before committing to treating this site.
#7	M-032	Gibson Creek #3	Leslie Street	Steelhead	15	9,350	21.8	Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge. CDFG noted this crossing as a steelhead barrier in 1985.
#8	M-006	Pratt Ranch Creek #2	Pratt Ranch Road	Steelhead	15	1,900	21.0	Severely perched outlet that spills over lots of riprap. Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge.
#9	M-052	Calpella Creek	North State Street	Steelhead	15	11,250	20.5	Flat concrete floor at a 3.2% slope over 81.5ft. Prior to treatment, assess other crossings where status is unknown.
#10	M-029	Doolin Creek #7	Laurel Ave	Steelhead	14	4,150	20.2	Use Taylor and Assoc habitat length estimate - up to 11% slope on USGS topographic map. Slightly perched outlet, probably allows temporal/partial passage.
Tied #11	M-017	Mill Creek #1	Private - Parnum Paving	Steelhead	13	42,970	20.0	Concrete outlet apron = 6% slope for nearly 40ft. Is there a second crossing on Parnun property? USGS shows xing just upstream of Mill Creek #1.
Tied #11	M-050	Un-named trib on Redemeyer Rd.	Redemeyer Road	Steelhead	15	29,700	20.0	Extremely perched outlet with some undercutting of box culvert - lots of riprap at outlet too. Any project to improve passage will be costly at this site – may consider dropping in priority.
Tied #11	M-051	Howard Creek	Redemeyer Road	Steelhead	15	17,800	20.0	Severely perched outlet (6.4ft) with a lack-of-depth. Downstream channel has a moderately steep drop over riprap.
#12	M-035	Gibson Creek #6 - 2 bays	North State Street	Steelhead	13	7,100	19.8	Crossing actually provides adequate passage of adults and older juveniles – no treatment recommended. **Drop in ranking.**
Tied #13	M-013	Un-named trib #1 to Robinson Cr	Robinson Creek Road	Steelhead	13	6,200	19.6	Use Taylor and Associates habitat length estimate. Slightly perched outlet, with steeply-sloped concrete apron.

Table 8 (continued). Ranked list of 58 stream crossings located in the Mendocino County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tied #13	M-008	McDowell Creek #2	HWY 175	Steelhead	15	2,600	19.6	Slightly perched outlet. Several y-o-y's observed above and below box culvert. Retrofit is recommended because current crossing is properly sized and in good condition.
#14	M-054	Forsytyhe Creek - 4 pipes	Black Bart Road	Steelhead	12	10,100	19.5	This site is in upper Forsythhe Creek and is above natural falls identified in several past surveys = **drop in ranking.**
Tied #15	M-030	Gibson Creek #1	Orchard Road	Steelhead	13	10,350	19.0	A retrofit should be carefully considered - possible impacts of reduced flow conveyance. An open bottom arch or a bridge is the best long-term solution to improve passage and increase flow capacity.
Tied #15	M-056	Salt Hollow Creek #1	Road B	Steelhead	14	24,650	19.0	Outlet is perched ~ 2ft, has a lower ledge that extends out and riprap. Between sites #1 and #2 there are remains of a box culvert floor under new bridge w/large drop. Need to assess additional (private) crossings.
Tied #15	M-011	Un-named trib to Howell Cr - 2 bays	East Side Road	Steelhead	13	6,050	19.0	Used CDFG habitat length estimate. Slightly perched outlet, but drops over riprap that looks problematic for fish passage.
#16	M-040	Gibson Creek #11	North Dora Street	Steelhead	12	5,700	18.8	Slightly perched outlet with a lack-of-depth. From winter photos, culvert appears to provide temporal/partial passage of at least adult steelhead.
Tied #17	M-041	Gibson Creek #12	Spring Street	Steelhead	13	5,050	18.5	Culvert has a series of baffles comprised of logs - looks like lots of leakage occurs at lower flows, should have more defined notches too.
Tied #17	M-015	Robinson Creek	Pine Ridge Road	Steelhead	15	0	18.5	Should drop this site from ranking because culvert is located upstream of a 650' long, 24% sloped reach of channel.
#18	M-003	Un-named tributary to Feliz Cr	Feliz Creek Road	Steelhead	10	6,100	18.1	Used lesser habitat length value. Habitat quality score based on culvert crew's field notes - yoy's observed in isolated pools. No treatment recommended because crossing allows nearly 100% adult passage.
#19	M-031	Gibson Creek #2	Warren Drive	Steelhead	11	9,700	17.9	Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replacement with a properly sized open-bottom arch or bridge is only feasible treatment option.
#20	M-043	Gibson Creek #14	Standley Street	Steelhead	13	700	17.8	Slightly perched outlet with a lack-of-depth. From winter photos, culvert appears to provide temporal/partial passage of at least adult steelhead.
#21	M-023	Doolin Creek#1 - 2 bays	Babcock Lane	Steelhead	10	20,900	17.5	Culvert is extremely undersized, yet RB bay is nearly full of sediment. Doolin #1 habitat includes 9000+ feet of a northern trib - why didn't we survey this?
#22	M-039	Gibson Creek #10	Bush Street	Steelhead	11	5,950	17.4	At-grade, lack-of-depth, but should provide partial passage of juveniles too. Locals said lots of STHD 30 yrs ago, now is rare to see adults.
#23	M-047	Un-named Trib #3 to Orrs Creek	Pine Ridge Road	Steelhead	15	850	17.2	This tributary is upstream of limit to anadromy on mainstem Orrs Creek - 14%sloped, 600ft reach of channel.
#24	M-045	Un-named Trib #1 to Orrs Creek	Pine Ridge Road	Steelhead	12	0	17.0	This tributary is upstream of limit to anadromy on mainstem Orrs Creek ~5000ft downstream is a 14%sloped, 600ft reach of channel.
Tied #25	M-027	Doolin Creek #5	Talmage Road	Steelhead	9	7,350	16.9	None recommended because the current culvert allows for adequate adult passage, however the crossing is extremely undersized. Periodically inspect for condition and maintenance.
Tied #25	M-001	Un-named tributary #1 on Mtn House Rd	Mountain House road	Steelhead	13	1,650	16.9	Habitat quality score based on culvert survey crew's field notes - small creek, fairly steep, and lots of grazing impacts.

Table 8 (continued). Ranked list of 58 stream crossings located in the Mendocino County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tied #25	M-014	Un-named trib #2 to Robinson Cr - 3 bays	Robinson Creek Road	Steelhead	13	12,950	16.9	CDFG habitat length seems way too generous - channel slopes steepens quickly right after main channel splits into multiple tribs.
#26	M-057	Salt Hollow Creek #2	Road B	Steelhead	10	23,950	16.5	Taylor and Assoc length estimate includes all three branches of creek, CDFG appears to use only two of the tribs.
#27	M-012	Howell Creek - 2 bays	East Side Road	Steelhead	13	7,350	16.3	Used Taylor and Assoc. habitat length estimate. At-grade crossing, lack-of-depth fails to meet criteria, but probably allows partial/temporal passage.
#28	M-048	Sulphur Creek #1	Vichy Springs Road	Steelhead	10	20,900	16.0	Lack-of-depth, but provides nearly 100% adult passage – no treatment recommended.
#29	M-046	Un-named Trib #2 to Orrs Creek	Pine Ridge Road	Steelhead	10	1,050	15.8	This tributary is upstream of limit to anadromy on mainstem Orrs Creek - 14% sloped, 600ft reach of channel.
#30	M-009	Un-named trib #2 on East Side Rd	East Side Road	Steelhead	10	2,800	15.7	Use lesser habitat length value. Habitat quality score based on culvert crew's field notes. Local says creek dries every summer by June at the latest.
#31	M-037	Gibson Creek #8 - 2 bays	Oak Street	Steelhead	8	6,500	15.6	None recommended because current culvert provides adequate passage. Channel upstream of culvert is a concrete ditch.
#32	M-028	Doolin Creek #6	Wabash Ave	Steelhead	9	4,300	15.2	None recommended because the current culvert allows for adequate adult passage, however the crossing is extremely undersized.
#33	M-034	Gibson Creek #5	Mason Street	Steelhead	7	8,200	14.3	None recommended because current culvert provides adequate passage.
Tied #34	M-042	Gibson Creek #13	Barnes Street	Steelhead	7	4,250	14.2	None recommended because current culvert provides adequate passage for adult steelhead and probably some passage of resident coastal rainbow trout and older juveniles.
Tied #34	M-022	Mill Creek #3	Mill Creek Road	Steelhead	10	2,700	14.2	Use Taylor and Assoc. length of habitat up to 1st dam on USGS map. Moderately perched outlet ~ 2ft.
#35	M-025	Doolin Creek #3	Betty Street	Steelhead	6	8,600	13.9	None recommended because the current box culvert allows for nearly 100% passage, however the crossing is extremely undersized.
#36	M-036	Gibson Creek #7 - 2 bays	School Street	Steelhead	5	6,800	12.7	None recommended because current culvert provides adequate passage.
#37	M-055	North Fork Salt Hollow Creek	Road B	Steelhead	5	5,550	11.4	CDFG length estimate seems too short. Local said the good flow in creek was the result of leakage from an u.s. impoundment, also hadn't seen fish in 40-50yrs.
#38	M-044	Orrs Creek - 3 pipes	Oak Street	Steelhead	2	17,000	9.9	Used Taylor and Assoc length of habitat = to falls ID by CDFG survey. Crossing is three large arches, set at stream grade = good passage.
#39	M-018	McClure Creek #1 - 2 bays	Sanford Ranch Road	Steelhead	2	20,400	9.5	Used Taylor and Assoc. length of habitat. CDFG estimate stopped at 6% slope. LB bay is highly embedded.
#40	M-016	Cleland Mountain Creek	South State Street	Steelhead	3	3,650	8.9	Used lesser habitat length value. Habitat quality score based on culvert crew's field notes. Local says creek dries every summer by June at the latest.
#41	M-026	Doolin Creek #4	Cunningham Street	Steelhead	0	7,650	8.1	Fully embedded culvert. Local said he's seen adult steelhead moving through this reach of creek during winter storms.

Table 8 (continued). Ranked list of 58 stream crossings located in the Mendocino County portion of the Russian River Basin.

Initial Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
Tied #42	M-019	McClure Creek #2 - 2 bays	Sanford Ranch Road	Steelhead	15	16,400	7.5	None recommended because the current crossing provides adequate passage and is in good condition. However, the two-bay box culvert is undersized and should be periodically inspected for condition and maintenance.
Tied #42	M-020	Mill Creek #2	HWY 222	Steelhead	0	20,250	7.5	None recommended because the current crossing provides adequate passage and is in good condition. However, the two-bay box culvert is undersized and should be periodically inspected for condition and maintenance.
#43	M-038	Gibson Creek #9	Pine Street	Steelhead	0	6,300	7.0	None recommended because current culvert provides unimpeded passage for all steelhead life stages.
#44	M-024	Doolin Creek #2	Lorraine Street	Steelhead	0	8,900	6.7	None recommended because the current box culvert allows for nearly 100% passage, however the crossing is extremely undersized.
#45	M-002	La Franchi Creek	Mountain House road	Steelhead	0	5,900	6.0	None recommended because the current box culvert is in good condition and provides unimpeded passage for all age classes of steelhead.
#46	M-021	North Fork Mill Creek	Guidiville road	Steelhead	0	4,450	5.1	None recommended because the current crossing provides adequate passage and is in good condition. However, the culvert is undersized and should be periodically inspected for condition and maintenance.
#47	M-004	Un-named Trib#1 on East Side Rd	East Side Road	Steelhead	0	12,000	5.0	None recommended because the current culvert is in good condition, passes nearly a 70-year storm flow, and provides unimpeded passage for all age classes of steelhead.
#48	M-010	Romers Dairy Creek	Romers Dairy Rd	Steelhead	2	2,100	4.5	None required, culvert allows passage, is in good condition, and is properly sized for flow conveyance. The current box culvert is fully embedded with cobbles, gravels, and fines.

Table 9. Ranked list of 39 stream crossings located in Sonoma and Mendocino Counties with a Ranking Matrix Score of = 20.0 points.

Basin-wide RANK	Co. Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
#1	**#1**	S-080	Porter Creek #1 (Russian R)- 2 circular pipes	Sweetwater Springs Road	Steelhead	14	11,800	27.3	A replacement is recommended, the current crossing is undersized and in poor condition. Slightly perched, both pipes steep = 3.3% and 7.9%.
#2	**#2**	S-008	Dutch Bill Creek#2	Footbridge over Dam	Coho, Steelhead	15	17,750	26.2	Still "RED" because of excessive drop over lowermost weir. Recommend complete removal of dam as the best long-term solution.
#3	**#3**	S-101	Dutcher Creek #4	Dutcher Creek Road	Steelhead	15	19,500	25.2	Used CDFG values for habitat length. Perched outlet (5ft) with lots of riprap at toe of outlet is major migration impediment. Treat downstream migration barriers prior to this site – **drop in ranking.**
#4	**#4**	S-009	Lancel Creek	Occidental Camp Meeker Road	Coho, Steelhead	14	12,250	24.8	Consider the construction of two downstream boulder weirs to raise tail-water elevation. Corner baffles within the culvert would increase depths and decrease velocities, however consider the potential impacts of the reduction of storm flow conveyance through a moderately undersized culvert. Consider treatment of the two sites located downstream of Lancel Creek - Dutch Bill #1 and #2 prior to treating this site.
#5	**#5**	S-007	Dutch Bill Creek#1	Market Street	Coho, Steelhead	15	17,950	24.7	Consider the feasibility of constructing a series of eight to ten concrete weirs attached to the culvert's outlet, designed to function as a fishway. It may be appropriate to divert lower flows into one of the bays with a weir across the inlet of one of the bays.
#6	**#6**	S-010	Mission Creek #1 - 2 culverts	Camino Del Arroyo	Coho(historic), Steelhead	13	9,150	24.5	A replacement with an open-bottom arch set on concrete footings or a bridge is recommended. Treat concurrently with Mission Creek #2.
#7	**#7**	S-103	Dutcher Creek #6	Dutcher Creek Road	Steelhead	14	10,350	24.0	Used CDFG values for habitat length. Treat downstream migration barriers prior to this site – **drop in ranking.**
#8	**#8**	S-011	Mission Creek #2	Old Cazadero Road	Coho(historic), Steelhead	15	8,450	23.6	A retrofit of the existing box culvert is recommended. Treat concurrently with Mission Creek #2.
#9	**#1**	M-007	McDowell Creek #1	Hooper Ranch Road	Steelhead	15	5,900	23.4	Severely perched outlet that spills over apron of concrete and riprap. Poor sizing and condition of current crossing warrant a full replacement as the only feasible treatment option.
#10	**#2**	M-005	Pratt Ranch Creek #1	Pratt Ranch Road	Steelhead	15	8,900	23.2	Use CDFG habitat length estimate. Severely perched outlet. Culvert was occupied by local guy who wants no Gov't agency on his property - said he sees adult steelhead every year trying to migrate upstream.

Table 9 (continued). Ranked list of 39 stream crossings located in Sonoma and Mendocino Counties with a Ranking Matrix Score of = 20.0 points.

Basin-wide RANK	Co. Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
#11	**#3**	M-053	Bakers Creek 2 pipes	Northwestern Pacific RR	Steelhead	15	3,100	22.6	Really funky crossing! Sized to overtop on less than a 5-yr storm and is in poor condition. More than 30,000 cubic yards of fill material in road prism – failure would have major impacts to downstream channel.
Tie #12	**#4**	M-033	Gibson Creek #4	East Perkins Street	Steelhead	14	8,800	22.5	Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge.
Tie #12	**#9**	S-069	Linda Creek #1 (Palmer Creek?)	Mark West Springs Road	Steelhead	15	13,050	22.5	Because the crossing is properly sized, a retrofit is recommended. Four to five boulder weirs downstream of the culvert will raise tail-water elevation and corner baffles will increase depths and decrease velocities. Recommend fish passage evaluations at the eight private crossings prior to treatment of this site.
#13	**#10**	S-099	Dutcher Creek #2	Dutcher Creek Road	Steelhead	15	32,150	22.4	Because the current crossing is properly sized, four to five downstream boulders weirs would raise the tail-water elevation. Corner baffles within the culvert would increase depths and decrease velocities. Consider a beam across one of the inlets to concentrate lower migration flows into a single bay. Treat prior to other Dutcher Creek sites – **raise in rank.**
#14	**#6**	M-058	Mariposa Creek	Tomki Road	Steelhead, coho (historic)	15	7,600	22.3	Culvert is extremely perched. A dam 750ft above culvert limits habitat gain to 2,750 ft (2000' in RB trib). Do not treat this site until landowner agrees to modify upstream dam to allow for fish passage.
#15	**#7**	M-049	Sulphur Creek #2	Vichy Springs Road	Steelhead	15	15,600	22.0	Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge. Projecting concrete apron at the outlet. Need to assess passage at downstream private crossings before committing to treating this site.
Tie #16	**#11**	S-100	Dutcher Creek #3 - 3 pipes	Private Driveway	Steelhead	10	31,900	21.8	Use CDFG values for habitat length. Have two outlet pics - good contrast between dry channel and with winter flow.
Tie #16	**#8**	M-032	Gibson Creek #3	Leslie Street	Steelhead	15	9,350	21.8	Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge. CDFG noted this crossing as a steelhead barrier in 1985.

Table 9 (continued). Ranked list of 39 stream crossings located in Sonoma and Mendocino Counties with a Ranking Matrix Score of = 20.0 points.

Basin-wide RANK	Co. Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
#17	#12	S-079	Press Creek	Sweetwater Springs Road	Steelhead	13	9,800	21.7	Use CDFG habitat length estimate. Good-quality habitat. Site would be a good retrofit project. Inlet plugged with LWD - impediment too.
#18	#13	S-031	Pool Creek	Chalk Hill Road	Steelhead	15	11,600	21.5	Severely perched outlet impedes passage = 4.1 feet. A series of four to five boulder weirs downstream of the crossing will raise the tail-water elevation and cost-effectively improve fish passage. The offset baffles already within the culvert should increase depths and decrease velocities.
#19	#14	S-089	Grape Creek #1	West Dry Creek Road	Steelhead	13	15,950	21.4	Use CDFG habitat length estimate. Slightly perched outlet and lack-of-depth, probably provides some passage. Needs further modification.
#20	#15	S-029	Harrison Grade Creek #1	Green Valley Road	Coho, Steelhead	15	5,300	21.3	A full replacement with a properly sized SSP circular culvert is the best long-term solution for this crossing. Because of the extremely perched of the nature of the current culvert, grade-control structures may be required to minimize headcutting. CDFG sampled juvenile coho in 1995. Local has seen adult steelhead during the winter. Outlet perched nearly 7ft.
Tie #21	Tie #16	S-082	Turtle Creek	West Side Road	Coho, Steelhead	13	10,200	21.1	Because the current crossing is properly sized and in good condition, a retrofit is recommended. Two downstream boulder weirs will raise tailwater elevation (possibly back-water the culvert) and corner baffles within the box culvert will increase depths and decrease velocities. An assessment of the eight-foot diameter private culvert is recommended prior to treating this site.
Tie #21	Tie #16	S-026	Purrington Creek #1	Graton Road	Coho(historic), Steelhead	15	4,700	21.1	Used CDFG habitat length estimate. NOTE: 11,000' downstream there is a splashboard dam approximately five-feet high.
#22	#9	M-006	Pratt Ranch Creek #2	Pratt Ranch Road	Steelhead	15	1,900	21.0	Severely perched outlet that spills over riprap. Current box culvert is extremely undersized – retrofit would further reduce flow capacity. Replace with a properly sized open-bottom arch or bridge.
Tie #23	Tie #17	S-104	Schoolhouse Creek	Dry Creek Road	Steelhead	15	1,750	20.8	Use greater value for habitat length. Inlet overtops on ~ 3yr flow.
Tie #23	Tie #17	S-107	Unnamed Tributary to Barnes Creek - 3 pipes	Private Driveway-Lawton Shurtleff	Steelhead	15	3,100	20.8	Lesser habitat length goes to base of upstream dam/reservoir. Habitat value score based on culvert survey crew's field notes.

Table 9 (continued). Ranked list of 39 stream crossings located in Sonoma and Mendocino Counties with a Ranking Matrix Score of = 20.0 points.

Basin-wide RANK	Co. Rank	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Barrier Score	Length of Upstream Habitat	TOTAL SCORE	Comments Regarding Adjustments to Final Ranking
#24	#18	S-062	Blucher Creek #1 - 2 bays	Bloomfield Road	Steelhead	15	6,300	20.7	Use lesser estimate of habitat length. Downstream habitat = 3.6 miles to confluence with Laguna de Santa Rosa. 3.8ft drop - cascade over riprap.
#25	#19	S-083	Wallace Creek	Mill Creek Road	Steelhead	13	26,050	20.6	Use CDFG habitat length estimate. Steeply sloped outlet apron = 52% over four feet. Would be a good site for retrofit project.
Tie #26	Tie #20	S-028	Green Valley Creek	Green Valley Road	Coho,Steelhead	11	11,550	20.5	Where did CDFG survey consider the end of anadromy? Tom and Anabel looked at upper Co. xing and said "not fish-bearing channel".
Tie #26	#11	M-052	Calpella Creek	North State Street	Steelhead	15	11,250	20.5	Flat concrete floor at a 3.2% slope over 81.5ft. Prior to treatment, assess other crossings where status is unknown.
Tie #26	Tie #20	S-002	Kohute Gulch	Austin Creek Road	Steelhead	14	3,000	20.5	Because the current culvert is extremely undersized a full replacement is the only option to improve fish passage and increase storm flow conveyance. Replace with a properly sized open-bottom arch on concrete footings or with a bridge.
#27	#12	M-029	Doolin Creek #7	Laurel Ave	Steelhead	14	4,150	20.2	Use Taylor and Assoc habitat length estimate - up to 11% slope on USGS topo map. Slightly perched outlet, probably allows temporal/partial passage.
Tie #28	Tied #13	M-017	Mill Creek #1	Private - Parnum Paving	Steelhead	13	42,970	20.0	Concrete outlet apron = 6% slope for nearly 40ft. Is there a second xing on Parnun property?? USGS shows xing just upstream of Mill Creek #1.
Tie #28	Tied #13	M-050	Un-named trib on Redemeyer Rd.	Redemeyer Road	Steelhead	15	29,700	20.0	Extremely perched outlet with some undercutting of box culvert - lots of riprap at outlet too. Any project to improve passage will be costly at this site.
Tie #28	Tied #13	M-051	Howard Creek	Redemeyer Road	Steelhead	15	17,800	20.0	Slightly perched outlet with a lack-of-depth. Downstream channel has a moderately steep drop over riprap. 10,000 ft of habitat until next xing.
Tie #28	Tie #21	S-043	Pauline Creek #9	Chanate Road	Steelhead	13	10,300	20.0	Use CDFG habitat lengths. Sized for less than a 5-yr storm flow.
Tie #28	Tie #21	S-097	Canyon Creek	Dry Creek Road	Steelhead	15	28,000	20.0	A local told survey crew there is a migration barrier prior to the Canyon Road xing. Severely perched outlet.
Tie #28	Tie #21	S-067	Crane Creek #3	Pressley Road	Steelhead	15	1,150	20.0	CDFG length of anadromy seems too long. Severely perched outlet (5ft) w/concrete/rock apron. Hardened ford located 30ft u.s.

Site-Specific Treatments and Scheduling

High and Moderate Priority Sites

During the past five years, several sources of restorations funds have been available for treating priority culverts – SB271, California Coastal Salmon Recovery Program (CCSRP), and Proposition 13 (Clean Water Bond). As of March, 2003 Sonoma County has:

- Secured funding to replace the crossing at Porter Creek #1/Sweetwater Springs Road (scheduled for construction – summer/fall of 2003). This stream crossing was assessed by CDFG and NMFS as a probable high-priority site before this fish passage project was started. The site ended up receiving the top score based on the ranking matrix.

- Secured funding to retrofit the box culvert at Dutch Bill Creek #1/Market Street. NMFS's hydraulic engineer is currently assisting the County DOT and the Gold Ridge Resource Conservation District in a retrofit design to eliminate the extremely perched outlet (scheduled for construction – summer/fall of 2003 or 2004).

Sonoma County DOT and the FishNet4C chair-person have held discussions regarding the development of a multi-year plan for scheduling the funding, permitting, and implementation of the remaining 27 high and moderate priority sites listed on Table 10. The exact scheduling of sites has yet to be decided, however the County tentatively plans to address two to four crossings annually. The general framework of the multi-year plan assumes that to treat a single site involves roughly a two-year timeline to complete the following phases:

- Develop project design and budget
- Proposal(s) written and submitted
- Grant(s) awarded
- Contract(s) signed
- Permits developed
- Project implemented

As of 2003, Mendocino County DOT is in the process of addressing high-priority stream crossings outside of the Russian River watershed that were identified in a previously completed fish passage evaluation project (Taylor, 2001). The highest ranked site within the Mendocino County portion of the Russian ranked #9 on the basin-wide ranking. Also, four of the top five sites in Mendocino County are not located on county-maintained roads. Thus, it is anticipated that Mendocino County DOT will wait several years before addressing fish passage at their crossings within the Russian River basin.

It is recommended that both County DOT's work closely with the FishNet4C, CDFG's Russian River basin planner and staff, CDFG and NMFS hydraulic engineers, the basin's RCD offices and other watershed stake holders to implement fish passage improvement projects at stream crossings. These other groups are involved with grant writing assistance, funding, additional biological assessment, technical engineering assistance, and public out-reach.

The CDFG basin planners should provide a vital role in coordinating fish passage improvement projects with the County DOT's, as well as, City planners and private property owners where many of the high and moderate priority crossings are located.

Design Options and Recommended Criteria

Recommendations for improving fish passage at the crossings are provided in the two separate documents, titled "A Catalog of Sonoma County Stream Crossings with Culverts in the Russian River Watershed" and "A Catalog of Mendocino County Stream Crossings with Culverts in the Russian River Watershed". The treatments suggested are general in nature, and fall mostly into four broad categories:

- Full replacement because current crossing is undersized and/or in poor condition.
- Retrofit is feasible because current crossing is sized for >100-year storm flow.
- None recommended because current crossing is provides adequate passage, however crossing is undersized – periodically inspect for condition and maintenance.
- None recommended because current crossing is provides adequate (or 100%) passage, is properly sized, and is in good condition.

All stream crossing replacements should follow recently developed state criteria and federal guidelines for facilitating adult and juvenile fish passage (CDFG 2002; NMFS 2001). However, site-specific characteristics of the crossing's location should always be carefully reviewed prior to selecting the type of crossing to install. These characteristics include local geology, slope of natural channel, channel confinement, and extent of channel incision likely from removal of a perched culvert.

For additional information, Bates et al. (1999) is recommended as an excellent reference to use when considering fish-friendly culvert installation options and Robinson et al. (2000) provides a comprehensive review of the advantages and disadvantages of the various treatment alternatives as related to site-specific conditions.

CDFG Allowable Design Options

Active Channel Design Option is a simplified design method that is intended to size a crossing sufficiently large and embedded deep enough into the channel to allow the natural movement of bed load and formation of a stable bed inside the culvert. Determination of the high and low fish passage design flows, water velocity, and water depth is not required for this option since the stream hydraulic characteristics within the culvert are intended to mimic the stream conditions upstream and downstream of the crossing.

The Active Channel Design Option is suitable for the following conditions:

New and replacement culvert installations
Simple installations with channel slopes of less than 3%.
Short culvert lengths (less than 100 feet).
Passage is required for all fish species and life-stages.

Culvert Setting and Dimensions

Culvert Width – the minimum culvert width shall be equal to, or greater than, 1.5 times the active channel width.

Culvert Slope – the culvert shall be placed level (0% slope).

Embedment – the bottom of the culvert shall be buried into the streambed not less than 20% of the culvert height at the outlet and not more than 40% of the culvert height at the inlet. Embedment does not apply to bottomless culverts.

Stream Simulation Design Option

The Stream Simulation Design Option is a design process that is intended to mimic the natural stream processes within a culvert. Fish passage, sediment transport, flood and debris conveyance within the crossing are intended to function as they would in a natural channel. Determination of the high and low fish passage flows, water velocity, and water depth is not required for this option since the stream hydraulic characteristics within the culvert are designed to mimic the stream conditions upstream and downstream of the culvert.

Stream simulation crossings are sized as wide, or wider than, the bank-full channel and the bed inside the culvert is sloped at a gradient similar to that of the adjacent stream reach. These crossings are filled with a streambed mixture that is resistant to erosion and is unlikely to change grade, unless specifically designed to do so. Stream simulation crossings require a greater level of information on hydrology and topography and a higher level of engineering expertise than the Active Channel Design Option.

The Stream Simulation Design Option is suitable for the following conditions:

New and replacement culvert installations.
Complex installations with channel slopes less than 6%.
Moderate to long culvert length (greater than 100 feet).
Passage required for all fish species and life-stages.
Ecological connectivity is required.

Culvert Setting and Dimensions

Culvert Width – the minimum culvert width shall be equal to, or greater than, the bankfull channel width. The minimum culvert width shall not be less than six feet.

Culvert Slope - the culvert slope shall approximate the slope of the stream through the reach in which it is being placed. The maximum slope shall not exceed 6%.

Embedment – the bottom of the culvert shall be buried into the streambed, not less than 30% and not more than 50% of the culvert height. Embedment does not apply to bottomless culverts.

Substrate Configuration and Stability

Culverts with slopes greater than 3% shall have the bed inside the culvert arranged into a series of step-pools with the drop at each step not exceeding 0.5 feet for juvenile salmonids.

Smooth walled culverts with slopes greater than 3% may require bed retention sills within the culvert to maintain the bed stability under elevated flows.

The gradation of the native streambed material or engineered fill within the culvert shall address stability at high flows and shall be well graded to minimize interstitial flow through it.

Hydraulic Design Option

The Hydraulic Design Option is a design process that matches the hydraulic performance of a culvert with the swimming abilities of a target species and age class of fish. The method targets specific species of fish and therefore does not account for ecosystem requirements of non-target species. There can be significant errors associated with estimation of hydrology and fish swimming speeds that are mitigated by making conservative assumptions in the design process. Determination of the high and low fish passage design flows, water velocity, and water depth are required for this option.

The Hydraulic Design Option requires hydrologic data analysis, open channel flow hydraulic calculations and information on the swimming ability and behavior of the target group of fish. This design option can be applied to the design of new and replacement culverts, and can be used to evaluate the effectiveness of retrofits for existing culverts.

The Hydraulic Design option is suitable for the following conditions:

New, replacement, and retrofit culvert installations.
Low to moderate channel slopes (less than 3%).
Situation where either Active Channel Design or Stream Simulation Options are not physically feasible.
Swimming ability and behavior of target fish species is known.
Ecological connectivity is not required.
Evaluation of proposed improvements to existing culverts.

For more information regarding the Hydraulic Design option, or to obtain the most recent copy of the CDFG *Culvert Criteria for Fish Passage*, contact George Heise, CDFG's hydraulic engineer, at GHEISE@dfg.ca.gov.

NMFS Order of Preferred Alternatives

1. *No crossing* - relocate or decommission the road.

2. *Bridge* - spanning the stream to allow for long-term dynamic channel stability.

3. *Streambed simulation strategies* – bottomless arch, embedded culvert design, or ford.

4. *Non-embedded culvert* – this often referred to as a hydraulic design, associated with more traditional culvert design approaches limited to low slopes for fish passage.

5. *Baffled culvert, or structure designed with a fish way* – for steeper slopes.

For more information, or to obtain a copy of the NMFS *Guidelines for Salmonid Passage at Stream Crossings* go to the Southwest Region website at: http://swr.nmfs.noaa.gov

Low-Priority Sites

Most of the low-priority stream crossings either allow adequate-to-unimpeded fish passage, or have minimal biological benefit if treated. Minimal biological benefits were the result of either a limited amount of upstream habitat or the crossing was located in a stream with overall poor habitat conditions, with a high likelihood of a long-term continuance of these conditions.

The five most common activities impacting poor-quality streams within the Russian River basin include - loss of habitat from permanent dams, agriculture, unfenced grazing, urban and residential development, and timber harvesting. Most of these low-priority creeks generally exhibited some or all of the following characteristics:

1. Lack of pools and habitat complexity;
2. Denuded or non-existent riparian zones;
3. Extensive straightening, berming, and diking of channels;
4. High volumes of fine sediment;
5. Lack of surface flow in summer months; and/or
6. Warm summer water temperatures.

Limited fisheries restoration dollars should probably not be spent on improving fish passage in these streams, unless significant improvements occur to impacts of other land management activities. However, the Counties should carefully examine this list and determine which locations may be treated with existing maintenance funds. These sites should be examined for "consequence-of-risk" as to current condition, sizing, and amount of fill material within the road prism. All future replacements with County maintenance funds should include properly sized crossings that permit unimpeded passage of adult and juvenile salmonids. For example, Sonoma or Mendocino County DOT may have a general plan for improvements to specific traffic corridors or routes.

Finally, when low-priority stream crossings fail during winter storms, planners should examine the sizing of the failed structure and budget for properly-sized replacements. When applying for FEMA funds, the Counties' DOT and Water Agencies should utilize this report to explain why the replacement should be a larger and higher-quality crossing (for both fisheries and future-flood benefits).

LITERATURE CITED

Bates, K; B. Barnard; B. Heiner; P. Klavas; and P. Powers. 1999. Fish passage design at road culverts: a design manual for fish passage at road crossings. WA Department of Fish and Wildlife. Olympia, Washington. 44 p.

CDFG. 2001. See *G. Heise.*

Cederholm, C.J. and W.J. Scarlett. 1981. Seasonal immigrations of juvenile salmonids into four small tributaries of the Clearwater River, Washington, 1977-1981, p. 98-110. *In* E.L. Brannon and E.O. Salo, editors. Proceedings of the Salmon and Trout Migratory Behavior Symposium. School of Fisheries, University of Washington, Seattle, WA.

Flannigan, S.A.; T.S. Ledwith; J. Ory; and M.J. Furniss. 1997. Risk assessment of culvert installations of forest roads. Water-roads Interactions Project, Six Rivers National Forest. 28 p.

Flosi, G. and F.L. Reynolds. 1994. California salmonid stream habitat restoration manual. Inland Fisheries Division, CDFG, Sacramento, California.

Heise, G. 2002. Culvert criteria for fish passage. California Department of Fish and Game, Sacramento, CA. 15 p.

Nickelson, T.E., J.D. Rogers, S.L. Johnson, and M.F. Solazzi. 1992. Seasonal changes in habitat use by juvenile coho salmon (*Oncorhynchus kisutch*) in Oregon coastal streams. Can. J. Aquat. Sci. 49: 783-789.

Normann, J. L., R. J. Houghtalen, and W. J. Johnston. 1985. Hydraulic Design of Highway Culverts. U.S. Department of Transportation, Federal Highway Administration, Hydraulic Design Series No. 5, 272 pp.

Piehl, B. T., M. R. Pyles, and R. L. Beschta. 1988. Flow Capacity of Culverts on Oregon Coast Range Forest Roads. Water Resources Bulletin. Vol. 24, No. 3. pp 631- 637.

Rantz, S.E. 1968. Average annual precipitation and runoff in North Coastal California. USGS, Menlo Park, CA. 3 accompanying maps. 4 p.

Robison, E.G.; A. Mirati; and M. Allen. 1999. Oregon road/stream crossing restoration guide: spring 1999. Advanced Fish Passage Training Version. 75 p.

Roni, P., T.J.Beechie, R.E. Bilby, F.E. Leonetti, M.M. Pollack, and G.R. Pess. A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in Pacific Northwest watersheds. N. Am. J. Fish. Man. 22 (1): 1-20.

Scarlett, W.J. and C.J. Cederholm. 1984. Juvenile coho salmon fall-winter utilization of two small tributaries of the Clearwater River, Jefferson County, Washington, p. 227-242. *In* J.M. Walton and D.B. Houston, editors. Proceedings of the Olympic Wild Fish Conference, March 23-25, 1983. Fisheries Technology Program, Peninsula College, Port Angeles, WA.

SSHEAR. 1998. Fish passage barrier assessment and prioritization manual. Washington Department of Fish and Wildlife, Salmonid Screening, Habitat Enhancement, and Restoration (SSHEAR) Division. 57 p.

Skeesick, D.B. 1970. The fall immigration of juvenile coho salmon into a small tributary. Res. Rep. Fish Comm. Oregon 2: 90-95.

Taylor, R.N. 2000. Humboldt County culvert inventory and fish passage evaluation. Final Report, CDFG Agreement #FG 7068 IF. 39 p and appendices.

Taylor, R.N. 2001. Del Norte County culvert inventory and fish passage evaluation. Final Report, CDFG Agreement #FG 8094 WR. 50 p and appendices.

Taylor, R.N. 2001. Coastal Mendocino County culvert inventory and fish passage evaluation. Final Report, CDFG Agreement #FG 8072 WR. 43 p and appendices.

Taylor, R.N. and M. Love. (2002). Fish passage evaluation at road crossings. Section 10 of the California Salmonid Stream Habitat Restoration Manual, CDFG Agreement #P9985035.

Tripp, D. and P. McCart. 1983. Effects of different coho stocking strategies on coho and cutthroat trout production in isolated headwater streams. Can. Tech. Rep. Fish. Aquat. Sci. 40: 452-461.

Tschaplinski, P.J. and G.F. Hartman. 1983. Winter distribution of juvenile coho salmon (*Oncorhynchus kisutch*) before and after logging in Carnation Creek, British Columbia, and some implications for over-wintering survival. Can J. Fish Aquat. Sci. 40: 452-461.

Waananen, A.O. and J.R. Crippen. 1977. Magnitude and frequency of floods in California. U.S. Geological Survey, Water Resources Investigation 77-21, Menlo Park, CA. 96 p.

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Status of 545 Stream Crossings Visited in the Russian River Watershed

From the mouth heading upstream of each sub basin

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
SONOMA COUNTY					
Willow Creek	Willow Creek	Willow Creek Rd	3J45		Bridge
Willow Creek	Willow Creek	Willow Creek Rd	3J45		Bridge
Willow Creek	Willow Creek	Willow Creek Rd	3J45		Bridge
Unnamed Trib	Willow Creek	Willow Creek Rd	3J45		**Surveyed**
Freezeout Creek	Freezeout Creek	Freezeout Rd	3J45		Bridge
Big Austin Creek	Big Austin Creek	Old Duncans Grade Rd	3J45		Bridge
Kohute Gulch	Big Austin Creek	Austin Creek Rd	3J45		**Surveyed**
Frazier Gulch	Big Austin Creek	Cazadero Highway	3J45		No
Consolli Gulch	Big Austin Creek	Cazadero Highway	3J45		No
Bull Barn Gulch	Big Austin Creek	Cazadero Highway	3J45		No
Kidd Creek	Big Austin Creek	Cazadero Highway	3J45		Bridge
Kidd Creek	Big Austin Creek	Kidd Creek Road	3J45		Bridge
Kidd Creek	Big Austin Creek	Kidd Creek Road	3J45		Bridge
Kidd Creek	Big Austin Creek	Kidd Creek Road	3J45		Bridge
Unnamed trib. On Inger Bareilles land	East Austin Creek	East Austin Creek Rd	3J35		Need Access
East Austin Creek	Big Austin Creek	Old Cazadero Rd	3J35		Road Closed-Local Said bridge blew out
Big Austin Creek	Big Austin Creek	Cazadero Highway	3J35		Bridge
Unnamed trib.	Big Austin Creek	Austin Creek Rd	3J35	T8N, R11W, Section 21	No
Unnamed trib.	Big Austin Creek	Austin Creek Rd	3J35	T8N, R11W, Section 21	No
Big Austin Creek	Big Austin Creek	Cazadero Highway	3J35	T8N, R11W, Section 21	Bridge
St. Elmo Creek	Big Austin Creek	Cazadero Highway	3J35	T8N, R11W, Section 21	Bridge
St. Elmo Creek	Big Austin Creek	Austin Creek Rd	3J35	T8N, R11W, Section 21	No
Unnamed trib	Big Austin Creek	Cazadero Highway	3J35	T8N, R11W, Section 21	No
Unnamed trib	Big Austin Creek	Austin Creek Rd	3J35	T8N, R11W, Section 16	No
Unnamed trib	Big Austin Creek	Bei Rd	3J35	T8N, R11W, Section 16	No
Big Austin Creek	Big Austin Creek	Old Cazadero Rd	3J35	T8N, R11W, Section 16	Bridge
Ward Creek	Big Austin Creek	King Ridge Rd	3J35	T8N, R11W, Section 16	Bridge
Unnamed Trib	Ward Creek	Fort Ross Rd	3J35	T8N, R11W, Section 17	No
Pole Mountain Creek	Ward Creek	Fort Ross Rd	3J, 3K	T8N, R12W, Section 13	**Surveyed**
Big Austin Creek	Big Austin Creek	King Ridge Rd	3J35	T8N, R11W, Section 16	No
Unnamed Trib	Big Austin Creek	King Ridge Rd	3J35	T8N, R11W, Section 9	No
Unnamed Trib	Big Austin Creek	King Ridge Rd	3J35	T8N, R11W, Section 8	No
Unnamed Trib	Big Austin Creek	King Ridge Rd	3J35	T8N, R11W, Section 8	No

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Sheridan Gulch	Sheridan Gulch	Moscow Rd	3J45		No
Mesa Grande Gulch	Mesa Grande Gulch	Moscow Rd	3J45		No
Dutch Bill Creek	Dutch Bill Creek	Main St	3J45		Bridge
Dutch Bill Creek	Dutch Bill Creek	Fir Rd	3J45		Bridge
Schoolhouse Gulch	Dutch Bill Creek	Main St	3J45		No
Dutch Bill Creek	Dutch Bill Creek	Main St	4J41		Bridge
Tyrone Gulch	Dutch Bill Creek	Tyrone Rd	4J41		**Surveyed**
Unnamed Trib	Dutch Bill Creek	Bohemian Highway	4J41	T7N, R10W, Section 16	No- Steep
Devoul Creek	Dutch Bill Creek	Bohemian Highway	4J41	T7N, R10W, Section 21	**Surveyed**
Grub Creek	Dutch Bill Creek	Bohemian Highway	4J41	T7N, R10W, Section 21	**Surveyed**
Grub Creek	Dutch Bill Creek	N7005 (non-county)	4J41	T7N, R10W, Section 21	No
Alder Creek	Dutch Bill Creek	Bohemian Highway	4J41	T7N, R10W, Section 22	No
Dutch Bill Creek	Dutch Bill Creek	Market Street	4J41	T7N, R10W, Section 27	**Surveyed**
Dutch Bill Creek	Dutch Bill Creek	Foot Bridge over Dam	4J41	T7N, R10W, Section 27	**Surveyed**
Dutch Bill Creek	Dutch Bill Creek	Bohemian Highway	4J41	T7N, R10W, Section 27	Bridge
Lancel Creek	Dutch Bill Creek	Occidental Camp Meeker Rd	4J41	T7N, R10W, Section 27	**Surveyed**
North Fork Lancel Creek	Dutch Bill Creek	Morelli Lane	4J41	T7N, R10W, Section 27	Bridge
Madrone Mill Creek	Madrone Mill Creek	River Blvd	3J45		Bridge
Madrone Mill Creek	Madrone Mill Creek	Bohemian Avenue	3J45		No
Hidden Valley	Hulburt Creek	Cherry Lovers Lane	3J45		No
Hulburt Creek	Hulburt Creek	Old Cazadero Rd	3J35		Bridge
Hulburt Creek	Hulburt Creek	Fern Way	3J35		Bridge
Mission Creek	Hulburt Creek	Camino del Arroyo (private)	3J35		**Surveyed**
Mission Creek	Hulburt Creek	Old Cazadero Rd	3J35		**Surveyed**
Mission Creek	Hulburt Creek	Rd# 81004 - Bridge on private drive	3J35		Bridge
Fife Creek	Fife Creek	Brookside Lane	3J35		Bridge
Fife Creek	Fife Creek	Laughlin Rd	4J31	T8N, R10W, Section 29	Bridge
Fife Creek	Fife Creek	Watson Rd	4J31	T8N, R10W, Section 20	**Surveyed**
Redwood Creek	Fife Creek	Armstrong Woods Rd	4J31	T8N, R10W, Section 20	**Surveyed**
Sweetwater Creek	Redwood Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 17	**Surveyed**
Sweetwater Creek	Redwood Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 17	No- Steep
Fife Creek	Fife Creek	N8024 - non-county	3J35	T8N, R10W, Section 18	Non-county
Fife Creek	Fife Creek	N8025 - non-county	3J35	T8N, R10W, Section 18	Non-county
Mays Canyon	Mays Canyon	Neeley Road	4J41	T8N, R10W, Section 32	**Surveyed**
Pocket Canyon	Mays Canyon	Mays Canyon Road	4J41	T8N, R10W, Section 32	**Surveyed**

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Pocket Canyon	Mays Canyon	Mays Canyon Road	4J41	T7N, R10W, Section 3	Bridge
Mays Canyon	Mays Canyon	Mays Canyon Road	4J41	T7N, R10W, Section 5	No- small
Korbel Trib	Korbel Trib	River Road	4J31	T8N, R10W, Section 28	**Surveyed**
Unnamed Trib	Unnamed Trib	River Road	4J31	T8N, R10W, Section 27	No- Small/access
Hobson Creek	Hobson Creek	Westside Road	4J31	T8N, R10W, Section 26	**Surveyed**
Hobson Creek	Hobson Creek	N8006	4J31	T8N, R10W, Section 26	Bridge
Unnamed Trib	Unnamed Trib	Westside Road	4J31	T8N, R10W, Section 25	No-Steep
Unnamed Trib	Unnamed Trib	Westside Road	4J31	T8N, R9W, Section 30	No
Green Valley Creek	Green Valley Creek	River Road	4J31	T8N, R9W, Section 30	Bridge
Green Valley Creek	Green Valley Creek	Old River Road	4J31	T8N, R9W, Section 31	Bridge
Green Valley Creek	Green Valley Creek	Martinelli Road	4J41	T7N, R9W, Section 6	Bridge
Atascadero Creek	Green Valley Creek	Green Valley Road	4J42		Bridge
Atascadero Creek	Green Valley Creek	Graton Road	4J42		Bridge
Atascadero Creek	Green Valley Creek	Occidental Road	4J42		Bridge
Atascadero Creek	Green Valley Creek	Mill Station Road	4J52		Bridge
Atascadero Creek	Green Valley Creek	Bodega Highway	4J52		No- City limits
Atascadero Creek	Green Valley Creek	Watertrough Rd	4J52		Bridge
Atascadero Creek	Green Valley Creek	Barnett Valley Road	4J52		No
Jonive Creek	Atascadero Creek	Ferguson Road	4J52		Bridge
Jonive Creek	Atascadero Creek	Montgomery Road	4J52		Bridge
Jonive Creek	Atascadero Creek	Grandview Road	4J52		Bridge
Jonive Creek	Atascadero Creek	Bodega Highway	4J52		**Surveyed**
Jonive Creek	Atascadero Creek	Sexton Road	4J52		Bridge
Jonive Creek	Atascadero Creek	Bodega Highway	4J52		**Surveyed**
Jonive Creek	Atascadero Creek	Furlong Road	4J52		**Surveyed**
Unnamed Trib	Jonive Creek	Furlong Road	4J52		**Surveyed**
Unnamed Trib	Jonive Creek	??	4J52		Non-county
Unnamed Trib	Jonive Creek	Furlong Road	4J52		**Surveyed**
Jonive Creek	Atascadero Creek	Bodega Highway	4J52		**Surveyed**
Jonive Creek	Atascadero Creek	Wagnon Road	4J52		**Surveyed**
Green Valley Creek	Green Valley Creek	Green Valley Road	4J42		Bridge
Purrington Creek	Green Valley Creek	Graton Road	4J42		Bridge
Purrington Creek	Green Valley Creek	Graton Road	4J41	T7N, R9W, Section 31	Bridge
Purrington Creek	Green Valley Creek	Graton Road	4J51		**Surveyed**
Purrington Creek	Green Valley Creek	Private Driveway	4J42		**Surveyed**
Unnamed Trib	Green Valley Creek	Green Valley Road	4J41	T7N, R9W, Section 13	No
Green Valley Creek	Green Valley Creek	Green Valley Road	4J41	T7N, R9W, Section 13	**Surveyed**
Harrison Grade Creek	Green Valley Creek	Green Valley Road	4J41	T7N, R9W, Section 13	**Surveyed**
Harrison Grade Creek	Green Valley Creek	Harrison Grade Road	4J41	T7N, R9W, Section 14	**Surveyed**

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Green Valley Creek	Green Valley Creek	Green Valley Road	4J41	T7N, R9W, Section 14	No
Mark West Creek	Mark West Creek	Wohler Road	4J42		Bridge
Mark West Creek	Mark West Creek	Trenton Healdsburg Rd	4J42		Bridge
Windsor Creek	Mark West Creek	Mark West Station Rd	4J32		Bridge
Pool Creek	Windsor Creek	Windsor Road	4J32	T8N, R9W, Section 23	Bridge
Unnamed Trib	Pool Creek	Shiloh Road	4J33	T8N, R8W, Section 20	Bridge
Pool Creek	Windsor Creek	Conde Lane	4J33	T8N, R8W, Section 19	Bridge
Pool Creek	Windsor Creek	Hembree Lane	4J33	T8N, R8W, Section 19	Bridge
Pool Creek	Windsor Creek	Old Redwood Highway	4J33	T8N, R8W, Section 18	Bridge
Pool Creek	Windsor Creek	Pleasant Ave	4J33	T8N, R8W, Section 18	Bridge
Pool Creek	Windsor Creek	Chalk Hill Road	4J33	T8N, R8W, Section 17	**Surveyed**
Wright Creek	Pool Creek	Chalk Hill Road	4J33	T8N, R8W, Section 8	Bridge
Wright Creek	Pool Creek	Chalk Hill Road	4J33	T8N, R8W, Section 8	Bridge
Pool Creek	Windsor Creek	Leslie Road	4J33	T8N, R8W, Section 17	Bridge
Pool Creek	Windsor Creek	Leslie Road	4J33	T8N, R8W, Section 9	Bridge
Pool Creek	Windsor Creek	Leslie Road	4J33	T8N, R8W, Section 9	Too steep above
Unnamed Trib	Windsor Creek	Starr Road	4J32	T8N, R9W, Section 23	Bridge
Windsor Creek	Mark West Creek	Windsor Road	4J32	T8N, R9W, Section 14	Bridge
Windsor Creek	Mark West Creek	Conde Lane	4J32	T8N, R9W	Bridge
Windsor Creek	Mark West Creek	Los Amigos Road	4J32	T8N, R9W	Under 101 as 1 culvert
Windsor Creek	Mark West Creek	Natalie Drive	4J32	T8N, R9W, Section 12	**Surveyed**
Windsor Creek	Mark West Creek	Brooks Road	4J32	T8N, R9W, Section 12	**Surveyed**
Windsor Creek	Mark West Creek	Arata Lane	4J32	T8N, R9W, Section 1	Bridge
Windsor Creek	Mark West Creek	Brooks Road	4J33	T8N, R9W, Section 1	**Surveyed**
Windsor Creek	Mark West Creek	Chalk Hill Road	4J33	T8N, R9W, Section 5	Too small - not fish bearing
Mark West Creek	Mark West Creek	River Road	4J42	T7N, R9W	Bridge
Laguna de Santa Rosa	Mark West Creek	Guerneville Road	4J42		Bridge
Santa Rosa Creek	Santa Rosa Creek	Willowside Road	4J42	T7N, R9W	Bridge
Abramson Creek	Santa Rosa Creek	Guerneville Road	4J43	T7N, R8W, Section18	Bridge
Abramson Creek	Santa Rosa Creek	Piner Road	4J43	T7N, R8W, Section7	Too small - not fish bearing
Piner Creek	Santa Rosa Creek	Fulton Road	4J43	T7N, R8W	Bridge
Piner Creek	Santa Rosa Creek	Guerneville Road	4J43	T7N, R8W	Bridge
Pauline Creek	Piner Creek	Marlow Road	4J43	T7N, R8W	**Surveyed**

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Pauline Creek	Piner Creek	Steele Lane	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Apache Avenue	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Coffey Lane	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Mardie's Lane	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Range Avenue	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Mc Bride Lane	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Cleveland Avenue	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	County Center Drive	4J43	T7N, R8W	Under 101 as one pipe
Pauline Creek	Piner Creek	Mendocino Avenue	4J43	T7N, R8W	Bridge
Pauline Creek	Piner Creek	Chanate Drive	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Lomitas Avenue	4J43	T7N, R8W	Bridge
Pauline Creek	Piner Creek	Chanate Drive	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	County Farm Drive	4J43	T7N, R8W	**Surveyed**
Pauline Creek	Piner Creek	Chanate Drive	4J43	T7N, R8W	**Surveyed**
Piner Creek	Santa Rosa Creek	Valdez Road	4J43	T7N, R8W	**Surveyed**
Piner Creek	Santa Rosa Creek	Marlow Road	4J43	T7N, R8W	**Surveyed**
Piner Creek	Santa Rosa Creek	Coffey Lane	4J43	T7N, R8W	**Surveyed**
Piner Creek	Santa Rosa Creek	Piner Road	4J43	T7N, R8W	Bridge
Piner Creek	Santa Rosa Creek	Hopper Avenue	4J43	T7N, R8W	**Surveyed**
Piner Creek	Santa Rosa Creek	Redwood Highway	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	Fulton Road	4J43	T7N, R8W, Section20	Bridge
Santa Rosa Creek	Mark West Creek	Stony Point Road	4J43	T7N, R8W, Section21	Bridge
Santa Rosa Creek	Mark West Creek	Dutton Ave	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	Pierson Street	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	3rd Street	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	Olive Street	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	A street	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	Santa Rosa Ave to E Street	4J43	T7N, R8W	One Huge Box Culvert
Matanzas Creek	Santa Rosa Creek	E Street	4J43	T7N, R8W	Bridge
Matanzas Creek	Santa Rosa Creek	Brookwood Avenue	4J43	T7N, R8W	Bridge
Spring Creek	Matanzas Creek	Hoen Avenue	4J44	T7N, R8W	Bridge
Spring Creek	Matanzas Creek	Summerfield Avenue	4J44	T7N, R7W	**Surveyed**
Spring Creek	Matanzas Creek	Stone Hedge Drive	4J44	T7N, R7W	**Surveyed**
Matanzas Creek	Santa Rosa Creek	Farmers Lane	4J44	T7N, R7W	Bridge
Matanzas Creek	Santa Rosa Creek	Montgomery Road	4J44	T7N, R7W	Bridge
Matanzas Creek	Santa Rosa Creek	Hoen Avenue	4J44		Bridge
Matanzas Creek	Santa Rosa Creek	Yulupa Avenue	4J44	T7N, R7W	Bridge
Matanzas Creek	Santa Rosa Creek	Bethnards Avenue	4J44	T7N, R7W	**Surveyed**
Matanzas Creek	Santa Rosa Creek	Bennett Valley Road	4J54	T7N, R7W	Bridge
Santa Rosa Creek	Mark West Creek	Brookwood Drive	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	Montgomery Drive	4J43	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	Talbot Ave	4J44	T7N, R8W	Bridge
Santa Rosa Creek	Mark West Creek	Alderbrook Drive	4J44	T7N, R8W	Bridge
Ducker Creek	Brush Cr aka Rincon Cr	Mission Boulevard	4J44	T7N, R7W	Bridge
Ducker Creek	Brush Cr aka Rincon Cr	Benicia Drive	4J44	T7N, R7W	**Surveyed**
Ducker Creek	Brush Cr aka Rincon Cr	Rinconada Drive	4J44	T7N, R7W	**Surveyed**
Ducker Creek	Brush Cr aka Rincon Cr	Middle Rincon Avenue	4J44	T7N, R7W	Bridge
Ducker Creek	Brush Cr aka Rincon Cr	Speers Road	4J44	T7N, R7W	Goes Underground
Ducker Creek	Brush Cr aka Rincon Cr	Calistoga Road	4J44	T7N, R7W	No access

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Brush Cr aka Rincon Cr	Santa Rosa Creek	Montecito Blvd	4J44	T7N, R7W, Section13	**Surveyed**
Brush Cr aka Rincon Cr	Santa Rosa Creek	Bridgewood Dr	4J44	T7N, R7W, Section13	Bridge
Brush Cr aka Rincon Cr	Santa Rosa Creek	Brush Creek Road	4J44	T7N, R7W, Section6	**Surveyed**
Brush Cr aka Rincon Cr	Santa Rosa Creek	Deer Trail Road	4J44	T7N, R7W, Section6	**Surveyed**
Brush Cr aka Rincon Cr	Santa Rosa Creek	Amber Lane	4J44	T8N, R7W, Section31	**Surveyed**
Unnamed Trib	Brush Cr aka Rincon Cr	Wallace Road	4J44	T8N, R7W, Section31	**Surveyed**
Brush Cr aka Rincon Cr	Santa Rosa Creek	Riebli Road	4J34	T8N, R8W, Section 36	**Surveyed**
Santa Rosa Creek	Santa Rosa Creek	Mission Blvd	4J44		Bridge
Santa Rosa Creek	Santa Rosa Creek	Montgomery Drive	4J44	T7N, R7W	Water Diversion Culvert
Santa Rosa Creek	Santa Rosa Creek	Melita Road	4J44	T7N, R7W	Bridge
Santa Rosa Creek	Santa Rosa Creek	Wildwood Mountain Road	4J44	T7N, R7W	Bridge
Laguna de Santa Rosa	Mark West Creek	Occidental Road	4J42		Bridge
Blucher Creek	Laguna de Santa Rosa	Old Gravenstein Hwy	4J53		Bridge
Blucher Creek	Laguna de Santa Rosa	Lone Pine Road	4J53		Bridge
Blucher Creek	Laguna de Santa Rosa	Canfield Road	4J52		Bridge
Blucher Creek	Laguna de Santa Rosa	Bloomfield Road	4J52		**Surveyed**
Blucher Creek	Laguna de Santa Rosa	Blucher Valley Road	4J52		**Surveyed**
Laguna de Santa Rosa	Laguna de Santa Rosa	Todd Road	4J53		Bridge
Colgan Creek	Laguna de Santa Rosa	Llano Road	4J53		Bridge
Colgan Creek	Laguna de Santa Rosa	Walker Avenue	4J53		Bridge
Colgan Creek	Laguna de Santa Rosa	Todd Road	4J53		Bridge
Colgan Creek	Laguna de Santa Rosa	Stony Point Road	4J53		Not fish bearing
Laguna de Santa Rosa	Laguna de Santa Rosa	Llano Road	4J53		Bridge
Laguna de Santa Rosa	Laguna de Santa Rosa	Stony Point Road	4J53		Bridge
Hinebaugh Creek	Laguna de Santa Rosa	Rohnert Park Expressway	4J53		Bridge
Hinebaugh Creek	Laguna de Santa Rosa	Labath Ave	4J53		Bridge
Hinebaugh Creek	Laguna de Santa Rosa	South Santa Rosa Ave	4J53		Bridge
Hinebaugh Creek	Laguna de Santa Rosa	Commerce Blvd	4J53		**Surveyed**
Crane Creek	Laguna de Santa Rosa	Snyder Lane	4J54		**Surveyed**
Crane Creek	Laguna de Santa Rosa	Petaluma Hill Road	4J54		**Surveyed**
Crane Creek	Laguna de Santa Rosa	Pressley Road	4J54		**Surveyed**
Gossage Creek	Laguna de Santa Rosa	Lowell Road	4J53		Bridge
Gossage Creek	Laguna de Santa Rosa	Filmore Ave	4J53		Bridge
Gossage Creek	Laguna de Santa Rosa	Stony Point Road	4J53		Bridge
Copeland Creek	Laguna de Santa Rosa	South Santa Rosa Ave	4J53		Under 101 as one culvert
Copeland Creek	Laguna de Santa Rosa	Commerce Blvd	4J53		Bridge
Copeland Creek	Laguna de Santa Rosa	Northwest Blvd	4J54		Bridge
Copeland Creek	Laguna de Santa Rosa	Country Club Drive	4J54		Bridge
Copeland Creek	Laguna de Santa Rosa	Snyder Lane	4J54		**Surveyed**
Copeland Creek	Laguna de Santa Rosa	Petaluma Hill Road	4J54		Bridge
Copeland Creek	Laguna de Santa Rosa	Pressley Road	4J54		Bridge
Copeland Creek	Laguna de Santa Rosa	Lichau Road	4K14		Bridge
Mark West Creek	Mark West Creek	River Road	4J42	T7N, R9W	Bridge

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Unnamed Trib	Mark West Creek	Slusser Road	4J42		Too small - not fish bearing
Unnamed Trib	Mark West Creek	River Road	4J42		Too small - not fish bearing
Unnamed Trib	Mark West Creek	Woolsey Road	4J42		Too small - not fish bearing
Mark West Creek	Mark West Creek	Slusser Road	4J42		Bridge
Unnamed Trib	Mark West Creek	River Road	4J42		Too small - not fish bearing
Mark West Creek	Mark West Creek	North Laughlin Road	4J33	T8N, R9W, Section 36	Bridge
Mark West Creek	Mark West Creek	Fulton Road	4J33	T8N, R8W, Section 29	Bridge
Mark West Creek	Mark West Creek	Old Redwood Highway	4J33	T8N, R8W, Section 28	Bridge
Linda Creek	Mark West Creek	Mark West Springs Road	4J33	T8N, R8W, Section 27	**Surveyed**
Linda Creek	Mark West Creek	Riebli Road	4J33	T8N, R8W, Section 26	**Surveyed**
Mark West Creek	Mark West Creek	Michelle Way	4J33	T8N, R8W, Section 26	Bridge
Horse Hill Creek	Mark West Creek	Leslie Road	4J33	T8N, R8W, Section 10	Bridge
Horse Hill Creek	Mark West Creek	Leslie Road	4J34	T8N, R8W, Section 10	Bridge
Mark West Creek	Mark West Creek	Mark West Springs Road	4J33	T8N, R8W, Section 11	Bridge
Porter Creek	Mark West Creek	Diamond Ranch	4J34	T8N, R8W, Section 12	Bridge
Porter Creek	Mark West Creek	Driveway	4J34	T8N, R8W, Section 12	Bridge
Porter Creek	Mark West Creek	Porter Creek Road	4J34	T8N, R8W, Section 12	Bridge
Porter Creek	Mark West Creek	Private Drive	4J34	T8N, R8W, Section 12	Bridge
Porter Creek	Mark West Creek	Postwood Lane	4J34	T8N, R7W, Section 7	Bridge
Porter Creek	Mark West Creek	Postwood Lane	4J34	T8N, R7W, Section 7	Bridge
Porter Creek	Mark West Creek	Private Drive	4J34	T8N, R7W, Section 7	Bridge
Porter Creek	Mark West Creek	Porter Creek Road	4J34	T8N, R7W, Section 7	**Surveyed**
Porter Creek	Mark West Creek	Private Drive	4J34	T8N, R7W, Section 8	Bridge
Porter Creek	Mark West Creek	Private Drive	4J34	T8N, R7W, Section 8	Bridge
Porter Creek	Mark West Creek	Calistoga Road	4J34	T8N, R7W, Section 8	**Surveyed**
Porter Creek	Mark West Creek	Private Drive	4J34	T8N, R7W, Section 10	Bridge
Porter Creek	Mark West Creek	Fechter Road	4J34	T8N, R7W, Section 10	Access
Porter Creek	Mark West Creek	Driveway- 5344 Sharp Rd	4J34	T8N, R7W, Section 10	Access

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Mark West Creek	Mark West Creek	Alpine Rd- Driveway	4J34	T8N, R7W, Section 20	Bridge
Mark West Creek	Mark West Creek	Roehmer Road	4J34	T8N, R7W, Section 20	**Surveyed**
Humbug Creek	Mark West Creek	Alpine Road	4J34	T8N, R7W, Section 20	Bridge
Humbug Creek	Mark West Creek	Calistoga Road	4J34	T8N, R7W, Section 20	Bridge
Unnamed Trib	Humbug Creek	Calistoga Road	4J34	T8N, R7W, Section 20	No- too steep
Humbug Creek	Mark West Creek	Driveway	4J34	T8N, R7W, Section 20	Bridge
Humbug Creek	Mark West Creek	Driveway	4J34	T8N, R7W, Section 20	Bridge
Humbug Creek	Mark West Creek	Driveway	4J34	T8N, R7W, Section 20	Bridge
Humbug Creek	Mark West Creek	Driveway	4J34	T8N, R7W, Section 20	Bridge
Humbug Creek	Mark West Creek	Driveway	4J34	T8N, R7W, Section 20	Bridge
Humbug Creek	Mark West Creek	Driveway	4J34	T8N, R7W, Section 20	Bridge
Humbug Creek	Mark West Creek	Gates Road	4J34	T8N, R7W, Section 16	Bridge
Humbug Creek	Mark West Creek	Gates Road	4J34	T8N, R7W, Section 16	Bridge
Humbug Creek	Mark West Creek	Gates Road	4J34	T8N, R7W, Section 16	Bridge
Mark West Creek	Mark West Creek	Calistoga Road	4J34	T8N, R7W, Section 29	Bridge
Weeks Creek	Mark West Creek	Calistoga Road	4J34	T8N, R7W, Section 29	**Surveyed**
Weeks Creek	Mark West Creek	Calistoga Road	4J44	T8N, R7W, Section 33	Bridge
Alpine Creek	Mark West Creek	St. Helena Road	4J34	T8N, R7W, Section 33	**Surveyed**
Van Buren Creek	Mark West Creek	St. Helena Road	4J34	T8N, R7W, Section 28	**Surveyed**
Van Buren Creek	Mark West Creek	Private Drive	4J34	T8N, R7W, Section 27	Bridge
Van Buren Creek	Mark West Creek	Private Drive	4J34	T8N, R7W, Section 27	Bridge
Mark West Creek	Mark West Creek	St. Helena Road	4J34	T8N, R7W, Section 28	Bridge
Unnamed Trib	Mark West Creek	St. Helena Road	4J34	T8N, R7W, Section 26	No- too steep
Mark West Creek	Mark West Creek	Lone Pine Lane	4J34	T8N, R7W, Section 26	Bridge
Unnamed Trib	Mark West Creek	St. Helena Road	4J34	T8N, R7W, Section 26	**Surveyed**
Mark West Creek	Mark West Creek	Tarwater Lane	4J34	T8N, R7W, Section 26	Bridge
Unnamed Trib	Mark West Creek	St. Helena Road	4J35		**Surveyed**

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Porter Creek	Porter Creek	Westside Road	4J32	T8N, R9W, Section 20	Bridge
Porter Creek	Porter Creek	Vineyard Access Rd	4J32	T8N, R9W, Section 19	Ford
Press Creek	Porter Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 13	**Surveyed**
Porter Creek	Porter Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 13	Bridge
Porter Creek	Porter Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 13	Bridge
Porter Creek	Porter Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 14	Bridge
Porter Creek	Porter Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 14	**Surveyed**
Porter Creek	Porter Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 14	Bridge
Porter Creek	Porter Creek	Hendren Driveway	4J31	T8N, R10W, Section 10	**Surveyed**
Unnamed Trib	Porter Creek	Sweetwater Springs Rd	4J31	T8N, R10W, Section 10	Too small - not fish bearing
Unnamed Trib	Unnamed Trib	Westside Road	4J32	T8N, R9W, Section 21	Too small - not fish bearing
Turtle Creek	Unnamed Trib	Westside Road	4J32		**Surveyed**
Unnamed Trib	Unnamed Trib	Westside Road	4J32		Bridge
Unnamed Trib	Unnamed Trib	Westside Road	4J32		Too small - not fish bearing
Mill Creek	Dry Creek	Westside Road	4J32		Bridge
Felta Creek	Mill Creek	Felta Road	4J32		Bridge
Wallace Creek	Mill Creek	Mill Creek Road	4J21	T9N, R10W	**Surveyed**
Wallace Creek	Mill Creek	Wallace Creek Road	4J21		Bridge
Mill Creek	Dry Creek	Mill Creek Road	4J21		Bridge
Mill Creek	Dry Creek	Mill Creek Road	4J21		Bridge
Unnamed Trib	Mill Creek	Mill Creek Road	4J21		Too small - not fish bearing
Mill Creek	Dry Creek	Mill Creek Road	4J21		Bridge
Coldwater Gulch	Mill Creek	Mill Creek Road	4J21		Too small - not fish bearing
Mill Creek	Dry Creek	Mill Creek Road	4J21		Bridge
Mill Creek	Dry Creek	Mill Creek Road	4J21		Bridge
Mill Creek	Dry Creek	Mill Creek Road	4J21		Bridge
Mill Creek	Dry Creek	Mill Creek Road	4J21	T9N, R10W, Section 28	**Surveyed**
Boyd Creek	Mill Creek	Mill Creek Road	4J21	T9N, R10W, Section 29	**Surveyed**
Dry Creek	Dry Creek	Westside Road	4J22		Bridge
Pine Ridge Canyon	Dry Creek	West Dry Creek Road	4J22		Bridge
Kelley Creek	Dry Creek	West Dry Creek Road	4J21	T9N, R9W, Section 18	**Surveyed**
Lytton Springs Creek	Dry Creek	Dry Creek Road	4J21		**Surveyed**
Crane Creek	Dry Creek	West Dry Creek Road	4J21	T9N, R10W, Section 11	**Surveyed**
Dry Creek	Dry Creek	Lambert Bridge Road	4J21		Bridge
Grape Creek	Dry Creek	West Dry Creek Road	4J21	T9N, R10W, Section 2	**Surveyed**
Grape Creek	Dry Creek	Wine Creek Road	4J21	T9N, R10W, Section 2	Bridge

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Wine Creek	Grape Creek	Wine Creek Road	4J21	T9N, R10W, Section 3	**Surveyed**
Wine Creek	Grape Creek	Koch Road	4J21	T9N, R10W, Section 3	**Surveyed**
Wine Creek	Grape Creek	Koch Road	4J21	T9N, R10W, Section 3	**Surveyed**
Grape Creek	Dry Creek	Wine Creek Road	4J21	T9N, R10W, Section 3	**Surveyed**
Unnamed Trib	Grape Creek	Wine Creek Road	4J21	T9N, R10W, Section 3	No- Steep, Access
Unnamed Trib	Dry Creek	West Dry Creek Road	4J11	T10N, R10W, Section 35	**Surveyed**
Unnamed Trib	Dry Creek	Dry Creek Road	4J11		**Surveyed**
Unnamed Trib	Dry Creek	Dry Creek Road	4J11		**Surveyed**
Canyon Creek	Dry Creek	Dry Creek Road	4J11		**Surveyed**
Dry Creek	Dry Creek	Yoakim Bridge Road	4J11		Bridge
Pena Creek	Dry Creek	West Dry Creek Road	4J11	T10N, R10W, Section 21	Bridge
Unnamed Trib	Dry Creek	Dry Creek Road	4J11		Too small - not fish bearing
Dutcher Creek	Dry Creek	Dry Creek Road	4J11	T10N, R10W	**Surveyed**
Dutcher Creek	Dry Creek	Dutcher Creek Road	4J11	T10N, R10W	**Surveyed**
Dutcher Creek	Dry Creek	Driveway off Dutcher Creek Road	4J11	T10N, R10W	**Surveyed**
Dutcher Creek	Dry Creek	Dutcher Creek Road	4J11	T10N, R10W	**Surveyed**
Dutcher Creek	Dry Creek	Dutcher Creek Road	4J11	T10N, R10W, Section 9	**Surveyed**
Dutcher Creek	Dry Creek	Dutcher Creek Road	4J11	T10N, R10W, Section 9	**Surveyed**
Unnamed Trib	Dry Creek	Dry Creek Road	4J11		Too small - not fish bearing
Schoolhouse Creek	Dry Creek	Dry Creek Road	4J11	T10N, R10W, Section 17	**Surveyed**
Dry Creek	Dry Creek	Dry Creek Road	4J11	T10N, R10W, Section 17	Bridge
Brooks Creek	Brooks Creek	Chalk Hill Road	4J		Bridge
Brooks Creek	Brooks Creek	Spurgeon Road	4J	T9N, R9W, Section 32	**Surveyed**
Barnes Creek	Brooks Creek	Private Drive	4J		Bridge
Martin Creek	Brooks Creek	Private Drive	4J		**Surveyed**
Barnes Creek	Brooks Creek	Shurtleff Private Dr	4J		Bridge
Unnamed Trib to Barnes	Brooks Creek	Shurtleff Private Dr	4J		**Surveyed**
Franz Creek	Maacama Creek	Chalk Hill Road	4J		Bridge
Franz Creek	Maacama Creek	Franz Valley Road	4J		Bridge
Franz Creek	Maacama Creek	Franz Valley School Road	4J	T9N, R7W, Section 31	Bridge
Maacama Creek	Maacama Creek	Chalk Hill Road	4J		Bridge
Little Briggs Creek	Maacama Creek	Santa Angelina Ranch	4J	T10N, R8W, Section 35	**Surveyed**
Coon Creek	Maacama Creek	Santa Angelina Ranch	4J	T10N, R8W, Section 35	**Surveyed**

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Sausal Creek	Sausal Creek	Pine Flat Road	4J		Bridge
Deer Creek	Sausal Creek	Pine Flat Road	4J		No- Steep
Bear Canyon	Sausal Creek	Pine Flat Road	4J		No- Steep
Gird Creek	Gird Creek	Geysers Road	4J12	T10N, R9W	**Surveyed**
Gird Creek	Gird Creek	Wilson Road	4J12	T10N, R9W	**Surveyed**
Gird Creek	Gird Creek	Geysers Road	4J12	T10N, R9W	**Surveyed**
Indian Creek	Russian River	Hwy 128	4J12	T10N, R9W	**Surveyed**
Peterson Creek	Peterson Creek	Geyserville Avenue	4J12		No- Goes under Hwy 101 as 1 culvert
Wood Creek	Wood Creek	All Sites	4J11		No- Sites are no longer existant through Geyserville
Gill Creek	Gill Creek	River Road	4J11		Bridge
Unnamed Trib	Russian River	Asti Road	4H51		Too small - not fish bearing
Unnamed Trib	Russian River	Asti Road	4H51		Too small - not fish bearing
Unnamed Trib	Russian River	Asti Road	4H51		Too small - not fish bearing
Crocker Creek	Crocker Creek	River Road	4H51		**Surveyed**
Barrelli Creek	Barrelli Creek	Asti Road	4H51		Bridge
Barrelli Creek	Barrelli Creek	Dutcher Creek Road	4H51		**Surveyed**
Unnamed Trib	Russian River	River Road	4H51		**Surveyed**
Unnamed Trib	Icaria Creek	Asti Road	4H51		Too small - not fish bearing
Unnamed Trib	Icaria Creek	Dutcher Creek Road	4H51		No- Goes under Hwy 101 as 1 culvert
Icaria Creek	Icaria Creek	Asti Road	4H51		**Surveyed**
Icaria Creek	Icaria Creek	Dutcher Creek Road	3H55		No- Goes under Hwy 101 as 1 culvert
Unnamed Trib	Russian River	River Road	4H51		**Surveyed**
Porterfield Creek	Porterfield Creek	Asti Road	3H55	T11N, R10W, Section 18	No-Goes under Hwy 101 as 1 pipe
Porterfield Creek	Porterfield Creek	South Cloverdale Blvd	3H55	T11N, R10W, Section 19	**Surveyed**
Porterfield Creek	Porterfield Creek	Foothill Blvd	3H55	T11N, R10W, Section 18	Bridge
North Branch	Porterfield Creek	Cherry Creek Road	3H55	T11N, R11W, Section 13	**Surveyed**
Unnamed trib	Porterfield Creek	Asti Road	3H55	T11N, R10W, Section 18	No- Goes under Hwy 101 as 1 pipe
Cloverdale Creek	Cloverdale Creek	East First Street	3H55	T11N, R10W	**Surveyed**
Cloverdale Creek	Cloverdale Creek	3rd Street	3H55	T11N, R10W	Bridge
Cloverdale Creek	Cloverdale Creek	4th Street	3H55	T11N, R10W	Bridge
Cloverdale Creek	Cloverdale Creek	Vista View Drive	3H55	T11N, R10W	**Surveyed**
Cloverdale Creek	Cloverdale Creek	University Street	3H55	T11N, R10W	Bridge

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Cloverdale Creek	Cloverdale Creek	Cloverdale Creek Drive	3H55	T11N, R10W	Bridge
Big Sulphur Creek	Big Sulphur Creek	River Road	3H55	T11N, R10W, Section 5	Bridge
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 5	No- Steep
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 5	No- Steep
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 10	No- Steep
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 10	Bridge
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 11	**Surveyed**
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 11	No- Steep
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 11	No- Steep
Lover Gulch	Little Sulphur Creek	Geysers Road	4J12	T10N, R9W, Section 2	No- Steep
Little Sulphur Creek	Big Sulphur Creek	Geysers Road	4H	T11N, R9W, Section 25	Bridge
Anna Belcher Creek	Little Sulphur Creek	Pine Flat Road	4J		**Surveyed**
Hurley Creek	Little Sulphur Creek	Pine Flat Road	4J		**Surveyed**
Little Sulphur Creek	Big Sulphur Creek	Pine Flat Road	4J		Bridge
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H51	T11N, R10W, Section 1	No- Steep
Frasier Creek	Big Sulphur Creek	Geysers Road	4H51	T11N, R9W, Section 6	Bridge
Unnamed Trib	Big Sulphur Creek	Geysers Road	4H	T11N, R9W, Section 5	No- Steep
Big Sulphur Creek	Big Sulphur Creek	Geysers Road	4H	T11N, R9W, Section 5	Bridge
Unnamed Trib	Russian River	Geysers Road	35HH	T11N, R10W, Section 5	No- Steep
MENDOCINO COUNTY					
Cummiskey Creek	Cummiskey Creek	Mountain House Road	3H	T12N, R11W, Section 9	Bridge
Coleman Creek	Pieta Creek	Old Toll Road	3H35	T13N, R11W, Section 35	Bridge
Unnamed Trib	Russian River	Mountain House Road	3H35	T12N, R11W, Section 4	**Surveyed**

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Unnamed Trib	Unnamed Trib	Mountain House Road	3H35	T13N, R11W, Section 32	Too small - not fish bearing
Unnamed Trib	Russian River	Mountain House Road	3H35	T13N, R11W, Section 32	Bridge
La Franchi	Russian River	Mountain House Road	3H34	T13N, R11W, Section 30	**Surveyed**
Unnamed Trib	Russian River	La Franchi Road?	3H34	T13N, R12W, Section 25	Too small - not fish bearing
Feliz Creek	Feliz Creek	Mountain House Road	3H34		Bridge
Johnson Creek	Feliz Creek	Road 110	3H34	T13N, R12W, Section 26	Bridge
Feliz Creek	Feliz Creek	Road 110	3H34	T13N, R12W, Section 23	Bridge
Unnamed Trib	Feliz Creek	Feliz Creek Road	3H34	T13N, R12W, Section 15	No- Steep
Unnamed Trib	Feliz Creek	Feliz Creek Road	3H34	T13N, R12W, Section 15	**Surveyed**
Unnamed Trib	Russian River	East Side Road	3H34		**Surveyed**
Dooley Creek	Dooley Creek	East Side Road	3H34		Bridge
Dooley Creek	Dooley Creek	Old Toll Road	3H35	T13N, R11W, Section 21	Bridge
Pratt Ranch Creek #1	Dooley Creek	Pratt Ranch Road	3H35	T13N, R11W, Section 15	**Surveyed**
Pratt Ranch Creek #2	Dooley Creek	Pratt Ranch Road	3H35	T13N, R11W, Section 15	**Surveyed**
McDowell Creek	Dooley Creek	Hooper Ranch Road	3H35	T13N, R11W, Section 23	**Surveyed**
McDowell Creek	Dooley Creek	Sanel Valley Road	3H35	T13N, R11W, Section 23	Bridge
McDowell Creek	Dooley Creek	HWY 175	3H35	T13N, R11W, Section 24	**Surveyed**
Unnamed Trib	Dooley Creek	117	3H35	T13N, R11W, Section 15	Under Construction- Will Survey later
Unnamed Trib	Russian River	112A	3H34	T13N, R12W, Section 15	No- Not fish bearing
Unnamed Trib	Russian River	Hewlitt and Sturtevant Road	3H34	T13N, R12W, Section 15	No- Not fish bearing

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Unnamed Trib	Russian River	East Side Road	3H34		No- Not fish bearing
Unnamed Trib	Russian River	University Road	3H35		No- Not fish bearing
Unnamed Trib	McNab Creek	Henry Station Road	3H24		Access
Parsons Creek	Parsons Creek	East Side Road	3H24		Access
Unnamed Trib	Russian River	East Side Road	3H24		**Surveyed**
Unnamed Trib	Russian River	East Side Road	3H24		No- steep
Unnamed Trib	Russian River	East Side Road	3H24		Too small - not fish bearing
Morrison Creek	Morrison Creek	East Side Road	3H24		Bridge
Unnamed Trib	Russian River	East Side Road	3H14		Too small - not fish bearing
Romers Dairy Creek	Russian River	Romers Dairy Road	3H24		**Surveyed**
Unnamed Trib	Russian River	El Roble Road	3H14		Too small - not fish bearing
Unnamed Trib	Russian River	Frontage 'D'	3H14		No- Goes under Hwy 101 as 1 culvert
Unnamed Trib	Howell Creek	Ruddick Cunningham Road	3H14		Bridge
Unnamed Trib	Howell Creek	East Side Road	3H14		Bridge
Howell Creek	Howell Creek	Ruddick Cunningham Road	3H14		Bridge
Unnamed Trib	Howell Creek	East Side Road	3H14		**Surveyed**
Howell Creek	Howell Creek	East Side Road	3H14		**Surveyed**
Unnamed Trib	Howell Creek	Ruddick Cunningham Road	3H14		Too small - not fish bearing
Unnamed Trib	Howell Creek	Gielow Lane	3H14		Too small - not fish bearing
Unnamed Trib	Howell Creek	East Side Road	3H14		Too small - not fish bearing
Unnamed Trib	Robinson Creek	Robinson Creek Road	3H13	T14N, R12W, Section 7	No- Steep
Unnamed Trib	Robinson Creek	Robinson Creek Road	3H13	T14N, R12W, Section 7	No- Steep
Robinson Creek	Robinson Creek	Robinson Creek Road	3H13	T14N, R13W, Section 1	Bridge
Unnamed Trib	Robinson Creek	Robinson Creek Road	3H13	T14N, R13W, Section 1	**Surveyed**
Robinson Creek	Robinson Creek	Robinson Creek Road	3H13	T14N, R13W, Section 11	Bridge
Unnamed Trib	Robinson Creek	Robinson Creek Road	3H13	T14N, R13W, Section 11	**Surveyed**
Robinson Creek	Robinson Creek	Pine Ridge Road	3H13	T15N, R13W, Section 28	**Surveyed**
Cleland Mountain Creek	Russian River	South State Street	3H14	T15N, R13W	**Surveyed**
Unnamed Trib	Russian River	Norgard Lane	3H14		Too small - not fish bearing

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Unnamed Trib	Russian River	State Street	3H14		Too small - not fish bearing
Unnamed Trib	Russian River	South Dora Avenue	3H13	T15N, R12W, Section 32	Too small - not fish bearing
Mill Creek	Mill Creek	Parnum Paving Area	3H14	T15N, R12W	**Surveyed**
McClure Creek	Mill Creek	Sanford Ranch Road	3H14	T15N, R12W	**Surveyed**
McClure Creek	Mill Creek	Sanford Ranch Road	3H14	T15N, R12W	**Surveyed**
Mill Creek	Mill Creek	HWY 222	3H14	T15N, R12W	**Surveyed**
Mill Creek	Mill Creek	Talmage Court	3H14	T15N, R12W	Bridge
Mill Creek	Mill Creek	East Side Road	3H14	T15N, R12W	Bridge
North Fork Mill Creek	Mill Creek	Guidiville Reservation Road	3H14	T15N, R12W	**Surveyed**
Unnamed Trib	Mill Creek	Mill Creek Road	3H14	T15N, R12W	No- small
Mill Creek	Mill Creek	Mill Creek Road	3H14	T15N, R12W	**Surveyed**
Doolin Creek	Gibson Creek	Babcock Lane	3H14	T15N, R12W	**Surveyed**
Doolin Creek	Gibson Creek	Myrtle Lane	3H14	T15N, R12W	No- Private
Doolin Creek	Gibson Creek	Lorraine Street	3H14	T15N, R12W	**Surveyed**
Doolin Creek	Gibson Creek	Betty Street	3H14	T15N, R12W	**Surveyed**
Doolin Creek	Gibson Creek	Vaughn Lane	3H14	T15N, R12W	Bridge
Doolin Creek	Gibson Creek	Cunningham Street	3H13	T15N, R12W	**Surveyed**
Doolin Creek	Gibson Creek	Talmage Road	3H13	T15N, R12W	**Surveyed**
Doolin Creek	Gibson Creek	South State Street	3H13	T15N, R12W	Under Gas Station
Doolin Creek	Gibson Creek	Dora Ave	3H13	T15N, R12W	Bridge
Doolin Creek	Gibson Creek	Wabash Ave	3H13	T15N, R12W	**Surveyed**
Doolin Creek	Gibson Creek	Laurel Ave	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	East Gobbi Street	3H14	T15N, R12W	Bridge
Gibson Creek	Gibson Creek	Orchard Road	3H14	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Warren Drive	3H14	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Leslie Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	East Perkins Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Mason Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Smith Street to Main Street	3H13	T15N, R12W	Under City Block
Gibson Creek	Gibson Creek	North State Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	School Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Oak Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Pine Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Bush Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	North Dora Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Spring Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Barnes Street	3H13	T15N, R12W	**Surveyed**
Gibson Creek	Gibson Creek	Standley Street	3H13	T15N, R12W	**Surveyed**
Orrs Creek	Orrs Creek	Orrs Street	3H13	T15N, R12W	Bridge
Orrs Creek	Orrs Creek	Ford Street	3H13	T15N, R12W	Bridge
Orrs Creek	Orrs Creek	North State Street	3H13	T15N, R12W	Bridge
Orrs Creek	Orrs Creek	Oak Street	3H13	T15N, R12W	**Surveyed**
Orrs Creek	Orrs Creek	Bush Street	3H13	T15N, R12W	Bridge
Unnamed Trib	Orrs Creek	Pine Ridge Road	3H13	T15N, R13W, Section 15	**Surveyed**
Unnamed Trib	Orrs Creek	Pine Ridge Road	3H13	T15N, R13W, Section 22	**Surveyed**

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Unnamed Trib	Orrs Creek	Pine Ridge Road	3H13	T15N, R13W, Section 22	Bridge
Unnamed Trib	Orrs Creek	Pine Ridge Road	3H13	T15N, R13W, Section 22	**Surveyed**
Sulphur Creek	Sulphur Creek	Vichy Springs Road	3H14	T15N, R12W	**Surveyed**
Sulphur Creek	Sulphur Creek	Vichy Springs Road	3H14	T15N, R12W	Access
Sulphur Creek	Sulphur Creek	Vichy Springs Road	3H14	T15N, R12W	Access
Sulphur Creek	Sulphur Creek	Vichy Springs Road	3H14	T15N, R12W	Access
Sulphur Creek	Sulphur Creek	Vichy Springs Road	3H14	T15N, R12W	Private-Access
Sulphur Creek	Sulphur Creek	Vichy Springs Road	3H14	T15N, R12W	**Surveyed**
Unnamed Trib	Russian River	Redemeyer Road	3G54	T15N, R12W	**Surveyed**
Unnamed Trib	Russian River	Redemeyer Road	3G54	T15N, R12W	Too small - not fish bearing
Unnamed Trib	Russian River	Wildwood Road	3G54	T15N, R12W	Too small - not fish bearing
Ackerman Creek	Ackerman Creek	North State Street	3G53	T15N, R12W	Bridge with fish ladder
Ackerman Creek	Ackerman Creek	Orr Springs Road	3G53	T15N, R13W, Section 12	Bridge
Hensley Creek	Hensley Creek	North State Street	3G53	T15N, R12W	Bridge with fish ladder
Howard Creek	Howard Creek	Redemeyer Road	3G54	T15N, R12W	**Surveyed**
Howard Creek	Howard Creek	Deerwood Drive EXT	3G54	T15N, R12W	Bridge
York Creek	York Creek	North State Street	3G53	T16N, R12W	Bridge
Unnamed Trib	Russian River	North State Street	3G53	T16N, R12W	**Surveyed**
Forsythe Creek	Forsythe Creek	North State Street	3G43	T16N, R12W	Bridge
Unnamed Trib	Forsythe Creek	Bel Arbres Road	3G43	T16N, R12W, Section 7	Too small - not fish bearing
Unnamed Trib	Forsythe Creek	Bel Arbres Road	3G43	T16N, R12W, Section 7	Too small - not fish bearing
Unnamed Trib	Forsythe Creek	Lennix Drive	3G43	T16N, R12W, Section 7	Too small - not fish bearing
Forsythe Creek	Forsythe Creek	Uva Drive	3G43	T16N, R12W, Section 7	Bridge
Bakers Creek	Forsythe Creek	North State Street	3G43	T16N, R12W, Section 6	Under 101 as one culvert
Bakers Creek	Forsythe Creek	Northwestern Pacific RR	3G43	T17N, R13W, Section 36	**Surveyed**
Mill Creek	Forsythe Creek	Reeves Canyon Road	3G43	T17N, R13W, Section 34	Ford
Mill Creek	Forsythe Creek	Reeves Canyon Road	3G	T17N, R13W	Bridge
Mill Creek	Forsythe Creek	Reeves Canyon Road	3G	T17N, R13W	Bridge
Mill Creek	Forsythe Creek	Reeves Canyon Road	3G	T17N, R13W	Bridge
Mill Creek	Forsythe Creek	Reeves Canyon Road	3G	T17N, R13W	Bridge
Mill Creek	Forsythe Creek	Reeves Canyon Road	3G	T17N, R13W	Bridge
Forsythe Creek	Forsythe Creek	Reeves Canyon Road	3G43		Bridge

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Forsythe Creek	Forsythe Creek	Black Bart Road	3G32	T17N, R13W, Section 7	**Surveyed**
Salt Hollow Creek	Salt Hollow Creek	East Road	3G44	T16N, R12W	Bridge
North Fork Salt Hollow Cr	Salt Hollow Creek	Road B	3G44	T16N, R12W	**Surveyed**
Salt Hollow Creek	Salt Hollow Creek	Road B	3G44	T16N, R12W	**Surveyed**
Salt Hollow Creek	Salt Hollow Creek	Road B	3G44	T16N, R12W	Bridge
Salt Hollow Creek	Salt Hollow Creek	Road B	3G44	T16N, R12W	**Surveyed**
Rocky Creek	Rocky Creek	Tomki Road	3G43	T17N, R12W, Section 20	Bridge
Mariposa Creek	Mariposa Creek	Tomki Road	3G43	T17N, R12W, Section 17	**Surveyed**
COASTAL SONOMA COUNTY - Status of 58 stream Crossings Visited					
South Fork Gualala River					
Wheatfield Fork Gualala River	South Fork Gualala River	Annapolis Road		T10N, R14W, Section 22	Bridge
Sullivan Creek	Fuller Creek	Annapolis Road		T10N, R13W, Section 21	Too small - not fish bearing
Boyd Creek	Fuller Creek	Annapolis Road		T10N, R13W, Section 21	**Surveyed**
Fuller Creek	Wheatfield Fork Gualala River	Annapolis Road		T10N, R13W, Section 20	Bridge
Haupt Creek	Wheatfield Fork Gualala River	Skaggs Springs Road		T9N, R13W, Section 4	Bridge
Wheatfield Fork Gualala River	South Fork Gualala River	Annapolis Road		T10N, R13W, Section 33	Bridge
Unnamed Trib	Wheatfield Fork Gualala River	Annapolis Road		T10N, R13W, Section 33	Small
Tobacco Creek	Wheatfield Fork Gualala River	Skaggs Springs Road		T10N, R13W, Section 34	**Surveyed**
Unnamed Trib	Wheatfield Fork Gualala River	Skaggs Springs Road		T10N, R13W, Section 25	Too small - not fish bearing
House Creek	Wheatfield Fork Gualala River	Skaggs Springs Road		T10N, R12W, Section 6	Bridge
Wolf Creek	Wheatfield Fork Gualala River	Skaggs Springs Road		T10N, R12W, Section 32	Bridge
Wolf Creek	Wheatfield Fork Gualala River	Skaggs Springs Road		T10N, R12W, Section 32	Bridge
South Fork Gualala River	Gualala River	Skaggs Springs Road		T9N, R14W, Section 1	Bridge
South Fork Gualala River	Gualala River	Hauser Bridge Road		T9N, R13W, Section 22	Bridge

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Unnamed Trib	South Fork Gualala River	Bohan Dillon Creek		T8N, R12W, Section 17	Bridge
Bohan Dillon Creek	South Fork Gualala River	Fort Ross Road		T8N, R12W	**Surveyed**
South Fork Gualala River	Gualala River	Miestrath Road		T8N, R12W, Section 16	Bridge
SALMON CREEK					
Coleman Valley Creek	Salmon Creek	Salmon Creek Road	3J55	T6N, R10W	Bridge
Fay Creek	Salmon Creek	Salmon Creek Road	3J55	T6N, R10W	**Surveyed**
Fay Creek	Salmon Creek	Fitzpatrick Lane	3J55	T6N, R10W	Bridge
Unnamed Trib	Salmon Creek	Salmon Creek Road	4J51	T6N, R10W	Too small - not fish bearing
Tannery Creek	Salmon Creek	Salmon Creek Road	4J51	T6N, R10W	Bridge
Salmon Creek	Salmon Creek	Salmon Creek Road	4J51	T6N, R10W	Bridge
Salmon Creek	Salmon Creek	Bodega Highway	4J51	T6N, R10W	Bridge
Nolan Creek	Salmon Creek	Bodega Highway	4J51	T6N, R10W	Bridge
Thurston Creek	Nolan Creek	Joy Road	4J51	T6N, R10W	**Surveyed**
Nolan Creek	Salmon Creek	Joy Road	4J51	T6N, R10W	Need Access
Unnamed Trib	Salmon Creek	Bodega Highway	4J51	T6N, R10W	**Surveyed**
Vina Creek	Salmon Creek	Bodega Highway	4J51	T6N, R10W	**Surveyed**
Unnamed Trib	Salmon Creek	Bodega Highway	4J51	T6N, R10W, Section 14	Too small - not fish bearing
Salmon Creek	Salmon Creek	Bodega Highway	4J51	T6N, R10W, Section 24	Bridge
Salmon Creek	Salmon Creek	Bohemian Highway	4J51	T6N, R10W, Section 12	Bridge
Salmon Creek	Salmon Creek	Freestone Flat Road	4J51	T6N, R10W,	Bridge
Salmon Creek	Salmon Creek	Bohemian Highway	4J51	T6N, R10W, Section 2	**Surveyed**
Unnamed Trib	Salmon Creek	Bohemian Highway	4J51	T6N, R10W, Section 2	**Surveyed**
Salmon Creek	Salmon Creek	Bittner Road	4J51	T7N, R10W, Section 34	**Surveyed**
Salmon Creek	Salmon Creek	Bittner Road	4J51	T7N, R10W, Section 34	**Surveyed**
Salmon Creek	Salmon Creek	Marra Road	4J51	T6N, R10W, Section 3	**Surveyed**
Unnamed Trib	Salmon Creek	Bittner Road	4J51	T6N, R10W, Section 3	Possible site
Salmon Creek	Salmon Creek	Bittner Road	4J51	T6N, R10W, Section 4	Too small - not fish bearing
ESTERO AMERICANO					
Ebabias Creek	Estero Americano	Valley Ford Freestone Road	4K11	T6N, R10W	Bridge
Unnamed Trib	Ebabias Creek	Valley Ford Freestone Road	4J51	T6N, R10W	Too small - not fish bearing
Unnamed Trib	Estero Americano	Valley Ford Road	4K12	T5N, R9W	Bridge
Estero Americano	Estero Americano	Gericke Road	4K12	T5N, R9W	Bridge
Unnamed Trib	Estero Americano	Valley Ford Road	4K12	T5N, R9W	Too small - not fish bearing
Bloomfield Creek	Estero Americano	Valley Ford Road	4K12	T5N, R9W	Too small - not fish bearing
Bloomfield Creek	Estero Americano	Bloomfield Road	4K12	T5N, R9W	Too small - not fish bearing
Bloomfield Creek	Estero Americano	Bloomfield Road	4K12	T6N, R9W	Too small - not fish bearing

STREAM NAME	SUB BASIN NAME	ROAD NAME	COUNTY MAP #	Township, Range and Section	STATUS OF INITIAL SITE VISIT
Estero Americano	Estero Americano	Valley Ford Road	4K12	T5N, R9W	Bridge
Unnamed Trib	Estero Americano	Valley Ford Road	4K12	T5N, R9W	Too small - not fish bearing
Estero Americano	Estero Americano	Roblar Road	4K12	T5N, R9W	Bridge
Estero Americano	Estero Americano	Roblar Road	4K12	T5N, R9W	Too small - not fish bearing
Estero Americano	Estero Americano	Roblar Road	4K12	T6N, R9W	Too small - not fish bearing
Estero Americano	Estero Americano	Canfield Road	4K13	T6N, R9W	Too small - not fish bearing
				Total Surveyed	**195**

MENDOCINO COUNTY RUSSIAN RIVER CULVERT LOCATIONS AND CHARACTERISTICS **MENDOCINO COUNTY RUSSIAN RIVER CULVERT DATA**

ID #	Stream Name	Road Name	Drainage	County Map #	Township, Range, Section	Latitude and Longitude Coordinates	Road ID #	Milemarker or Name and Distance to nearest Crossroad	Type of Culvert	Construction Material	Corrugation Dimensions	Culvert Length (ft)	Culvert Dimensions: Diameter, height/width, or rise/span (ft)	% Slope thru Culvert	Outlet Apron
M-001	Un-named tributary #1 on Mtn House Rd	Mountain House road	Russian R	3H35	T12N, R11W, Section 4	38° 55' 24.99" N 123° 05' 30.93" W	111	4.4	Box	Concrete	Smooth	35.6	6.3 X 6.0	1.60	N/A
M-002	La Franchi Creek	Mountain House road	Russian R	3H34	T13N, R11W	38° 57' 32.04" N 123° 06' 48.09" W	111	8.26	Box	Concrete	Smooth	27.0	3.6 X 10.0	-1.04	N/A
M-003	Un-named tributary to Feliz Cr	Feliz Creek Road	Feliz Cr-Russian R	3H34	T13N, R12W, Section 15	38° 59' 24.80" N 123° 09' 45.23" W	109	1.6 M to Road 110	Circular	SSP	2-2/3" X 1/2"	35.0	4.5	2.23	N/A
M-004	Un-named Trib#1 on East Side Rd	East Side Road	Russian R	3H34	T13N, R11W	38° 58' 8.63" N 123° 06' 4.69" W	201	1.27	Box	Concrete	Smooth	47.1	8 X 6	1.66	Slope= -0.33% Length= 9.2ft
M-005	Pratt Ranch Creek #1	Pratt Ranch Road	Dooley Cr-Russian R	3H35	T13N, R11W, Section15	38° 59' 11.49" N 123° 03' 31.31" W	116A	0.9 M to Hwy 175	Circular	SSP	2-2/3" X 1/2"	122.4	5.5	1.53	N/A
M-006	Pratt Ranch Creek #2	Pratt Ranch Road	Dooley Cr-Russian R	3H35	T13N, R11W, Section15	38° 59' 20.70" N 123° 03' 27.11" W	116A	1.1 M to Hwy 175	Circular	SSP	2-2/3" X 1/2"	56.7	4.5	3.90	N/A
M-007	McDowell Creek #1	Hooper Ranch Road	Dooley Cr-Russian R	3H35	T13N, R11W, Section 23	38° 58' 13.32" N 123° 01' 59.60" W	Private	0.05 M to Hwy175	Open Bottom Arch w/ concrete floor	SSP	6" X 2"	39.4	10.4 X 12.5	1.27	Slope=16.22% Length=33.6ft
M-008	McDowell Creek #2	HWY 175	Dooley Cr-Russian R	3H35	T13N, R11W, Section 24	38° 58' 20.41" N 123° 01' 11.73" W	State	5.7	Box	Concrete	Smooth	54.7	7.7 X 10	4.17	Slope= -7.50% Length= 0.6ft
M-009	Un-named trib #2 on East Side Rd	East Side Road	Russian R	3H24	T14N, R12W	39° 02' 50.16" N 123° 07' 57.81" W	201	7.72	Circular	SSP	2-2/3" X 1/2"	55.6	4.0	3.71	N/A
M-010	Romers Dairy Creek	Romers Dairy Rd	Russian R	3H24	T14N, R12W	39° 04' 48.51" N 123° 10' 51.54" W	107A	0.2 M to Frontage Rd	Box	Concrete	Smooth	26.0	6.1 X 6.0	-6.19	N/A
M-011	Un-named trib to Howell Cr - 1of2	East Side Road	Howell Cr-Russian R	3H14	T15N, R12W	39° 06' 47.08" N 123° 09' 24.12" W	201	13.02	Box	Concrete	Smooth	35.6	3.1 X 8.0	1.29	N/A
M-011	Un-named trib to Howell Cr - 2of2	East Side Road	Howell Cr-Russian R	3H14	T15N, R12W	39° 06' 47.08" N 123° 09' 24.12" W	201	13.02	Box	Concrete	Smooth	35.6	3.1 X 8.0	0.56	N/A
M-012	Howell Creek - 1of2	East Side Road	Russian R	3H14	T15N, R12W	39° 06' 32.81" N 123° 09' 26.27" W	201	12.75	Box	Concrete	Smooth	27.5	8 X 8	0.65	N/A

MENDO

ID #	Rustline Height (ft)	Inlet Type	Inlet Alignment to Channel	Outlet Configuration	Culvert Embedded?	Culvert Condition	Average Active Channel Width (ft)	Estimated Road fill (cubic yards)	Previous Modifications to Culvert	Additional Comments from Initial Site Visit	Hydrologic Region
M-001	N/A	Headwall	<30°	At Stream Grade	Inlet=0.0' Outlet=0.4'	Fair - wingwalls cracked	8.2	457	No	Data Collected at 10:00 am. Air=21C Water=14C. Fair fish habitat. Russian is ~ 1.5 miles downstream from culvert. Fairly small creek. Lots of cows grazing around and in creek.	V
M-002	N/A	Wingwalls	Straight	At Stream Grade	Yes-Depth??	Good	13.9	114	No	Creek is dry on 10-2-01. Fair fish habitat, good spawning gravels. Sparse canopy of hardwoods. Culvert appears to be filling with sediment. Deepest pool area is at the outlet.	V
M-003	N/A	Headwall	Straight	Cascade over Riprap	No	Fair-Abraded	9.7	466	Concrete bottom up to 0.2'	Data Collected at 1:45am. Air=27C Water=15C. Very good fish habitat. Nice hardwood canopy. Carved bedrock, pools and overhanging banks. Not much water currently, just 2 pools.	V
M-004	N/A	Wingwalls	<30°	At Stream Grade	No	Good	8.6	482	No	Creek is dry on 10-2-01. Poor fish habitat around culvert. Upstream channel measurements were done downstream due to debris and vegetation at inlet. Substrate of fines. Hardwood canopy.	V
M-005	2.0	Projecting	>45°	Freefall into Pool	No	Poor- Rusted Through	9.0	5375	No	Data Collecteed at 8:30am. Air=18C Water=11C. Fair fish habitat. Only water present was in the outlet pool. Owner gave us access but said no one else, especially a government agency, is allowed to come here. Small channel with a moderate hardwood canopy. Substrate of fines and gravels. 100 ft from the outlet is a homemade flasboard dam about 3.5' high. Outlet is rusted through and the owner has installed a 2' platform to create a waterfall. Property owner sees lots of fish every year trying to get through the culvert.	V
M-006	1.1	Projecting	30°-45°	Cascade over Riprap	No	Poor- Rusted Through	6.5	335	No	Creek is dry on 10-11-01. Sparse canopy of hardwoods. Fair fish habitat but pretty small trib. Lack of any pool depth.	V
M-007	Below Footings	Wingwalls	<30°	Cascade over Riprap	No	Fair	13.6	1,175	No	Data Collected at 2:00pm. Air=17.5C Water=13C. Good fish habitat. Good spawning substrate. Moderate hardwood canopy. Oultlet apron in very long and steep, with the bottom half being rip rap concreted in place. Appears as if concrete was poured in pipe. Poor indicators for ACM.	V
M-008	N/A	Wingwalls	<30°	Freefall into Pool	No	Good	12.5	1580	No	Data Collected at 4:00 pm. Air=12C Water=10C. Very good fish habitat. Stream is flowing very well for a dry year. Substrate is cobbles to small boulders with good spawning gravels. Drop at outlet into large pool. Looks slightly silty upstream. Dense canopy of hardwoods.	V
M-009	0.1	Wingwalls	Straight	Freefall into Pool	No	Fair	9.3	816	No	Creek is dry on 10-2-01. Steep banks above and below culvert. Definite fish barrier. Pipe is very perched. Local resident said she has not seen fish here and has looked. Moderate canopy of hardwoods.	V
M-010	N/A	Headwall	>45°	At Stream Grade	Yes-Depth??	Good	8.4	172	No	Creek is dry of 10-11-01. Fair fish habitat. Not that great of a fish stream. Old timer local says it dries up every year in June at the latest. Culvert is fully embedded making is difficult to determine if it is a box or a bridge. Moderate canopy of hardwoods.	V
M-011	N/A	Headwall	Straight	Cascade over Riprap	Inlet=0.3' Outlet=0.0'	Fair	8.4	201	No	Creek is dry on 10-3-01. Moderate canopy of hardwoods. Creek is currently dry. Local said it only flows in the winter. Does not seem like very good fish habitat due to lack of gradient and features.	V
M-011	N/A	Headwall	Straight	Cascade over Riprap	No	Fair	8.4	201	No	Creek is dry on 10-3-01. Moderate canopy of hardwoods. Creek is currently dry. Local said it only flows in the winter. Does not seem like very good fish habitat due to lack of gradient and features.	V
M-012	N/A	Headwall	<30°	At Stream Grade	No	Good	12.6	147	No	Creek is dry on 10-3-01. Poor fish habitat. Creek is surrounded by vineyards and ag. Land with cows in the creek upstream. Very little canopy. About 40' downstream the creek is used as a road for the vineyard.	V

ID #	Stream Name	Road Name	Drainage	County Map #	Township, Range, Section	Latitude and Longitude Coordinates	Road ID #	Milemarker or Name and Distance to nearest Crossroad	Type of Culvert	Construction Material	Corrugation Dimensions	Culvert Length (ft)	Culvert Dimensions: Diameter, height/width, or rise/span (ft)	% Slope thru Culvert	Outlet Apron
M-012	Howell Creek - 2of2	East Side Road	Russian R	3H14	T15N, R12W	39° 06' 32.81" N 123° 09' 26.27" W	201	12.75	Box	Concrete	Smooth	27.5	8 X 8	-1.27	N/A
M-013	Un-named trib #1 to Robinson Cr	Robinson Creek Road	Robinson Cr-Russian R	3H13	T14N, R13W, Section 1	39° 05' 46.53" N 123° 14' 10.91" W	125	1.22	Box	Concrete	Smooth	21.3	8.3 X 8.8	1.31	Slope= 17.92% Length= 10.1ft
M-014	Un-named trib #2 to Robinson Cr - 1of3	Robinson Creek Road	Robinson Cr-Russian R	3H13	T14N, R13W, Section 11	39° 05' 33.07" N 123° 15' 52.14" W	125	3.2 Miles to Hwy 253	Box	Concrete	Smooth	22.8	8 X 12	0.66	N/A
M-014	Un-named trib #2 to Robinson Cr - 2of3	Robinson Creek Road	Robinson Cr-Russian R	3H13	T14N, R13W, Section 11	39° 05' 33.07" N 123° 15' 52.14" W	125	3.2 Miles to Hwy 253	Box	Concrete	Smooth	22.8	8 X 12	-0.04	N/A
M-014	Un-named trib #2 to Robinson Cr - 3of3	Robinson Creek Road	Robinson Cr-Russian R	3H13	T14N, R13W, Section 11	39° 05' 33.07" N 123° 15' 52.14" W	125	3.2 Miles to Hwy 253	Box	Concrete	Smooth	22.8	8 X 12	-1.40	N/A
M-015	Robinson Creek	Pine Ridge Road	Russian R	3H13	T15N, R13W, Section 28	39° 07' 32.05" N 123° 17' 13.60" W	220	5.4 M to Low Gap Rd	Circular	SSP	2-2/3" X 1/2"	25.4	6.0	6.14	N/A
M-016	Cleland Mountain Creek	South State Street	Russian R	3H14	T15N, R12W	39° 06' 50.12" N 123° 11' 50.83" W	104A	500' to Whitmore Lane	Circular	SSP	2-2/3" X 1/2"	55.0	6.0	0.02	N/A
M-017	Mill Creek #1	Private Road-Parnum Paving Co.	Russian R	3H14	T15N, R12W	39° 08' 8.49" N 123° 11' 2.15" W	Parnum Paving Co.	0.2 M to Hwy 222	Pipe Arch	Aluminum	9" X 3"	31.2	6.1 X 9.2	2.63	Slope= 6.05% Length= 39.2ft
M-018	McClure Creek #1 - 1of2	Sanford Ranch Road	Mill Cr-Russian R	3H14	T15N, R12W	39° 08' 0.08" N 123° 10' 33.45" W	200	0.05 M to Hwy 222	Box	Concrete	Smooth	58.6	8 X 8	-4.10	N/A
M-018	McClure Creek #1 - 2of2	Sanford Ranch Road	Mill Cr-Russian R	3H14	T15N, R12W	39° 08' 0.08" N 123° 10' 33.45" W	200	0.05 M to Hwy 222	Box	Concrete	Smooth	58.6	8 X 8	-4.66	N/A
M-019	McClure Creek #2 - 1of2	Sanford Ranch Road	Mill Cr-Russian R	3H14	T15N, R12W	39° 08' 20.90" N 123° 09' 56.77" W	200	0.86	Box	Concrete	Smooth	53.8	7.9 X 8.0	-3.66	N/A
M-019	McClure Creek #2 - 2of2	Sanford Ranch Road	Mill Cr-Russian R	3H14	T15N, R12W	39° 08' 20.90" N 123° 09' 56.77" W	200	0.86	Box	Concrete	Smooth	53.8	7.9 X 8.0	-0.09	N/A
M-020	Mill Creek #2	HWY 222	Russian R	3H14	T15N, R12W	39° 07' 59.56" N 123° 10' 36.28" W	State	1.52	Box	Concrete	Smooth	38.0	4.5 X 18.15	0.68	N/A

ID #	Rustline Height (ft)	Inlet Type	Inlet Alignment to Channel	Outlet Configuration	Culvert Embedded?	Culvert Condition	Average Active Channel Width (ft)	Estimated Road fill (cubic yards)	Previous Modifications to Culvert	Additional Comments from Initial Site Visit	Hydrologic Region
M-012	N/A	Headwall	<30°	At Stream Grade	Inlet=0.4 Outlet=0.5'	Good	12.6	147	No	Creek is dry on 10-3-01. Poor fish habitat. Creek is surrounded by vineyards and ag. Land with cows in the creek upstream. Very little canopy. About 40' downstream the creek is used as a road for the vineyard.	V
M-013	N/A	Wingwalls	Straight	At Stream Grade	No	Fair	11.5	274	No	Creek is dry on 10-3-01. Fair fish habitat. Creek seems fairly small. It does have a nice pool-drop sort of look to it. Sparse hardwood canopy. Canyon hills are mostly steep and covered with dry grass & intermittent oaks along creek.	V
M-014	N/A	Wingwalls	<30°	At Stream Grade	No	Good	15.6	114	No	Creek is dry on 10-3-01. Large channel at this crossing. OK quality fish habitat. Moderate canopy of hardwoods. Locals say fish get up this creek each year and the stream dries up each year except for way up in the system where "exposed bedrock maintains pools with many fish."	V
M-014	N/A	Wingwalls	<30°	At Stream Grade	Inlet=1.4' Outlet=1.5'	Good	15.6	114	No	Creek is dry on 10-3-01. Large channel at this crossing. OK quality fish habitat. Moderate canopy of hardwoods. Locals say fish get up this creek each year and the stream dries up each year except for way up in the system where "exposed bedrock maintains pools with many fish."	V
M-014	N/A	Wingwalls	<30°	At Stream Grade	Inlet=2.4' Outlet=2.9'	Good	15.6	114	No	Creek is dry on 10-3-01. Large channel at this crossing. OK quality fish habitat. Moderate canopy of hardwoods. Locals say fish get up this creek each year and the stream dries up each year except for way up in the system where "exposed bedrock maintains pools with many fish."	V
M-015	0.4	Headwall	<30°	Cascade over Riprap	No	Poor- Rust Through	7.2	266	No	Creek is dry on 11-5-01. Questionable if fish bearing. Steep and bouldery at outlet. Continues at a steep downstream slope until station 103.0, then becomes more gradual in slope and narrows. Creek seems steep. Upstream from inlet creek bed is narrow and flat for about 100' then steepens.	V
M-016	1.2	Wingwalls	<30°	At Stream Grade	Inlet=0.0' Outlet=0.3'	Poor- Rust Through	6.0	271	No	Creek is dry on 10-11-01. Property owner says it only runs during the rainy season. Poor fish habitat. Resident said the only time he ever saw fish was right after the dam went in and "they didn't know where to go." Moderate canopy of hardwoods.	V
M-017	N/A	Headwall	Straight	At Stream Grade	No	Good	13.9	512	Concrete bottom	Creek is dry on 10-12-01. Downstream creek has been widened with heavy machinery. Poor fish habitat. Upstream the canopy is sparse hardwoods, downstream there is no canopy anywhere near the culvert.	V
M-018	N/A	Wingwalls	Straight	At Stream Grade	Inlet=0.0' Oultet=2.3'	Good	10.4	234	No	Creek is dry on 10-4-01. Moderate canopy of pines, oaks, grapevines and other brush. Seems like fair fish habitat but a bit lacking in features. Left bay is extremely embedded.	V
M-018	N/A	Wingwalls	Straight	At Stream Grade	Inlet=0.0' Outlet=1.7'	Good	10.4	234	No	Creek is dry on 10-4-01. Moderate canopy of pines, oaks, grapevines and other brush. Seems like fair fish habitat but a bit lacking in features. Left bay is extremely embedded.	V
M-019	N/A	Wingwalls	30°-45°	At Stream Grade	Inlet=1.8' Outlet=2.9'	Good	11.7	339	No	Data Collected at 10:30am. Air=18C Water=14.5C. Creek is dry except for three little pools upstream of the inlet about 30' apart. Pools all have fish. Fair fish habitat, canopy of hardwoods. Vineyards surrounding creek.	V
M-019	N/A	Wingwalls	30°-45°	At Stream Grade	Inlet=0.0' Outlet=0.7'	Good	11.7	339	No	Data Collected at 10:30am. Air=18C Water=14.5C. Creek is dry except for three little pools upstream of the inlet about 30' apart. Pools all have fish. Fair fish habitat, canopy of hardwoods. Vineyards surrounding creek.	V
M-020	N/A	Headwall	<30°	At Stream Grade	Yes- Depth??	Fair	12.5	175	No	It's unclear whether this crossing is a very embedded culvert or a bridge. Seems undersized. Creek is currently dry. Mill Creek is about a foot higher than McClure Cr at the confluence, then drops down to height of McClure. Crossing height was taken at the inlet.	V

ID #	Stream Name	Road Name	Drainage	County Map #	Township, Range, Section	Latitude and Longitude Coordinates	Road ID #	Milemarker or Name and Distance to nearest Crossroad	Type of Culvert	Construction Material	Corrugation Dimensions	Culvert Length (ft)	Culvert Dimensions: Diameter, height/width, or rise/span (ft)	% Slope thru Culvert	Outlet Apron
M-021	North Fork Mill Creek	Guidiville road	Mill Cr-Russian R	3H14	T15N, R12W	39° 07' 59.15" N 123° 08' 52.14" W	203B	0.1 M to Mill Creek Rd	Pipe Arch	SSP	6" X 2"	46.0	7.5 X 12.3	-0.59	N/A
M-022	Mill Creek #3	Mill Creek Road	Russian R	3H14	T15N, R12W	39° 07' 52.04" N 123° 08' 52.53" W	203	0.81	Box	Concrete	Smooth	32.7	8 X 12	0.18	Slope= -0.42% Length= 12.0ft
M-023	Doolin Creek#1 - 1of2	Babcock Lane	Gibson Cr-Russian R	3H14	T15N, R12W	39° 08' 11.67" N 123° 11' 25.81" W	207	300' to Talmage Road	Box	Concrete	Smooth	27.8	3.6 X 6.0	-0.25	N/A
M-023	Doolin Creek#1 - 2of2	Babcock Lane	Gibson Cr-Russian R	3H14	T15N, R12W	39° 08' 11.67" N 123° 11' 25.81" W	207	300' to Talmage Road	Box	Concrete	Smooth	27.8	3.6 X 6.0	-2.01	N/A
M-024	Doolin Creek #2	Lorraine Street	Gibson Cr-Russian R	3H14	T15N, R12W	39° 08' 16.41" N 123° 11' 43.39" W	City of Ukiah	0.1 M to Marlene St.	Box	Concrete	Smooth	40.2	3.5 X 14	-0.17	N/A
M-025	Doolin Creek #3	Betty Street	Gibson Cr-Russian R	3H14	T15N, R12W	39° 08' 16.16" N 123° 11' 53.83" W	City of Ukiah	0.1 M to Marlene St.	Box	Concrete	Smooth	40.0	3.25 X 14	0.20	N/A
M-026	Doolin Creek #4	Cunningham Street	Gibson Cr-Russian R	3H13	T15N, R12W	39° 08' 11.61" N 123° 12' 3.93" W	City of Ukiah	0.05 M to Talmage Rd	Circular	SSP	2-2/3" X 1/2"	40.4	7.3	-1.81	N/A
M-027	Doolin Creek #5	Talmage Road	Gibson Cr-Russian R	3H13	T15N, R12W	39° 08' 11.01" N 123° 12' 7.89" W	City of Ukiah	at Lewis Lane	Box	Concrete	Smooth	40.2	3 X 12.5	0.07	Slope= 3.55% Length= 9.3ft
M-028	Doolin Creek #6	Wabash Ave	Gibson Cr-Russian R	3H13	T15N, R12W	39° 07' 55.10" N 123° 12' 37.19" W	City of Ukiah	0.1 M to Baywood ct	Box	Concrete	Smooth	53.0	4.9 X 9.4	0.09	N/A
M-029	Doolin Creek #7	Laurel Ave	Gibson Cr-Russian R	3H13	T15N, R12W	39° 07' 54.17" N 123° 12' 38.08" W	City of Ukiah	at Baywood ct	Box	Concrete	Smooth	79.9	4.8 X 9.3	1.33	Slope=2.23% Length=9.4 ft
M-030	Gibson Creek #1	Orchard Road	Russian R	3H14	T15N, R12W	39° 08' 57.48" N 123° 11' 52.10" W	City of Ukiah	0.1 M to Peach Rd	Box	Concrete	Smooth	55.0	4.4 X 20	0.45	N/A
M-031	Gibson Creek #2	Warren Drive	Russian R	3H14	T15N, R12W	39° 08' 59.71" N 123° 11' 59.26" W	City of Ukiah	0.1 M to East Perkins St.	Box	Concrete	Smooth	53.5	4.6 X 10	0.65	Slope= 8.06% Length= 10.3ft
M-032	Gibson Creek #3	Leslie Street	Russian R	3H13	T15N, R12W	39° 09' 0.77" N 123° 12' 3.49" W	City of Ukiah	0.1 M to Perkins St.	Box	Concrete	Smooth	55.9	1.8 X 12	2.88	Slope= 9.93% Length= 40.4ft

ID #	Rustline Height (ft)	Inlet Type	Inlet Alignment to Channel	Outlet Configuration	Culvert Embedded?	Culvert Condition	Average Active Channel Width (ft)	Estimated Road fill (cubic yards)	Previous Modifications to Culvert	Additional Comments from Initial Site Visit	Hydrologic Region
M-021	1.0	Mitered	Straight	At Stream Grade	Inlet=0.8' Outlet=1.6'	Good	11.4	392	No	Creek is dry on 10-4-01. Good fish habitat. Nice canopy of hardwoods. According to residents there used to (~25yrs ago) be thousands of STHD. Now more like 10 a year. The culvert poses no problem, but vineyard above is allowed to take 3/4 of the water. Resident said there is a natural barrier, a waterfall, about 2 miles upstream and there is water above the vineyard.	V
M-022	N/A	Wingwalls	<30°	Freefall into Pool	No	Fair	9.6	234	No	Data Collected at 12:30pm. Air=17C Water=15C. Good fish habitat. Thick with grapevines and berry bushes. Good canopy of hardwoods. Big jump into culvert. Lots of water for this time of year. Suprised to not find any fish here. Good spawning gravels.	V
M-023	N/A	Wingwalls	>45°	Freefall into Pool	No	Fair	8.3	154	No	Creek is dry on 10-4-01. Poor fish habitat. Pear surround creek keeping it channelized. Sparse canopy, numerous upstream crossings. Right bay of box culvert almost fully embedded.	V
M-023	N/A	Wingwalls	>45°	Freefall into Pool	Inlet=0.2' Outlet=0.6'	Fair	8.3	154	No	Creek is dry on 10-4-01. Poor fish habitat. Pear surround creek keeping it channelized. Sparse canopy, numerous upstream crossings. Right bay of box culvert almost fully embedded.	V
M-024	N/A	Wingwalls	<30°	At Stream Grade	No	Good	8.5	34	No	Data Collected at 8:30am. Air=12.5C Water=13C. Poor fish habitat. Channel is straight, flat and confined by walls in this section. Residential area. Creek bed turns to concrete about 50' upstream.	V
M-025	N/A	Wingwalls	<30°	Freefall into Pool	No	Good	10.6	70	No	Data Collected at 9:45am. Air=12.5C Water=12.5C. Sparse Canopy, confined channel, poor fish habitat. Local resident of 15 years said water doesn't get too high and has seen "just a couple steelhead ever."	V
M-026	1.6	Wingwalls	<30°	At Stream Grade	Inlet=1.4' Outlet=2.5'	Fair	11.6	150	No	Data Collected at 10:30am. Air=13C Water=13C. Poor quality fish habitat. Stream is no longer contained by walls, it has a natural bed and is in residential/industrial area. Local says he sees fish coming up when it rains.	V
M-027	N/A	Wingwalls	>45°	At Stream Grade	No	Fair	9.8	186	No	Data Collected at 12:30pm. Air=14C Water=14C. Poor fish habitat in city limits of Ukiah. Busy street. Confined channel, especially upstream. Full of trash. Culvert partial barrier due to smooth concrete floor. No canopy here.	V
M-028	N/A	Wingwalls	<30°	At Stream Grade	Inlet=0.0' Outlet=0.4'	Good	12.6	255	No	Data Collected at 2:30pm. Air=6C Water=7C. Creek runs through residences front yard. Ok fish habitat. Sparse veg/canopy.	V
M-029	N/A	Wingwalls	<30°	At Stream Grade	No	Good	9.0	185	No	Data Collected at 2:30pm. Air=6C Water=7C. Creek runs through residences front yard. Fair fish habitat. Sparse veg/canopy. Channel confined by caged rock walls up and downstream.	V
M-030	N/A	Wingwalls	<30°	Freefall into Pool	No	Good	10.8	105	No	Data Collected at 10:00am. Air=15.5C Water=13.5C. Poor fish habitat around culvert. Channel is confined by shopping center and residential areas. Culvert floor sits about 0.5' above the stream bed. Upstream creek is channelized straight with walls 10.8 ft apart. Downstream is overgrown with berries, grasses and willows.	V
M-031	N/A	Wingwalls	<30°	At Stream Grade	No	Good	10.0	157	No	Creek is currently dry. Poor fish habitat. Channel is confined by walls on both sides as far as you can see from culvert. Upstream is embedded, but from the looks of the exposed concrete in a couple areas it seems that a concrete floor exists up the channel.	V
M-032	N/A	Headwall	<30°	Freefall into Pool	No	Good	8.8	134	No	Creek is currently dry. Poor fish habitat. Channel is confined by residential area and walls. There is substrate but no features for fish. Tiny canopy. Huge apron. Inlet seems way too small for the size creek.	V

ID #	Stream Name	Road Name	Drainage	County Map #	Township, Range, Section	Latitude and Longitude Coordinates	Road ID #	Milemarker or Name and Distance to nearest Crossroad	Type of Culvert	Construction Material	Corrugation Dimensions	Culvert Length (ft)	Culvert Dimensions: Diameter, height/width, or rise/span (ft)	% Slope thru Culvert	Outlet Apron
M-033	Gibson Creek #4	East Perkins Street	Russian R	3H13	T15N, R12W	39° 09' 2.38" N 123° 12' 10.00" W	City of Ukiah	at Mason St.	Box	Concrete	Smooth	323.5	3.7 X 13.0	1.07	N/A
M-034	Gibson Creek #5	Mason Street	Russian R	3H13	T15N, R12W	39° 09' 5.37" N 123° 12' 14.46" W	City of Ukiah	0.05 M to East Standley St.	Pipe Arch with concrete floor	SSP w/ concrete floor	6" X 2"	78.0	4.6 X 11.7	0.00	Slope= 7.76% Length= 16.5ft
M-035	Gibson Creek #6 - 1of2	North State Street	Russian R	3H13	T15N, R12W	39° 09' 11.33" N 123° 12' 24.95" W	City of Ukiah	200' to Scott St.	Box	Concrete	Smooth	86.5	4 X 8	0.61	N/A
M-035	Gibson Creek #6 - 2of2	North State Street	Russian R	3H13	T15N, R12W	39° 09' 11.33" N 123° 12' 24.95" W	City of Ukiah	200' to Scott St.	Box	Concrete	Smooth	86.5	4 X 8	0.81	N/A
M-036	Gibson Creek #7 - 1of2	School Street	Russian R	3H13	T15N, R12W	39° 09' 10.52" N 123° 12' 29.06" W	City of Ukiah	0.1 M to Henry St.	Box	Concrete	Smooth	46.4	3.3 X 7.0	-0.69	N/A
M-036	Gibson Creek #7 - 2of2	School Street	Russian R	3H13	T15N, R12W	39° 09' 10.52" N 123° 12' 29.06" W	City of Ukiah	0.1 M to Henry St.	Box	Concrete	Smooth	46.4	3.3 X 7.0	-0.60	N/A
M-037	Gibson Creek #8 - 1of2	Oak Street	Russian R	3H13	T15N, R12W	39° 09' 9.96" N 123° 12' 32.79" W	City of Ukiah	0.1 M to Morris St.	Box	Concrete	Smooth	61.2	4 X 5.5	-0.28	Slope= 21.74% Length= 2.3ft
M-037	Gibson Creek #8 - 2of2	Oak Street	Russian R	3H13	T15N, R12W	39° 09' 9.96" N 123° 12' 32.79" W	City of Ukiah	0.1 M to Morris St.	Box	Concrete	Smooth	61.2	4 X 5.5	1.00	N/A
M-038	Gibson Creek #9	Pine Street	Russian R	3H13	T15N, R12W	39° 09' 9.41" N 123° 12' 35.89" W	City of Ukiah	0.05 M to Morris St.	Box	Concrete	Smooth	60.7	4.3 X 11.8	0.54	N/A
M-039	Gibson Creek #10	Bush Street	Russian R	3H13	T15N, R12W	39° 09' 8.04" N 123° 12' 39.62" W	City of Ukiah	0.1 M to Walnut Ave.	Box	Concrete	Smooth	75.5	5 X 9.8	0.42	N/A
M-040	Gibson Creek #11	North Dora Street	Russian R	3H13	T15N, R12W	39° 09' 6.61" N 123° 12' 42.72" W	City of Ukiah	0.03 M to Willow Ave.	Box	Concrete	Smooth	90.5	5 X 10	0.69	N/A
M-041	Gibson Creek #12	Spring Street	Russian R	3H13	T15N, R12W	39° 09' 2.82" N 123° 12' 49.15" W	City of Ukiah	0.1 M to Smith St.	Box	Concrete	Smooth	69.0	7.2 X 11.0	1.07	N/A
M-042	Gibson Creek #13	Barnes Street	Russian R	3H13	T15N, R12W	39° 09' 3.38" N 123° 12' 58.28" W	City of Ukiah	at Todd Road	Pipe Arch	SSP w/ concrete floor	6" X 2"	59.3	5 X 11.9	2.01	N/A
M-043	Gibson Creek #14	Standley Street	Russian R	3H13	T15N, R12W, Section 19	39° 09' 0.94" N 123° 13' 28.21" W	City of Ukiah	0.2 M to Giorno Ave	Open Bottom Arch w/ concrete floor	Concrete	6" X 2"	29.7	6.5 X 9.5	1.52	N/A

ID #	Rustline Height (ft)	Inlet Type	Inlet Alignment to Channel	Outlet Configuration	Culvert Embedded?	Culvert Condition	Average Active Channel Width (ft)	Estimated Road fill (cubic yards)	Previous Modifications to Culvert	Additional Comments from Initial Site Visit	Hydrologic Region
M-033	N/A	Wingwalls	<30°	Freefall into Pool	No	Fair	9.2	120	No	Creek is currently dry. Poor fish habitat. Right in business section of Ukiah. No canopy. Confined channel. At station 186.0 it switches from 1 bay to 2 bays, then right bay is embedded from station 196.0 to outlet.	V
M-034	1.0	Wingwalls	<30°	At Stream Grade	Inlet=0.3' Outlet=0.4'	Fair	12.3	115	No	Poor fish habitat. Stream is very channelized and upstream about 100' the creek goes under the corner of a city block. Culvert doesn't seem to be too bad but the stream itself has no features.	V
M-035	N/A	Wingwalls	<30°	At Stream Grade	No	Good	9.8	142	No	Poor fish habitat. Channel is confined. Busy street through downtown Ukiah business district. Very sparse canopy. Currently the creek is dry in this area. The culvert bends in the middle. Bend is visible on roadway of North state Street.	V
M-035	N/A	Wingwalls	<30°	At Stream Grade	Inlet=0.15' Outlet=0.0'	Good	9.8	142	No	Poor fish habitat. Channel is confined. Busy street through downtown Ukiah business district. Very sparse canopy. Currently the creek is dry in this area. The culvert bends in the middle. Bend is visible on roadway of North state Street.	V
M-036	N/A	Wingwalls	<30°	At Stream Grade	Inlet=0.0' Outlet=0.9'	Fair	9.1	45	No	Creek is dry. Poor fish habitat. Channel is confined through city reach, with little to no features, and little canopy. Creek is surrounded by residential properties. Culvert has a little turn in it.	V
M-036	N/A	Wingwalls	<30°	At Stream Grade	Inlet=0.7' Outlet=1.3'	Fair	9.1	45	No	Creek is dry. Poor fish habitat. Channel is confined through city reach, with little to no features, and little canopy. Creek is surrounded by residential properties. Culvert has a little turn in it.	V
M-037	N/A	Wingwalls	<30°	At Stream Grade	No	Fair	12.0	121	No	Poor fish habitat due to lack of features, confined channel, concrete bottom upstream and sparse canopy. Residential area with in city limits of Ukiah. Creek is currently dry.	V
M-037	N/A	Wingwalls	<30°	At Stream Grade	Inlet=1.1' Outlet=0.2'	Fair	12.0	121	No	Poor fish habitat due to lack of features, confined channel, concrete bottom upstream and sparse canopy. Residential area with in city limits of Ukiah. Creek is currently dry.	V
M-038	N/A	Headwall	<30°	At Stream Grade	Yes- Depth??	Good	10.2	171	No	Poor fish habitat. Channel is confined by walls on both sides. Channel is flat and featureless and surrounded by residences. Could not determine if this was a bridge or not. Concrete channel begins or becomes exposed downstream at station 97.5.	V
M-039	N/A	Headwall	<30°	At Stream Grade	No	Good	8.4	383	No	Poor fish habitat. Featureless. Sparse canopy. Residential neighborhood in Ukiah city limits. Residents said that 30 years ago there used to be lots of fish but now very rare to see, but on occasion steelhead.	V
M-040	N/A	Headwall	<30°	Freefall into Pool	No	Fair	11.9	323	No	Creek surrounded by residences, confined by walls on right bank. Fish habitat improving going upstream and out of the city. Fair habitat here, hardwood canopy, cobble substrate as opposed to the concrete bed downstream and the stream is widening.	V
M-041	N/A	Headwall	>45°	Freefall into Pool	Inlet=0.4' Outlet=0.0'	Fair - Concrete worn	10.6	533	Yes- 4 Weirs	Data collected at 4:15pm. Air=15C Water=15C. Fair fish habitat. Water in pool at outlet, plus a very low flow continuing downstream. Flow ends 100' upstream from inlet and continues upstream. Moderate hardwood and brush canopy. Three full spanning wooden log weirs and one concrete weir.	V
M-042	N/A	Wingwalls	<30°	At Stream Grade	No	Poor	12.3	454	No	Data Collected at 8:40am. Air=11.5C Water=11.5C Moderate canopy of hardwoods. Seems like pretty good fish habitat. In city limits. Good flow in creek diminishes slightly within culvert except at thalweg area in center created by ear and tear.	V
M-043	N/A	Wingwalls	<30°	Freefall into Pool	No	Fair	13.4	324	No	Data collected at 12:00pm. Air=3.5C Water=4.5C. Very good fish habitat. Mixed substrate of gravels and cobbles. Dense hardwood and conifer canopy. Was here earlier in summer and there was still flow. Barrier due to floor and outlet drop. Last culvert in cit of Ukiah. Upstream looks undeveloped.	V

ID #	Stream Name	Road Name	Drainage	County Map #	Township, Range, Section	Latitude and Longitude Coordinates	Road ID #	Milemarker or Name and Distance to nearest Crossroad	Type of Culvert	Construction Material	Corrugation Dimensions	Culvert Length (ft)	Culvert Dimensions: Diameter, height/width, or rise/span (ft)	% Slope thru Culvert	Outlet Apron
M-044	Orrs Creek - 1of3	Oak Street	Russian R	3H13	T15N, R12W	39° 09' 23.59" N 123° 12' 36.10" W	City of Ukiah	0.15 M to Low Gap Rd.	Arch w/ concrete floor	SSP w/ concrete floor	6" X 2"	49.3	8.5 X 15	-1.70	N/A
M-044	Orrs Creek - 2of3	Oak Street	Russian R	3H13	T15N, R12W	39° 09' 23.59" N 123° 12' 36.10" W	City of Ukiah	0.15 M to Low Gap Rd.	Arch w/ concrete floor	SSP w/ concrete floor	6" X 2"	49.3	8.5 X 15	0.30	N/A
M-044	Orrs Creek - 3of3	Oak Street	Russian R	3H13	T15N, R12W	39° 09' 23.59" N 123° 12' 36.10" W	City of Ukiah	0.15 M to Low Gap Rd.	Arch w/ concrete floor	SSP w/ concrete floor	6" X 2"	49.3	8.5 X 15	-2.07	N/A
M-045	Un-named Trib #1 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	3H13	T15N, R13W, Section 15	39° 09' 49.51" N 123° 16' 32.19" W	220	0.3 M to Low Gap Rd	Circular	SSP	2-2/3" X 1/2"	40.5	4.0	4.47	N/A
M-046	Un-named Trib #2 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	3H13	T15N, R13W, Section 22	39° 09' 8.34" N 123° 17' 6.85" W	220	1.5 M to Low Gap Rd	Circular	SSP	2-2/3" X 1/2"	40.5	4.5	3.33	N/A
M-047	Un-named Trib #3 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	3H13	T15N, R13W, Section 22	39° 08' 50.01" N 123° 16' 53.51" W	220	2.0 M to Low Gap Rd	Box	Concrete	Smooth	25.5	6.0 X 12.0	0.20	N/A
M-048	Sulphur Creek #1	Vichy Springs Road	Russian R	3H14	T15N, R12W	39° 09' 39.61" N 123° 11' 6.69" W	215	at Redemeyer Rd.	Box	Concrete	Smooth	39.0	7.6 X 16.2	0.15	N/A
M-049	Sulphur Creek #2	Vichy Springs Road	Russian R	3H14	T15N, R12W	39° 09' 40.36" N 123° 10' 3.07" W	215	0.05 M to Appolinaris Dr	Box	Concrete	Smooth	36.0	6.1 X 14.8	0.06	Slope= -1.67% Length= 10.4ft
M-050	Un-named trib on Redemeyer Rd.	Redemeyer Road	Russian R	3G54	T15N, R12W	39° 10' 10.21" N 123° 11' 8.82" W	215A	0.63	Box	Concrete	Smooth	26.0	6.5 X 18.1	0.42	Slope= 73.16% Length= 7.6ft
M-051	Howard Creek	Redemeyer Road	Russian R	3G54	T15N, R12W	39° 10' 50.32" N 123° 11' 15.94" W	215A	1.45	Box	Concrete	Smooth	26.0	9 X 17.65	0.38	N/A
M-052	Calpella Creek	North State Street	Russian R	3G53	T16N, R12W	39° 13' 19.69" N 123° 12' 14.22" W	104	4.2	Box	Concrete	Smooth	81.5	6.1 X 6.0	3.18	N/A
M-053	Bakers Creek 2 pipes	Northwestern Pacific RR	Forsythe Cr-Russian R	3G43	T17N, R13W, Section 36	39° 17' 12.31" N 123° 14' 38.77" W	Northwestern Pacific RR	1.0 M to Bakers Creek Road	Circular	SSP	Smooth	202.8	4.0	3.26	N/A
M-054	Forsytyhe Creek 1of4	Black Bart Road	Russian R	3G32	T17N, R13W, Section 7	39° 20' 53.61" N 123° 20' 13.51" W	370	1.6 M to Hwy 101	Circular	CSP	2-2/3" X 1/2" Spiral	60.5	3.0	2.25	N/A

ID #	Rustline Height (ft)	Inlet Type	Inlet Alignment to Channel	Outlet Configuration	Culvert Embedded?	Culvert Condition	Average Active Channel Width (ft)	Estimated Road fill (cubic yards)	Previous Modifications to Culvert	Additional Comments from Initial Site Visit	Hydrologic Region
M-044	3.0	Headwall	<30°	At Stream Grade	Inlet=0.0' Outlet=2.9'	Good	25.5	1083	No	Good fish habitat. large creek. Sparse canopy of hardwoods and brush in city limits of Ukiah. Main flow through center pipe at this point.	V
M-044	3.0	Headwall	<30°	At Stream Grade	Inlet=0.0' Outlet=1.8'	Good	25.5	1083	No	Good fish habitat. large creek. Sparse canopy of hardwoods and brush in city limits of Ukiah. Main flow through center pipe at this point.	V
M-044	3.0	Headwall	<30°	At Stream Grade	Inlet=0.0' Outlet=2.3'	Good	25.5	1083	No	Good fish habitat. large creek. Sparse canopy of hardwoods and brush in city limits of Ukiah. Main flow through center pipe at this point.	V
M-045	0.6	Headwall	<30°	Freefall into Pool	No	Poor - Rust Through	8.8	481	No	Creek is dry on 11-5-01 and so is Orrs Creek in this section. OK fish habitat. It is a small stream with few pools. Nice spawning gravels. Sparse canopy of oaks. Creek appears steep, but by the culvert its not too steep.	V
M-046	0.8	Headwall	30°-45°	Freefall into Pool	No	Poor - Rust Through	10.3	230	No	Data Collected at 3:30 pm. Air=13C Water=10C. Difficult to determine how steep unnamed trib is due to property boundary. Big drop at outlet. Drops right into Orrs Creek. Unnamed trib is dry while Orrs Creek has flow. Orrs Creek seems like very good fish habitat. Unnamed trib seems like fair fish habitat. Sparse canopy of hardwoods.	V
M-047	N/A	Wingwalls	<30°	At Stream Grade	No	Good	7.6	132	No	Creek is dry on 11-5-01. OK to poor fish habitat. Moderate canopy of hardwoods. About 50 ft to confluence with Orrs Creek. Not many features in this section of creek. Orrs Creek has water.	V
M-048	N/A	Wingwalls	<30°	Cascade over Riprap	Inlet=0.0' Outlet=0.6'	Good	14.2	314	No	Data Collected at 4:00 pm. Air=11.5C Water=13C. Good fish habitat. Lots of canopy cover. Inlet is overgrown with reed grasses. Outlet is heavily riprapped. Substrate consists of fines. Geology upstream is an unconsolidated alluvial material that is being actively put into the channel. Series of pools at outlet.	V
M-049	N/A	Wingwalls	30°-45°	Freefall into Pool	No	Fair	16.1	218	No	Data Collected at 9:00am. Air=12C Water=11C. Good fish habitat. Lots of fish present. Stream has lots of water. Stream bed is fairly armored from calcium carbonate (assuming) in the spring water. Main channel separates about 50' from inlet and continues upstream that way. Sparse canopy of willows.	V
M-050	N/A	Wingwalls	<30°	Freefall into Pool	No	Fair	11.7	237	No	Creek is dry on 10-12-01. Sparse canopy of hardwoods. Seems like very good fish habitat. Lots of big pool areas. Culvert poses a definite problem. Large drop off from outlet. Apron is broken.	V
M-051	N/A	Wingwalls	Straight	Cascade over Riprap	No	Fair	17.1	530	No	Creek is dry on 10-12-01. Surrounded on downstream side by vineyards. Fair fish habitat. Sparse canopy of hardwoods. Map indicates something that looks like a diversion towards Lake Mendocino, upstream.	V
M-052	N/A	Wingwalls	<30°	At Stream Grade	No	Fair	6.6	2141	No	Creek is dry on 11-6-01. Pretty dense canopy of hardwoods and brush. Seems like good fish habitat. Took active channel widths downstream.	V
M-053	Completey Rusted	Projecting	<30°	At Stream Grade	No	Poor- Rusted Through	13.8	31,830	No	Data Collected at 4:00 pm. Air=22C Water=20C. Culverts are highly undersized. Very good fish habitat. Enormous amount of road fill under train tracks. Steep drop at inlet from deposition. Good hardwood canopy. Left pipe is partially filled with sediment. Landowner is Ralph Randolph 707-485-0634.	V
M-054	0.7	Headwall	<30°	At Stream Grade	Inlet=0.0' Outlet=0.4'	Fair - Rusty	9.9	851	No	Creek is dry on 11-8-01. Culvert is pretty far up in the Forsythe system. Fish habitat is not that good. Moderately sparse canopy of hardwoods. Crossing has 4 pipes. The 4of4 seems like the main flow pipe and the 3 others seem like storm flow pipes.	V

ID #	Stream Name	Road Name	Drainage	County Map #	Township, Range, Section	Latitude and Longitude Coordinates	Road ID #	Milemarker or Name and Distance to nearest Crossroad	Type of Culvert	Construction Material	Corrugation Dimensions	Culvert Length (ft)	Culvert Dimensions: Diameter, height/width, or rise/span (ft)	% Slope thru Culvert	Outlet Apron
M-054	Forsythe Creek 2of4	Black Bart Road	Russian R	3G32	T17N, R13W, Section 7	39° 20' 53.61" N 123° 20' 13.51" W	370	1.6 M to Hwy 101	Circular	CSP	2-2/3" X 1/2" Spiral	60.5	3.0	2.43	N/A
M-054	Forsythe Creek 3of4	Black Bart Road	Russian R	3G32	T17N, R13W, Section 7	39° 20' 53.61" N 123° 20' 13.51" W	370	1.6 M to Hwy 101	Circular	CSP	2-2/3" X 1/2" Spiral	60.5	3.0	3.16	N/A
M-054	Forsythe Creek 4of4	Black Bart Road	Russian R	3G32	T17N, R13W, Section 7	39° 20' 53.61" N 123° 20' 13.51" W	370	1.6 M to Hwy 101	Circular	SSP	2-2/3" X 1/2"	60.5	4.0	2.03	N/A
M-055	North Fork Salt Hollow Creek	Road B	Salt Hollow Cr-Russian R	3G44	T16N, R12W	39° 15' 31.94" N 123° 11' 53.27" W	231A	0.1 M to East Road	Circular	SSP	2-2/3" X 1/2"	35.0	4.0	0.54	N/A
M-056	Salt Hollow Creek #1	Road B	Russian R	3G44	T16N, R12W	39° 15' 27.99" N 123° 11' 20.40" W	231A	0.7 M to East Road	Box	Concrete	Smooth	32.0	10.05 X 8.5	0.00	Slope= 4.00% Length= 4ft
M-057	Salt Hollow Creek #2	Road B	Russian R	3G44	T16N, R12W	39° 15' 32.41" N 123° 11' 8.80" W	231A	0.9 M to East Road	Box	Concrete	Smooth	26.5	7.2 X 8.8	0.04	Slope= 2.00% Length= 13.5ft
M-058	Mariposa Creek	Tomki Road	Russian R	3G43	T17N, R12W, Section 17	39° 19' 36.61" N 123° 13' 24.83" W	237D	1.08	Box	Concrete	Smooth	69.5	13.5 X 9.35	2.89	N/A

ID #	Rustline Height (ft)	Inlet Type	Inlet Alignment to Channel	Outlet Configuration	Culvert Embedded?	Culvert Condition	Average Active Channel Width (ft)	Estimated Road fill (cubic yards)	Previous Modifications to Culvert	Additional Comments from Initial Site Visit	Hydrologic Region
M-054	0.9	Headwall	<30°	At Stream Grade	Inlet=0.0' Outlet=0.4'	Fair - Rusty	9.9	851	No	Creek is dry on 11-8-01. Culvert is pretty far up in the Forsythe system. Fish habitat is not that good. Moderately sparse canopy of hardwoods. Crossing has 4 pipes. The 4of4 seems like the main flow pipe and the 3 others seem like storm flow pipes.	V
M-054	0.8	Headwall	<30°	Freefall into Pool	No	Fair - Rusty	9.9	851	No	Creek is dry on 11-8-01. Culvert is pretty far up in the Forsythe system. Fish habitat is not that good. Moderately sparse canopy of hardwoods. Crossing has 4 pipes. The 4of4 seems like the main flow pipe and the 3 others seem like storm flow pipes.	V
M-054	1.0	Headwall	<30°	Freefall into Pool	No	Poor- Rusted Through very badly	9.9	851	No	Creek is dry on 11-8-01. Culvert is pretty far up in the Forsythe system. Fish habitat is not that good. Moderately sparse canopy of hardwoods. Crossing has 4 pipes. The 4of4 seems like the main flow pipe and the 3 others seem like storm flow pipes.	V
M-055	1.6	Wingwalls	30°-45°	At Stream Grade	Inlet=0.1' Outlet=0.9'	Fair	7.3	99	No	Data Collected at 10:00 am. Air=10C Water=8C. According to local the only reason there is water now is a leak in the reservoir upstream. Hasn't seen fish for 50 years or so. Fair fish habitat. Dense canopy of hardwoods. Culvert seems undersized for winter flows.	V
M-056	N/A	Wingwalls	<30°	Freefall into Pool	No	Fair - Outlet being undercut	9.6	440	No	Creek is dry except for little pool at outlet. Outlet apron and wingwalls are undercut and suspended. Inlet is perched above channel bed. Sediment agrading upstream. Good fish habitat with moderate canopy of hardwoods. Barrier upstream which is floor of old culvet that failed.	V
M-057	N/A	Wingwalls	<30°	At Stream Grade	No	Fair - Worn Cement	7.9	265	No	Channel is dry on 11-7-01. Seems like good fish stream. Dense canopy of hardwoods and brush. Floor of culvert is worn cement. Not smooth, but cobbled. Channel is very wide at outlet, then narrows down again. Just downstream, about 100', is an old broken culvert bottom creating another barrier.	V
M-058	N/A	Wingwalls	<30°	Freefall into Pool	No	Fair - Exposed rebar in worn area	9.2	2685	No	Data collected at 3:30 pm. Air=15C Water=10C. Culvert has a box culvert base whose walls extend up 8.0' with a pipe arch sitting on top. Good fish habitat. Very large outlet pool. Substrate is mainly cobbles. creek is dry up and down stream, except for the large outlet pool. Nice canopy of hardwoods. Culvert is a definite problem, it is very perched and the inlet is even a foot or so above the stream bed.	V

Sonoma County within the Russian River Basin - Summary of Fish Passage Analysis for Existing Passage Conditions

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-001	Unnamed Trib to Willow Creek	Willow Creek Road	Willow Ck-Russian R	3.0	14.4	**35%**	2.0	4.4	**0%**	1.0	2.1	**0%**	Assumed Q1%=Active Channel Flow in outlet pool. Adequately sized, ~84 yr flow. 2300 ft of upstream habitat. Willow Creek watershed has sediment aggradation issues.	Can modify existing structure by raising tailwater elevation 2 ft using 2 rock weirs to backwater pipe. Due to width of pipe full replacement is best long term solution. Replacement structure should have a width of 13-15 ft.
S-002	Kohute Gulch	Austin Creek Road	Austin Ck-Russian R	3.0	47.6	**18%**	2.0	14.6	**0%**	1.0	6.9	**0%**	Assumed Q1%=active channel flow in outlet pool. High velocity pipe with > 2ft leap. Severly undersized, < 5yr flow.	Full replacement recommended due to leap conditions, high velocities, size and minimal fill making replacement relatively inexpensive. Recommend 12-14 ft circular metal pipe at 0% slope below current tailwater elevation or embedded pipe arch, open arch or bridge.
S-003	Pole Mountain Creek - 1of2	Fort Ross Road	Ward Ck-Austin Ck-Russian R	3.0	92.3	**98%**	2.0	28.3	**0%**	1.0	13.5	**0%**	Assumed flow is split evenly between the 2 pipes and Q1%=active channel flow in outlet pool. Pipes rusted through. 0.03 ft less than a 2ft jump at outlet. Approximately 1037 yd^3 of fill above pipe. Channel slope is >10% below crossing.	Full replacement due to pipe condition and leap conditions. Recommend an embedded pipe arch or an open bottom arch with 18 ft span. Interim fix raise tailwater elevation 2.4 ft with 3 rock weirs.
S-003	Pole Mountain Creek - 2of2	Fort Ross Road	Ward Ck-Austin Ck-Russian R	3.0	92.3	**98%**	2.0	28.3	**0%**	1.0	13.5	**0%**	Assumed flow is split evenly between the 2 pipes and Q1%=active channel flow in outlet pool. Pipes rusted through. 0.03 ft less than a 2ft jump at outlet. Approximately 1037 yd^3 of fill above pipe. Channel slope is >10% below crossing.	Full replacement due to pipe condition and leap conditions. Recommend an embedded pipe arch or an open bottom arch with 18 ft span. Interim fix raise tailwater elevation 2.4 ft with 3 rock weirs.
S-004	Tyrone Gulch - 1of2	Tyrone Road	Dutch Bill Ck-Russian R	3.0	25.8	**0%**	2.0	7.9	**0%**	1.0	3.8	**0%**	Minimal fill, highly undersized <3yr flow. Road width is 20 ft. Assumed all flow enters pipe 2of2	Full Replacement recommended due to limited hydraulic capacity and minimal fill making replacement relatively inexpensive. Since the road width is small a bridge with a 12-ft width is recommended.
S-004	Tyrone Gulch - 2of2	Tyrone Road	Dutch Bill Ck-Russian R	3.0	25.8	**89%**	2.0	7.9	**0%**	1.0	3.8	**0%**	Minimal fill, highly undersized <3yr flow. Road width is 20 ft. Assumed all flow enters pipe 2of2	Full Replacement recommended due to limited hydraulic capacity and minimal fill making replacement relatively inexpensive. Since the road width is small a bridge with a 12-ft width is recommended.
S-005	Devoul Creek	Bohemian Highway	Dutch Bill Ck-Russian R	3.0	49.1	**80%**	2.0	15.0	**21%**	1.0	7.2	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized for <10-yr flow. Minimal habitat to open <800 ft. Outlet backwatered 1.6 ft deep from Dutchbill creek and may be completely backwatered at migration flows. Steep drop in channel profile upstream of inlet, fish may have to burst out of pipe. Creek may provide refuge during high flow events in Dutchbill creek.	Low priority due to minimal habitat to open. Further investigation for migrating fish should be done. Full replacement is best option due to limited hydraulic capacity and location with Duthcbill creek. Recommend structure with 12-15 ft width.
S-006	Grub Creek	Bohemian Highway	Dutch Bill Ck-Russian R	3.0	20.7	**43%**	2.0	6.3	**0%**	1.0	3.0	**0%**	Sized for >100-yr flood. Approximately 19-ft of fill ~1100 yd^3. Concrete bottom creates lack of depth and increased velocities.	Due to amount of fill recommend a barrel retrofit by installing corner baffles. Retrofit will increase depth, decrease velocities and retain bedload in the pipe. Full replacement is best option due to width of pipe vs active channel width (6' vs 11.6').
S-007	Dutch Bill Creek #1	Market Street	Russian R	3.0	114.3	**0%**	2.0	35.0	**0%**	1.0	16.7	**0%**	Culvert perched 5 ft. Enormous amount of fill present ~4,700 yd^3. Old/seasonal dam structure 150 ft upstream. Sized for >100 yr flood event.	High priority. Most cost effective solution is modification of current culvert. Raise tailwater elevation 4.5-5.5 ft with 5-6 downstream weirs. Install corner baffles to reduce velocities, create depth and retain bedload. Best long term solution would be the removal of the existing structure. Upstream dam structure should also be remedied when this one is dealt with.
S-008	Dutch Bill Creek #2	Footbridge over Dam	Russian R	3.0	114.0	**0%**	2.0	34.9	**0%**	1.0	16.6	**0%**	Crossing is Red due to drop after the last weir. Sized for ~10-yr flow. Large amount of fill ~1,000 yd^3. Crossing is a flashboard dam.	High priority. Recommend removal of dam structure with no replacement. Interim recommendation, decrease drop present at 3rd weir by installing 2 more downstream weirs.
S-009	Lancel Creek	Occidental Camp Meeker Road	Dutch Bill Ck-Russian R	3.0	58.3	**13%**	2.0	17.9	**0%**	1.0	8.5	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized for <30yr flow. Culvert perched 1.6 ft.	High priority. Recommend raising tailwater elevation by 2-ft with 2-3 rock weirs and installing corner baffles to reduce velocities and create depth.
S-010	Mission Creek #1 2 culverts	Camino Del Arroyo	Hubert Ck-Russian R	3.0	62.7	**42%**	2.0	19.2	**0%**	1.0	9.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow split evenly between the 2 pipes. Sized for <5yr flow. Low amount of fill <400 yd^3. Rip rap at outlet may impeed adult leaping and swim in ability.	Recommend full replacement due to velocities and depth issue in concrete pipes, plus pipes are severely undersized. Replace with Pipe arch, open arch or bridge with 14-16 ft width. Grade control will be an issue.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-011	Mission Creek #2	Old Cazadero Road	Hubert Ck-Russian R	3.0	53.8	**0%**	2.0	16.5	**0%**	1.0	7.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized for >100 yr flood. Low amount of fill with ~311 yd^3.	Current structure can be modified by raising the tailwater elevation by 3 ft with 3-4 rock weirs and installing corner baffles to provide depth and reduce velocities.
S-012	Fife Creek	Watson Road	Russian R	3.0	229.4	**100%**	2.0	70.3	**100%**	1.0	33.5	**100%**	Sized for >100 yr flow. Minimal fill <250yd^3. ~35,000 ft of habitat upstream. Culvert is embedded and has a thalweg and a negative slope which fishXing can not model.	Recommend to leave the site as it is due to the tailwater conditions and substrate retained within the culvert.
S-013	Redwood Creek	Armstrong Woods Road	Fife Ck-Russian R	3.0	107.7	**0%**	2.0	33.0	**0%**	1.0	15.7	**0%**	Assumed Q1%=active channel flow in outlet pool. Slope=0.41% Sized for >100 yr flow. ~18,000 ft of habitat upstream.	Recommend modifying culvert by raising tailwater elevation 3ft with 3-4 rock weirs and installing corner baffles to reduce velocities, provide depth and retain substrate.
S-014	Sweetwater Creek	Sweetwater Springs Road	Redwood Ck-Fife Ck-Russian R	3.0	53.5	**0%**	2.0	16.4	**0%**	1.0	7.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Leap barrier due to lack of depth in outlet pool. Sized for >100 yr flood. Minimal fill with ~89 yd^3. 36 ft wide culvert.	Recommend modifying culvert by raising tailwater elevation 2ft with 3 rock weirs and installing corner baffles to reduce velocities, provide depth and retain substrate. Baffles may considerably reduce hydraulic capacity and thus full replacement may be better option.
S-015	Mays Canyon	Neeley Road	Russian R	3.0	251.5	**92%**	2.0	77.1	**27%**	1.0	36.7	**8%**	Assumed Q1%=active channel flow in outlet pool. Sized for ~5yr flow. Upstream habitat >46,000 ft. Residual inlet depth=0.13 ft.	Moderate to low priority. Due to size recommend full replacement with an open arch or bridge with a 22-24 ft width. Interim modification- raise tailwater control 0.5 ft with 1 rock weir.
S-016	Pocket Canyon	Mays Canyon Road	Mays Canyon Russian R	3.0	196.2	**100%**	2.0	60.1	**100%**	1.0	28.6	**100%**	Culvert is filling with sediment. Highly undersized <2yr flow. Steep channel profile upstream of inlet probably form ponding water and sediment agrading at inlet.	Eventhough culvert is passing fish it is highly undersized. If site has history of overtopping or being high maintenance, consider replacement with open arch or bridge with 20-22 ft span.
S-017	Korbel Tributary	River Road	Russian R	3.0	56.4	**79%**	2.0	17.3	**61%**	1.0	8.2	**86%**	Assumed Q1%=active channel flow in outlet pool. FishXing can not model negative slopes therefore the outlet elevation was set below the inlet surveyed elevation thus results may vary from models output. Depth is the limiting factor. Sized for >100 yr flow. Residual inlet depth=0.28 ft. Outlet poole and culvert used as a ford by Korbel vineyard.	Recommend modifying existing structure by installing corner baffles to reduce velocities and provide sufficient depth for adults. If crossing is modified then ford usage will have to be changed- will need to coordinate with Korbel.
S-018	Hobson Creek	Westside Road	Russian R	3.0	83.0	**67%**	2.0	25.4	**0%**	1.0	12.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Poor jump pool conditions. Sized for >100 yr flow. Large amount of fill ~1724 yd^3. Active channel width impinged upon by culvert width.	Recommend modifying existing structure by raising tailwater elevation 1 ft with 1 rock weir and installing corner baffles to reduce velocities and provide sufficient depth for adults. Long term solution would be full replacement however amount of fill may make it cost prohibative.
S-019	Jonive Creek #1	Bodega Highway	Atascadero Ck-Green Valley Ck-Russian R	3.0	181.1	**90%**	2.0	55.5	**59%**	1.0	26.4	**80%**	Assumed Q1%=active channel flow in outlet pool. Assumed there was not leap and depth conditions were inlet dependent due to the natural bed exposed. The concrete floor against the right bank has been broken and natural stream bed has been exposed, because of these conditions fishXing can not be used accurately. Outlet conditions are better than the model suggests. Sized >100 yr flow.	Further investigation required to determine if the structural integrity has been diminished due to the broken concrete floor. If floor needs to be repaired recommend installing corner baffles also. If a new structure is required then an open arch or bridge with at least a 18 ft span. Otherwise the structure should be left as is.
S-020	Jonive Creek #2	Bodega Highway	Atascadero Ck-Green Valley Ck-Russian R	3.0	124.7	**100%**	2.0	38.2	**100%**	1.0	18.2	**100%**	Sized >100 yr flow. Culvert is embedded and is simulating a bridge.	Recommend to leave the site as it is due to the tailwater conditions and substrate retained within the culvert.
S-021	Jonive Creek #3	Furlong Road	Atascadero Ck-Green Valley Ck-Russian R	3.0	105.8	**74%**	2.0	32.4	**0%**	1.0	15.4	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Drop at outlet and concrete floor create barrier situation.	High priority due to large amount of anadromy to open up. Recommend modifying current structure by raising tailwater elevation 1 ft with a rock weir and install corner baffles to reduce velocities and create depth.
S-022	Un-named Jonive Branch #1	Furlong Road	Jonive Ck-Atascadero Ck-Green Valley Ck-Russian R	3.0	50.2	**100%**	2.0	15.4	**100%**	1.0	7.3	**100%**	Sized >100 yr flow. Natural bottom open arch.	Recommend to leave site as is.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-023	Un-named Jonive Branch #2	Furlong Road	Jonive Ck-Atascadero Ck-Green Valley Ck-Russian R	3.0	31.7	**70%**	2.0	9.7	**0%**	1.0	4.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized <20 yr flow. Not a consideralbe amount of habitat to open up. 100% barrier. Small amount of fill.	Low priority. Can modify existing structure by raising tailwater elevation 1.5 ft using 2 rock weirs and install corner baffles to reduce velocities and provide depth. Long term solution would recommend full replacement with circular pipe, pipe arch, or open bottom arch with a 10 ft span.
S-024	Jonive Creek #4	Bodega Highway	Atascadero Ck-Green Valley Ck-Russian R	3.0	45.0	**100%**	2.0	13.8	**100%**	1.0	6.6	**100%**	Sized >100 yr flow. Road fill ~250 yd^3. Culvert is allinged at a sharp angle with the stream. Partially embedded and backwatered.	Due to inlet alignment culvert should be observed in future for scour to road fill. Otherwise culvert should be left as is due to size and tailwater conditions.
S-025	Jonive Creek #5	Wagnon Road	Atascadero Ck-Green Valley Ck-Russian R	3.0	37.6	**42%**	2.0	11.5	**0%**	1.0	5.5	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Minimal fill ~300 yd^3. Large drop at outlet (2.8ft).	Recommend modifying existing structure by raising tailwater elevation 2.5-3 ft with 3 rock weirs and installing corner baffles to reduce velocities and provide sufficient depth for adults.
S-026	Purrington Creek #1	Graton Road	Green Valley Ck-Russian R	3.0	54.6	**0%**	2.0	16.7	**0%**	1.0	8.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Steep sloped for a concrete box (3.23%).	Recommend modifying existing structure by raising tailwater elevation 1.5 ft with 2 rock weirs and install corner baffles to reduce velocities and provide depth.
S-027	Purrington Creek #2	Private Driveway	Green Valley Ck-Russian R	3.0	31.3	**86%**	2.0	9.6	**100%**	1.0	4.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Culvert backwatered, therefore depth is not an issue. Private crossing with a wooden rail car top. Minimal fill ~122 yd^3. Sized >100 yr flow.	Raising tailwater elevation 0.4 ft with 1 rock weir would backwater culvert sufficiently for full passage.
S-028	Green Valley Creek	Green Valley Road	Russian River	3.0	113.6	**71%**	2.0	34.8	**0%**	1.0	16.6	**0%**	Outlet drop=2.7' Sized for ~50yr flow. 20,220 ft of habitat upstream. Tailwater conditions appear to have been modified previously. 300 ft upstream is a dam with 2 concrete nothched weirs.	High to moderate priority. Recommend modifying existing structure by raising tailwater elevation 2.5-3 ft with 3 rock weirs and installing corner baffles to reduce velocities and provide sufficient depth for adults. Upstream dam structure should be removed or modified (additional weirs) for fish passage.
S-029	Harrison Grade Creek #1	Green Valley Road	Green Valley Ck-Russian R	3.0	26.6	**0%**	2.0	8.1	**0%**	1.0	3.9	**0%**	Sized >50yr flow. Moderate amount of road fill ~1380 yd^3. Inlet allingment with stream >45 DEG. Sediment aggrading at inlet, possibly partially due to enormous outlet pool. Outlet drop= 6.95 ft. Grade control issue.	Low priority due to cost prohibitive measures present. Full replacement is only feasible option due to upstream conditions, outlet conditon and outlet pool size. Recommend replacing with embedded pipe arch or open arch with a 16 ft span.
S-030	Harrison Grade Creek #2	Harrison Grade Road	Green Valley Ck-Russian R	3.0	24.0	**94%**	2.0	7.3	**0%**	1.0	3.5	**0%**	Assumed Q1%=active channel flow in outlet pool. Undersized at ~13yr flow. Minimal fill at ~472 yd^3. Steep sloped channel profile at inlet. 100% barrier 1300 ft downstream.	Low priority due to barrier downstream. Interim fix- raise tailwater elevation 1.5 ft with 2 rock weirs. For complete passage and long term fix recommend full replacement due to undersized pipe and small fill, with an embedded circular pipe, pipe arch, open arch or bridge with a 14-16 ft span.
S-031	Pool Creek	Chalk Hill Road	Windsor Cr-Mark West Cr Russian R	3.0	45.3	**0%**	2.0	14.2	**0%**	1.0	6.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Outlet perched 4.1 ft. Moderately undersized ~17 yr flow. Possibly 11,500 ft of habitat upstream. Enormous outlet pool. Moderate amount of fill with ~990 yd^3.	Interim fix install fish ladder for adults and residents. Due to size of outlet pool and hydraulic capacity best option is full replacement. Recommend replacing with an embedded pipe arch or open bottom arch with a 12 ft span.
S-032	Windsor Creek #1 1of2	Natalie Road	Mark West Ck-Russian R	3.0	98.5	**72%**	2.0	30.9	**27%**	1.0	13.0	**0%**	Assumed flow is split evenly between the 2 bays. Sized >100 yr flow. Embeddedness produces a negative slope which fishXing can not model and therefore the inlet elevation was set at the surveyed outlet elevation. Real life situation culvert is backwatered. Lots of upstream habitat >34,000 ft.	Low priority due to current passage condition through the right bay. Raising tailwater elevation 0.5 ft with 1 rock weir would provide full passage. However, eventhough the LB does not pass a high percentage, the RB is fairly adequate passing 90% + for each species.
S-032	Windsor Creek #1 2of2	Natalie Road	Mark West Ck-Russian R	3.0	98.5	**98%**	2.0	30.9	**95%**	1.0	13.0	**90%**	Assumed flow is split evenly between the 2 bays. Sized >100 yr flow. Embeddedness produces a negative slope which fishXing can not model and therefore the outlet elevation was set below the surveyed inlet elevation. Real life situation culvert is backwatered. Lots of upstream habitat >34,000 ft. Very high %passable.	Low priority due to current passage condition through the right bay. Raising tailwater elevation 0.5 ft with 1 rock weir would provide full passage. However, eventhough the LB does not pass a high percentage, the RB is fairly adequate passing 90% + for each species.
S-033	Windsor Creek #2	Brooks Road	Mark West Ck-Russian R	3.0	95.9	**54%**	2.0	30.0	**0%**	1.0	12.7	**0%**	Assumed Q1%=active channel flow in outlet pool. Outlet apron set outlet 3.2-ft above above tailwater control. 32,000+ ft of upstream habitat. Sized >100 yr flow. Road fill is ~1,213 yd^3.	Full replacement is best option due to culvert width. Recommend replacing with open arch or bridge with 25 ft span. Interim fix raise tailwater elevation 3 ft with 3-4 rock weirs and installing corner baffles to reduce velocities and provide depth.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-034	Windsor Creek #3	Brooks Road	Mark West Ck-Russian R	3.0	67.7	**100%**	2.0	21.2	**100%**	1.0	8.9	**100%**	Sized >100yr flow. Culvert is backwatered.	Recommend to leave as is.
S-035	Pauline Creek #1	Marlow Road	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	107.2	**100%**	2.0	33.6	**100%**	1.0	14.2	**100%**	Sized >100 yr flow.	Recommend to leave as is.
S-036	Pauline Creek #2 - 1of2	Steele Lane	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	101.9	**93%**	2.0	31.9	**97%**	1.0	13.5	**100%**	Assumed Q1%=active channle flow in outlet pool. Assumed flow is split evenly between the 2 bays. Sized >100 yr flow. FishXing can not model negative sloped culverts so the outlet elevation was set below the surveyed inlet elevation thus results may vary from models output. Passes a high percentage at current condition.	Placing a notched bean at the outlet would provide adequate depth for adults.
S-036	Pauline Creek #2 - 2of2	Steele Lane	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	101.9	**86%**	2.0	31.9	**77%**	1.0	13.5	**99%**	Assumed Q1%=active channle flow in outlet pool. Assumed flow is split evenly between the 2 bays. Sized >100 yr flow. Depth is the main limiting factor.	Recommend modifying existing structure with corner baffles to provide depth, reduce velocities and retain bedload or place a notched beam at outlet to provide depth and reduce velocities.
S-037	Pauline Creek #3 - 1of2	Apache Way	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	100.9	**100%**	2.0	31.6	**100%**	1.0	13.3	**100%**	Sized >100 yr flow. Embedded and sufficent for fish passage.	Recommend to do nothing, leave it as is.
S-037	Pauline Creek #3 - 2of2	Apache Way	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	100.9	**100%**	2.0	31.6	**100%**	1.0	13.3	**100%**	Sized >100 yr flow. Embedded and sufficent for fish passage.	Recommend to do nothing, leave it as is.
S-038	Pauline Creek #4	Coffey Lane	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	99.0	**91%**	2.0	31.0	**83%**	1.0	13.1	**100%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Depth is the limiting factor. Passes fish close to 100% of the time.	Recommend to do what is cheaper, either raise the tailwater elevation 0.5 ft with 1 rock weir or install corner baffles to provide depth.
S-039	Pauline Creek #5	Mardie's Lane	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	96.1	**100%**	2.0	30.1	**100%**	1.0	12.7	**100%**	Sized >100 yr flow.	Recommend to do nothing, leave it as is.
S-040	Pauline Creek #6	Range Avenue	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	95.1	**100%**	2.0	29.8	**100%**	1.0	12.6	**100%**	Assumed Q1%=active channle flow in outlet pool. Sized >100 yr flow. Depth is the limiting factor. Passes close to 100%.	Recommend to do what is cheaper, either raise the tailwater elevation 0.5 ft with 1 rock weir or install corner baffles to provide depth. However leaving culvert as is will pass almost 100% of all lifestages.
S-041	Pauline Creek #7	McBride Lane	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	93.0	**100%**	2.0	29.1	**100%**	1.0	12.3	**100%**	Sized ~61yr flow.	Eventhough the culvert does not pass a 100 yr flow it is sized for large flows. Recommend to leave as is.
S-042	Pauline Creek #8	Cleveland Avenue	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	92.5	**47%**	2.0	29.0	**0%**	1.0	12.2	**0%**	Outlet perched 1.8 ft. Sized ~63 yr flow.	Recommend modifying existing structure by raising tailwater elevation 2 ft with 2 rock weirs and installing corner baffles to provide depth, reduce velocities and retain bedload.
S-043	Pauline Creek #9	Chanate Road	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	86.7	**37%**	2.0	27.1	**0%**	1.0	11.4	**0%**	Assumed Q1%=active channel flow in outlet pool. Outlet perched 1.8 ft. Very undersized <5 yr flow. Road fill ~474 yd^3.	Due to size of pipe full replacement is best option. Recommend replacing with embedded pipe arch, open bottom arch or bridge with an 18 ft span.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-044	Pauline Creek #10	Chanate Road	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	82.2	**54%**	2.0	25.7	**0%**	1.0	10.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized ~44 yr flow. Moderate amount of road fill (~1186 yd^3). Depth and velocities are limiting factors. Culvert width vs active channel width (8.9' vs 13').	Interim fix modify existing structure with corner baffles to provide depth, reduce velocities and retain bedload. Due to size recommend replacing with open arch or bridge with 18 ft width.
S-045	Pauline Creek #11	County Farm Road	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	73.0	**100%**	2.0	22.9	**100%**	1.0	9.6	**100%**	Almost 100% passable. Sized >100 yr flow.	Due to high percentage of fish passing and size of culvert, recommend leaving the site as it is.
S-046	Pauline Creek #12	Chanate Road	Piner Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	70.1	**82%**	2.0	21.9	**60%**	1.0	9.3	**22%**	Assumed Q1%=active channel flow in outlet pool. FishXing can not model negative sloped culverts, therefore the outlet was set below the real surveyed elevation and thus results may vary in real life situations from the models predictions. Sized >100 yr flow. Depth was the limiting factor.	Recommend modifying existing structure with corner baffles to provide depth and reduce velocities.
S-047	Piner Creek #1	Valdes Drive	Santa Rosa Cr-Mark West Cr-Russian R	3.0	126.2	**100%**	2.0	39.5	**100%**	1.0	16.7	**100%**	Sized >100 yr flow.	Recommend to do nothing, leave it as is.
S-048	Piner Creek #2	Marlow Road	Santa Rosa Cr-Mark West Cr-Russian R	3.0	124.6	**71%**	2.0	39.0	**35%**	1.0	16.5	**41%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Backwatered 0.18 ft.	Recommend modifying existing structure with corner baffles to provide depth and reduce velocities.
S-049	Piner Creek #3	Coffey Lane	Santa Rosa Cr-Mark West Cr-Russian R	3.0	64.0	**55%**	2.0	20.0	**0%**	1.0	8.5	**0%**	Assumed Q1%=active channle flow in outlet pool. Sized >100 yr flow.	Recommend modifying existing structure with corner baffles to reduce velocities and provide depth and install a notched beam across the outlet to provide additional depth.
S-050	Piner Creek #4	Hopper Avenue	Santa Rosa Cr-Mark West Cr-Russian R	3.0	31.6	**64%**	2.0	9.9	**0%**	1.0	4.2	**0%**	Assumed Q1%=active channle flow in outlet pool. Sized >100 yr flow.	Recommend modifying existing structure with corner baffles to provide depth and reduce velocities.
S-051	Spring Creek #1	Summerfield Road	Matanzas Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	87.2	**100%**	2.0	27.3	**15%**	1.0	11.5	**0%**	Q1% over tops the pipe. For the cross section to work in fishXing the pool depth was set 0.05 ft lower than it was surveyed. Severly undersized <1 yr flow. Low to moderate fill volume ~626 yd^3.	Full replacement required due to pipe size. Recommend replacing with embedded pipe arch, open arch or bridge with a 16-18 ft span.
S-052	Spring Creek #2	Stone Hedge Drive	Matanzas Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	83.0	**99%**	2.0	26.0	**16%**	1.0	11.0	**0%**	Q1% over tops the pipe. FishXing can not model oval pipes, therefore a circular pipe with a similar inlet area was used. Extermely undersized <1 yr flow. Minimal fill ~268 yd^3.	Full replacement required due to pipe size. Recommend replacing with embedded circular pipe, embedded pipe arch, open arch or bridge with a 14-16 ft span.
S-053	Matanzas Creek	Bethnards Drive	Santa Rosa Cr-Mark West Cr-Russian R	3.0	370.6	**89%**	2.0	116.1	**22%**	1.0	49.0	**3%**	Assumed Q1%=active channel flow in outlet pool. Model output %passable is inaccurate due to limitations in fishXing with pipe arch sizes. Had to use a pipe arch considerably smaller. Enormous amount of road fill (23ft, ~4600 yd^3). Sized ~51 yr flow. Velocity is main limiting factor.	Recommend installing notched weirs within culvert to decrease velocities, provide depth and retain bedload.
S-054	Ducker Creek #1 - 1of2	Benicia Drive	Rincon Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	37.9	**100%**	2.0	11.9	**100%**	1.0	5.0	**100%**	Sized >100 yr flow.	Recommend to leave as is.
S-054	Ducker Creek #1 - 2of2	Benicia Drive	Rincon Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	37.9	**100%**	2.0	11.9	**100%**	1.0	5.0	**100%**	Assumed Q1%=active channel flow in outlet pool. Assumed split flow between the 2 bays. Culvert has negative slope due to aggraded sediment at outlet thus fishXing can not handle negative slopes so the outlet elevation was set below the surveyed inlet elevation. Sized >100 yr flow.	Site passes fish 100% of the time. Recommend to leave as is.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-055	Ducker Creek #2 - 1of2	Rinconada Drive	Rincon Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	37.4	**77%**	2.0	11.7	**49%**	1.0	4.9	**80%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between the 2 bays. Sized >100 yr flow. Depth is limiting factor.	Recommend modifying existing structure with a notched beam at the outlet to provide depth.
S-055	Ducker Creek #2 - 2of2	Rinconada Drive	Rincon Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	37.4	**68%**	2.0	11.7	**18%**	1.0	4.9	**59%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between the 2 bays. Sized >100 yr flow. Depth is limiting factor.	Recommend modifying existing structure with a notched beam at the outlet to provide depth.
S-056	Rincon Cr aka Brush Cr #1 - 1of2	Montecito Blvd	Santa Rosa Cr-Mark West Cr-Russian R	3.0	135.7	**86%**	2.0	42.5	**60%**	1.0	17.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between the 2 bays. Roughness was increased to 0.03 n because concrete is worn and has some substrate present. Both bays combined are sized for >33 yr flow. Crossing is a bridge with a concrete bottom. Upstream concrete is laid in channel for ~150 ft.	If structure does not need a concrete bottom for structural integrity then recommend removal of concrete, not just under bridge but extending upstream also. Other recommendation install baffles or notched weirs to provide depth and reduce velocities.
S-056	Rincon Cr aka Brush Cr #1 - 2of2	Montecito Blvd	Santa Rosa Cr-Mark West Cr-Russian R	3.0	135.7	**81%**	2.0	42.5	**11%**	1.0	17.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between the 2 bays. Roughness was increased to 0.03 n because concrete is worn and has some substrate present. Both bays combined are sized for >33 yr flow. Crossing is a bridge with a concrete bottom. Upstream concrete is laid in channel for ~150 ft.	If structure does not need a concrete bottom for structural integrity then recommend removal of concrete, not just under bridge but extending upstream also. Other recommendation install baffles or notched weirs to provide depth and reduce velocities.
S-057	Rincon Cr aka Brush Cr #2	Brush Creek Road	Santa Rosa Cr-Mark West Cr-Russian R	3.0	88.0	**86%**	2.0	27.6	**0%**	1.0	11.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Culvert width is half active channel width. Fill volume ~710 yd^3. Scour at the outlet may be due to small culvert width which may be depositing sediment at the inlet. Perched 2.7 ft.	Recommend modifying existing structure by raising tailwater elevation 2.5 ft with 3 rock weirs and installing corner baffles to provide depth and reduce velocities. Further monitoring for aggrading sediment at inlet should be done. If channel profile increases then full replacement is needed, however this has not been observed at initial visit.
S-058	Rincon Cr aka Brush Cr #3	Deer Trail Road	Santa Rosa Cr-Mark West Cr-Russian R	3.0	75.3	**75%**	2.0	23.6	**0%**	1.0	10.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Crossing is a bridge with a concrete floor but was modeled as a box culvert. Sized >100 yr flow. Roughness was increased to 0.03 n because concrete is worn and abrasive. Due to fishXing limitations culvert outlet elevation was placed below the surveyed inlet elevation to not create a negative slope.	If structure does not need a concrete bottom for structural integrity then recommend removal of concrete. Other recommendation raise tailwater elevation 0.5 ft with 1 rock weir and install baffles to provide depth and reduce velocities.
S-059	Rincon Cr aka Brush Cr #4 - 1of2	Amber Lane	Santa Rosa Cr-Mark West Cr-Russian R	3.0	62.2	**22%**	2.0	19.5	**0%**	1.0	8.2	**0%**	Assumed flow is split evenly between two bays. Perched 0.5 ft. Sized >100 yr flow. Minimal fill ~232 yd^3. Conrete bottom in concave thus creating depth.	If structure does not need a concrete bottom for structural integrity then recommend removal of concrete. Other recommendation raise tailwater elevation 0.5 ft with 1 rock weir and install baffles or notched weirs to provide depth and reduce velocities.
S-059	Rincon Cr aka Brush Cr #4 - 2of2	Amber Lane	Santa Rosa Cr-Mark West Cr-Russian R	3.0	62.2	**0%**	2.0	19.5	**0%**	1.0	8.2	**0%**	Assumed flow is split evenly between two bays. Perched 0.4 ft. Sized >100 yr flow. Minimal fill ~232 yd^3. Conrete bottom in concave thus creating depth.	If structure does not need a concrete bottom for structural integrity then recommend removal of concrete. Other recommendation raise tailwater elevation 0.5 ft with 1 rock weir and install baffles or notched weirs to provide depth and reduce velocities.
S-060	Unnamed Trib to Rincon Cr aka Brush Cr	Wallace Road	Rincon Cr-Santa Rosa Cr-Mark West Cr-Russian R	3.0	27.4	**0%**	2.0	8.6	**0%**	1.0	3.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Steep sloped (3.3%) concrete box. Perched 3 ft. Sized >100 yr flow.	Due to size of outlet pool, downstream channel width and width of culvert compared to active channel width full replacement might be best option. Recommend replacing with a 22-24 ft spanning structure. Can modify existing structure with a fish ladder or by raising tailwater elevation 3 ft with 3-4 rock weirs and installing corner baffles to reduce velocities and provide depth.
S-061	Rincon Cr aka Brush Cr #5	Riebli Road	Santa Rosa Cr-Mark West Cr-Russian R	3.0	19.1	**32%**	2.0	6.0	**0%**	1.0	2.5	**0%**	Assumed Q1%=active channel flow in outlet pool. Perched 0.9 ft. Sized >100 yr flow. Concrete apron at inlet may be problematic.	Full replacement is best option since culvert impinges on active channel width. Modification is possible by improving tailwater conditions and raising tailwater elevation 1 ft with 1rock weir and installing corner baffles to decrease velocities and provide depth.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-062	Blucher Creek #1	Bloomfield Road	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	37.4	**0%**	2.0	11.7	**0%**	1.0	4.9	**0%**	Assumed Q1%=active channel flow in outlet pool. 14 ft of rip rap. Perched 3.8 ft. Minimal fill ~232yd^3. Sized >100yr flow. Poor habitat around culvert.	Recommend raising tailwater elevation 3.5 ft with 4 rock weirs and install corner baffles to reduce velocities and provide depth.
S-063	Blucher Creek #2	Blucher Valley Road	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	20.0	**86%**	2.0	6.3	**0%**	1.0	2.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Severly undersized <4yr flow. Minimal fill ~205 yd^3. Sloped 4.8%	Full replacement only feasible solution. Replace with embedded circular pipe, pipe arch, open arch or bridge with a 10 ft span.
S-064	Hinebaugh Creek #1 1of4	Commerce Boulevard	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	226.8	**89%**	2.0	71.0	**0%**	1.0	30.0	**0%**	Assumed Q1%=active channel flow in outlet pool. 4 bay box with total span of 44 ft. Assumed flow is split evenly between the middle 2 bays, however I split it 3 ways to effectively model this bay. Inlet is partially outside of active channle flow. Culvert partially backwatered and almost completely embedded. Embeddedness at outlet is perched 1.3 ft. Sized >100 yr flow. Leap cfs is due to lack of pool depth.	Recommend modifying existing structure. Raise tailwater elevation 1 ft with 2 rock weirs will improve passage in the 2 middle bays where most flow is present.
S-064	Hinebaugh Creek #1 2of4	Commerce Boulevard	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	226.8	**74%**	2.0	71.0	**0%**	1.0	30.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between the middle 2 bays. 4 bay box with total span of 44 ft. Sized >100 yr flow. Leap cfs is due to lack of pool depth.	Recommend modifying existing structure. Raise tailwater elevation 1 ft with 2 rock weirs and install corner baffles to reduce velocities and provide depth.
S-064	Hinebaugh Creek #1 3of4	Commerce Boulevard	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	226.8	**74%**	2.0	71.0	**0%**	1.0	30.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between the middle 2 bays. 4 bay box with total span of 44 ft. Sized >100 yr flow. Leap cfs is due to lack of pool depth.	Recommend modifying existing structure. Raise tailwater elevation 1 ft with 2 rock weirs and install corner baffles to reduce velocities and provide depth.
S-064	Hinebaugh Creek #1 4of4	Commerce Boulevard	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	226.8	**0%**	2.0	71.0	**0%**	1.0	30.0	**0%**	Sized >100yr flow. 4 bay box with total span of 44 ft.	Recommend modifying existing structure. Raise tailwater elevation 1 ft with 2 rock weirs and install corner baffles to reduce velocities and provide depth.
S-065	Crane Creek #1 - 1of2	Snyder Lane	Hinebaugh Cr Laguna De Santa Rosa-Mark West Cr Russian R	3.0	89.6	**0%**	2.0	28.1	**0%**	1.0	11.8	**0%**	Assumed that the right bay (RB) recieves all the flow below Q1%. Perched 0.78 ft. Sized >100 yr flow, road fill ~554 yd^3.	Recommend modifying existing structure by raising tailwater elevation 0.5-1.0 ft with 1 rock weir and install corner baffles to provide depth and decrease velocities.
S-065	Crane Creek #1 - 2of2	Snyder Lane	Hinebaugh Cr Laguna De Santa Rosa-Mark West Cr Russian R	3.0	89.6	**72%**	2.0	28.1	**0%**	1.0	11.8	**0%**	Assumed that the right bay (RB) recieves all the flow below Q1%. Perched 0.78 ft. Sized >100 yr flow, road fill ~554 yd^3.	Recommend modifying existing structure by raising tailwater elevation 0.5-1.0 ft with 1 rock weir and install corner baffles to provide depth and decrease velocities.
S-066	Crane Creek #2	Petaluma Hill Road	Hinebaugh Cr Laguna De Santa Rosa-Mark West Cr Russian R	3.0	81.4	**100%**	2.0	25.5	**100%**	1.0	10.8	**100%**	Natural stream simulated within culvert. Culvert impinges active channel width minimally. Sized >100 yr flow. Poor channel allingment.	Monitoring inlet for scour due to poor channel alignment should be done. If excessive RSP is necessary at inlet consider installing structure with a 22 ft span. In mean time leave as is due to green rateing.
S-067	Crane Creek #3	Pressley Road	Hinebaugh Cr Laguna De Santa Rosa-Mark West Cr Russian R	3.0	49.0	**0%**	2.0	15.3	**0%**	1.0	6.5	**0%**	Limited upstream habitat. 30 ft upstream is a hardened ford which is a barrier. Perched 5 ft. Undersized <10 yr flow. Minimal fill 180 yd^3.	Best option is full replacement. If replaced then upstream ford should also be dealt with i.e. removed. Replacement should have a width of 18-20 ft.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-068	Copeland Creek 1of3	Snyder Lane	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	103.3	**0%**	2.0	32.3	**0%**	1.0	13.6	**0%**	Bay is very embedded. Recommendations will apply to the other 2 bays at crossing.	Leave this bay as is due to depth of embeddedness and follow recommendations for other 2 bays for fish passage.
S-068	Copeland Creek 2of3	Snyder Lane	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	103.3	**19%**	2.0	32.3	**0%**	1.0	13.6	**0%**	Assumed active channel flow is split evenly between bays 2of3 and 3of3. Sized >100 yr flow.	Recommend modifying existing structure by installing corner baffles to reduce velocities and provide depth or raise tailwater elevation 0.5 ft to backwater pipe.
S-068	Copeland Creek 3of3	Snyder Lane	Laguna De Santa Rosa-Mark West Cr Russian R	3.0	103.3	**7%**	2.0	32.3	**0%**	1.0	13.6	**0%**	Assumed active channel flow is split evenly between bays 2of3 and 3of3. Sized >100 yr flow.	Recommend modifying existing structure by installing corner baffles to reduce velocities and provide depth or raise tailwater elevation 0.5 ft to backwater pipe.
S-069	Linda Creek #1	Mark West Springs Road	Mark West Ck-Russian R	3.0	95.1	**0%**	2.0	29.8	**0%**	1.0	12.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Steep slope(3.16%) for a concrete box. Perched 1.6 ft. Sized >100 yr flow. Enormous amount of fill ~3,430 yd^3. Channel profile steep at inlet possibly from poor channel allingment. 19,000+ ft of habitat upstream. Large outlet pool area.	High priority. Full replacement seems cost prohibitive. Interim fixes should be pursued through cost effectiveness. Two options to consider 1) Install a fish ladder or 2) Raise tailwater elevation 1.5-2 ft with 2-3 rock weirs. High velocities and lack of depth within culvert need to be dealt with, corner baffles should remedy this problem. Steep slope may complicate situation.
S-070	Linda Creek #2	Riebli Road	Mark West Ck-Russian R	3.0	32.4	**0%**	2.0	10.1	**0%**	1.0	4.3	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Private culvert upstream ~100 ft. Perched 2.8 ft. 8 ft outlet apron starting to break apart. Road fill ~775 yd^3. Culvert width vs active channel width (12 vs 21.3).	Interim fix- improve tailwater conditions and raise tailwater elevation 2.5-3 ft with 3-4 rock weirs and install corner baffles to decrease velocities and provide depth. Recommend full replacement with a 25 ft wide structure.
S-071	Porter Creek #1 (Trib to Mark West)	Porter Creek Road	Mark West Ck-Russian R	3.0	213.7	**75%**	2.0	58.3	**0%**	1.0	27.3	**0%**	Sized >100 yr flow. 26,000 ft of upstream habitat. Outlet 2.45 ft above tailwater elevation. Poor tailwater conditions.	Recommend modifying existing structure by raising tailwater elevation 2.5 ft with 3 rock weirs and installing corner baffles or notched weirs to provide depth and reduce velocities.
S-072	Porter Creek #2 (Trib to Mark West) - 1of2	Calistoga Road	Mark West Ck-Russian R	3.0	171.6	**0%**	2.0	46.9	**0%**	1.0	21.9	**0%**	Sized >100 yr flow. 18,000+ ft upstream habitat. Left bay has a fish ladder whose effectiveness is questionable. After fish ladder enters culvert there are no baffles on the 2.9 ft wide concrete floor. Extremely perched 4.75 ft. Large amount of fill ~2,689 yd^3.	If current fish ladder functions, install baffels through concrete portion leading to ladder. If ladder does not function propertly recommend installing a new fish ladder with baffels in the culvert. Full replacement is cost prohibitive but best option.
S-072	Porter Creek #2 (Trib to Mark West) - 2of2	Calistoga Road	Mark West Ck-Russian R	3.0	171.6	**0%**	2.0	46.9	**0%**	1.0	21.9	**0%**	Sized >100 yr flow. 18,000+ ft upstream habitat. Left bay has a fish ladder whose effectiveness is questionable. After fish ladder enters culvert there are no baffles on the 2.9 ft wide concrete floor. Extremely perched 4.75 ft. Large amount of fill ~2,689 yd^3.	If current fish ladder functions, install baffels through concrete portion leading to ladder. If ladder does not function propertly recommend installing a new fish ladder with baffels in the culvert. Full replacement is cost prohibitive but best option.
S-073	Mark West Creek - 1of2	Roehmer Road	Russian R	5.1	626.6	**89%**	2.0	171.1	**15%**	1.0	80.1	**0%**	Assumed flow is split evenly between 2 bays. Fishxing can not model negative slopes, therefore the inlet was set higher than the outlet. This will affect depth and velocity. Crossing is a box with a railroad car top. Sized >100 yr flow. Very large active channel. Minimal fill due to size of bays under RR car. 73,000 ft of possible habitat upstream	Retrofitting existing structure is possible. Raise tailwater 2 ft with 3 rock weirs, this will take care of the right bay also. Install baffles to reduce velocities and provide depth. Recommend for long term solution to remove the concrete floor. The same railroad car top can be used and the sides and middle pillar may be structurally sound enough to have the floor removed. Otherwise replace the footings and put the RR car back on.
S-073	Mark West Creek - 2of2	Roehmer Road	Russian R	5.1	626.6	**94%**	2.0	171.1	**0%**	1.0	80.1	**0%**	Crossing is a box with a railroad car top. Sized >100 yr flow. Very large active channel. Minimal fill due to size of bays under RR car. Slope -6% thus backwatering bay. 73,000 ft of possible habitat upstream.	Retrofitting existing structure is possible. Raise tailwater 2 ft with 3 rock weirs, this will take care of the right bay also. Install baffles to reduce velocities and provide depth. Recommend for long term solution to remove the concrete floor. The same railroad car top and be used and the sides and middle pillar may be structurally sound enough to have the floor removed. Otherwise replace the footings and put the RR car back on.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-074	Weeks Creek - 1of2	Calistoga Road	Mark West Ck-Russian R	3.0	79.0	**95%**	2.0	21.6	**84%**	1.0	10.1	**0%**	Assumed left bay recieves all flows below Q1% due to embeddedness at right bay inlet. Deer fence over inlet. Minimal fill ~118 yd^3. Sized >100 yr flow. Strict juvenile barrier. Hydraulic capacity considerably reduced due to amount of embeddedness.	Immediate improvement remove deer fence blocking the inlet. Interim fix raise tailwater elevation 0.5 ft with 1 rock weir and install baffles in the left bay. Best option is full replacement recommend replacing with open arch or bridge with a 20 ft span.
S-074	Weeks Creek - 2of2	Calistoga Road	Mark West Ck-Russian R	3.0	79.0	**0%**	2.0	21.6	**0%**	1.0	10.1	**0%**	This bay of the 2 bay box is assumed to not be used below Q1%.	Immediate improvement remove deer fence blocking the inlet. Interim fix raise tailwater elevation 0.5 ft with 1 rock weir and install baffles in the left bay. Best option is full replacement recommend replacing with open arch or bridge with a 20 ft span.
S-075	Alpine Creek	St.Helena Road	Mark West Ck-Russian R	3.0	37.7	**54%**	2.0	10.3	**0%**	1.0	4.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Undersized for storm flows ~10 yr flow. Minimal fill ~135 yd^3. Perched 1.8 ft.	Due to culvert size and fill amount full replacement is best option. Recommend replacing with embedded pipe arch, open arch or bridge with 16-18 ft span.
S-076	Van Buren Creek	St.Helena Road	Mark West Ck-Russian R	3.0	61.8	**56%**	2.0	16.9	**0%**	1.0	7.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Perched 2 ft. Minimal fill ~211 yd^3. Undersized for storm flows ~9 yr flow. <3,000 ft of habitat to open up.	Due to culvert size and fill amount full replacement is best option. Recommend replacing with embedded pipe arch, open arch or bridge with 15 ft span.
S-077	Un-named trib to Mark West Ck #1	St.Helena Road	Mark West Ck-Russian R	3.0	11.1	**0%**	2.0	3.0	**0%**	1.0	1.4	**0%**	Assumed Q1%=active channel flow in outlet pool. 2100 ft of habitat upstream. Very steep channel profile upstream of inlet (23%). Culvert width impinges on active channel width (4' vs 13.7'). Severly perched at 4 ft. Fill ~928 yd^3. Close to Mark West mainstem.	Lower priority due to cost prohibitive measures and amount of habitat. Recommend full replacement with embedded pipe arch or open arch with 18 ft span.
S-078	Un-named trib to Mark West Ck #2	St.Helena Road	Mark West Ck-Russian R	3.0	53.1	**6%**	2.0	14.5	**0%**	1.0	6.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Culvert highly undersized ~6 yr flow. Steep slope 3.5%. 10 ft of rip rap at outlet. Perched 2.8 ft. Very small amount of habitat upstream.	Low priority due to upstream habitat. However, culvert is highly undersized and should be replaced with a structure with at least 16 ft width.
S-079	Press Creek	Sweetwater Springs Road	Porter Ck-Russian R	3.0	42.8	**32%**	2.0	13.1	**0%**	1.0	6.2	**0%**	Assumed Q1%=active channel flow in outlet pool. Debris jammed at inlet (probably removed by county workers). Perched 2.4 ft. Sloped 1.96% Road fill ~545 yd^3. Sized >100 yr flow. Fairly steep channel profile upstream (6%). Very close to main stem of Porter Creek.	Due to proximity to porter creek, slope and outlet conditions, it would be wiser to replace the structure than to try and raise tailwater elevations. Recommend replacing with embedded pipe arch, open arch or bridge with a 12 ft span.
S-080	Porter Creek #1 - 1of2	Sweetwater Springs Road	Russian R	3.0	108.1	**0%**	2.0	33.1	**0%**	1.0	15.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed all flow goes through pipe 2of2 since the inlet of pipe 1of2 is 1.6 ft higher in elevation then pipe 2of2. Severly undersized <3 yr flow. Steep channel profile uspstream. Minimal fill ~292 yd^3. Steep slope (7.8%). Very poor condition- rusted through and ripped apart.	Full replacement is only feasible option. High priority due to size of pipes, length of habitat and pipe condition. Recommend replacing with open arch or bridge with a 16 ft span.
S-080	Porter Creek #1 - 2of2	Sweetwater Springs Road	Russian R	3.0	108.1	**33%**	2.0	33.1	**0%**	1.0	15.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed all flow goes through pipe 2of2 since the inlet of pipe 1of2 is 1.6 ft higher in elevation then pipe 2of2. Severly undersized <3 yr flow. Steep channel profile uspstream. Minimal fill ~292 yd^3. Steep slope (7.8%). Very poor condition- rusted through and ripped apart.	Full replacement is only feasible option. High priority due to size of pipes, length of habitat and pipe condition. Recommend replacing with open arch or bridge with a 16 ft span.
S-081	Porter Creek #2 - 1of2	Hendren Driveway	Russian R	3.0	49.4	**17%**	2.0	15.1	**0%**	1.0	7.2	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow split evenly between both pipes. Severly undersized <2 yr flow. Pipe is sloped steep (8%). Very small fill ~63 yd^3.	Full replacement is only feasible option. Recommend replacing with structure with at least 12 ft span.
S-081	Porter Creek #2 - 2of2	Hendren Driveway	Russian R	3.0	49.4	**74%**	2.0	15.1	**0%**	1.0	7.2	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow split evenly between both pipes. Severly undersized <2 yr flow. Pipe is sloped steep (8%). Very small fill ~63 yd^3.	Full replacement is only feasible option. Recommend replacing with structure with at least 12 ft span.
S-082	Turtle Creek	West Side Road	Russian R	3.0	52.4	**31%**	2.0	16.0	**0%**	1.0	7.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Sloped 3.6% - with the outlet below the tailwater control 0.4 ft. Sized >100 yr flow. Active channel is impinged a little and may have some scour at the inlet. (CH SH present in '95)	Raising tailwater elevation 0.8-1.0 ft would effectively backwater the pipe. If signs of scour at inlet increase and channel alignment veers away from the inlet then full replacement would be necessary.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-083	Wallace Creek	Mill Creek Road	Mill Ck-Dry Ck-Russian R	3.0	184.4	**22%**	2.0	60.9	**0%**	1.0	29.7	**0%**	Assumed Q1%=active channel flow in outlet pool. Very close, about 25 ft, to the confluence with Mill Creek. Adequate size ~61 yr flow. Perched 2.9 ft. Culvert inlet is set at least 0.6 ft above the upstream channel thalweg. Low fill ~376 yd^3. Large amount of habitat.	High priority. Full replacement recommended due to proximity with Mill Creek and elevation of culvert inlet compared to upstream channel elevations. Replace with open arch or bridge with 22 ft span.
S-084	Mill Creek	Mill Creek Road	Dry Ck-Russian R	3.0	106.6	**100%**	2.0	35.2	**100%**	1.0	17.2	**100%**	Extremely undersized <3 yr flow. Completely backwatered to a depth of 0.78 ft. Minimal fill ~228 yd^3. Scour around pipe indicates topping over occurs.	Due to current condition, GREEN output, changing crossing for fish passage is low priority. If crossing is high maintenance consider replacing with a open arch or bridge with 18-20 ft span. Low amount of fill makes replacement relatively inexpensive.
S-085	Boyd Creek (a)	Mill Creek Road	Mill Ck-Dry Ck-Russian R	3.0	17.0	**0%**	2.0	5.6	**0%**	1.0	2.7	**0%**	Culvert is about 100 ft from confluence with Mill Creek. Extremely perched (9.6 ft). Minimal fill ~296 yd^3. Culvert width < active channel width. Low amount of habitat to open <1100 ft. Sized >100 yr flow.	Full replacement recommended due to outlet conditions and location to Mill Creek. Recommend replacing with embedded pipe arch, open arch or bridge with at least 10 ft width.
S-086	Kelley Creek	West Dry Creek Road	Dry Ck-Russian R	3.0	49.3	**68%**	2.0	16.3	**0%**	1.0	8.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Minimal fill ~290 yd^3.	Recommend modifying existing structure by raising tailwater elevation 1 ft with 1-2 rock weirs and installing corner baffles to reduce velocities and provide depth.
S-087	Lytton Springs Creek - 1of2	Dry Creek Road	Dry Ck-Russian R	3.0	59.7	**91%**	2.0	19.7	**0%**	1.0	9.6	**0%**	Assumed bay 1of2 receives all flow. Each bay of pipe estimated to pass 13 yr flow but in current embedded condition left bay passes <Q1%. Fill ~862 yd^3. Sediment aggrading at inlet.	Full replacement recommended due to embedded condition of bays. Recommend a bridge with a 18 ft span.
S-087	Lytton Springs Creek - 2of2	Dry Creek Road	Dry Ck-Russian R	3.0	59.7	**0%**	2.0	19.7	**0%**	1.0	9.6	**0%**	Highly embedded.	Full replacement recommended due to embedded condition of bays. Recommend a bridge with a 18 ft span.
S-088	Crane Creek Trib to Dry Creek	West Dry Creek Road	Dry Ck-Russian R	3.0	82.6	**88%**	2.0	27.3	**78%**	1.0	13.3	**79%**	Assumed Q1%=active channel flow in outlet pool. FishXing can not model negative slopes so the inlet was set at a higher elevation than was surveyed at. Culvert is mimicing a natural bottom. Sized >100 yr flow. Minimal fill 198 yd^3. Tailwater conditions poor. Steep upstream channel profile (17%). Depth is the limiting factor.	Improving tailwater conditions could maintain greater depth through culvert. Raising tailwater elevation 0.5 ft with a rock weir would establish depths adequate for full passage.
S-089	Grape Creek #1	West Dry Creek Road	Dry Ck-Russian R	3.0	110.1	**28%**	2.0	36.3	**0%**	1.0	17.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Perched 2.2 ft. Inlet elevation is 0.2 ft above the upstream elevation thus water is ponded upstream of culvert. Sized >100 yr flow. Road fill ~372 yd^3.	Existing structure can be modified by raising tailwater elevation 2.5-3.0 ft and install corner baffles to reduce velocities and provide depth. Channel may be naturally downcutting, in order to remedy this, full replacement would be necessary.
S-090	Wine Creek #1	Wine Creek Road	Grape Ck-Dry Ck-Russian R	3.0	47.2	**95%**	2.0	15.6	**90%**	1.0	7.6	**27%**	Outlet elevation was set below inlet elevaion due to limitation in fishXing not able to model negative slopes. Culvert sized for a 4 yr flow, however due to amount of embeddedness it currently passes a 2 yr flow. Minimal fill at 165 yd^3. Upstream creek is channelized by vineyards and looks to be dredged.	Full replacement only feasible option and relatively inexpensive due to limited fill and stream size. Replace with open arch or bridge with a 14-16 ft span.
S-091	Wine Creek #2	Koch Road	Grape Ck-Dry Ck-Russian R	3.0	43.4	**93%**	2.0	14.3	**0%**	1.0	7.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized <35 yr flow. Minimal fill ~178 yd^3.	Full replacement relatively inexpensive due to limited amount of fill. Recommend replacing with embedded pipe arch, open arch or bridge with 15 ft span. Interim fix raise tailwater elevation 1 ft with 1-2 rock weirs.
S-092	Wine Creek #3	Koch Road	Grape Ck-Dry Ck-Russian R	3.0	42.4	**94%**	2.0	14.0	**0%**	1.0	6.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Sloped 4.3% Severly undersized <2 yr flow. Very small fill 117 yd^3. Culvert in very poor conditon with poor channel allingment.	Full replacement only feasible option due to size, condition of pipe and slope. Low fill amount makes replacement relatively inexpensive. Recommend replacing with open arch or bridge with 14-15 ft span. Better stream alignment needs to be accomplished.
S-093	Grape Creek #2	Wine Creek Road	Dry Ck-Russian R	3.0	41.7	**30%**	2.0	13.8	**0%**	1.0	6.7	**0%**	Assumed Q1%=active channel flow in outlet pool. Very poor channel allingment with a fairly steep upstream channel profile. Sized >100 yr flow. Moderately steep slope for concrete floor (2.17%).	Interim fix install corner baffles or notched weirs within pipe. Best option is full replacement with open arch or bridge due to poor channel alignment.
S-094	Un-named Tributary #1 to Dry Creek	West Dry Creek Road	Dry Ck-Russian R	3.0	14.9	**50%**	2.0	4.9	**0%**	1.0	2.4	**0%**	100% barrier. Poor fish habitat-questionable if fish bearing. Poor channel allingment. Undersized<14 yr flow.	Low priority due to condition of habitat. Full replacement best option due to channel alignment and size.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-095	Un-named Tributary #2 to Dry Creek	Dry Creek Road	Dry Ck-Russian R	3.0	25.0	**9%**	2.0	8.3	**0%**	1.0	4.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Undersized <10 yr flow. Minimal fill 181 yd^3. Large outlet drop, 2.9 ft.	Low priority due to habitat. Due to size full replacement with a 15 ft spanning structure would be adequate.
S-096	Un-named Tributary #3 to Dry Creek	Dry Creek Road	Dry Ck-Russian R	3.0	14.2	**0%**	2.0	4.7	**0%**	1.0	2.3	**0%**	Assumed Q1%=active channel flow in outlet pool. Perched 3.5 ft with a 38 ft apron and 16 feet of rip rap. Sized >100 yr flow. Low quality fish habitat.	Low priority due to habitat. Raising tailwater elevation 3.5 ft with 4 rock weirs and installing corner baffles should be adequate for adult salmonids.
S-097	Canyon Creek	Dry Creek Road	Dry Ck-Russian R	3.0	70.5	**0%**	2.0	23.3	**0%**	1.0	11.4	**0%**	Assumed Q1%=active channel flow in outlet pool. Upstream habitat in poor condition from vineyard with numerous crossings. Local said there is a natural barrier not far upstream. Sized >100 yr flow. Extremely perched at 4.2 ft.	Existing structure can be modified by raising tailwater elevation 4.5 ft with 5-6 rock weirs and install corner baffles or weirs within pipe to reduce velocities and provide depth.
S-098	Dutcher Creek #1	Dry Creek Road	Dry Ck-Russian R	3.0	103.5	**61%**	2.0	34.2	**0%**	1.0	16.7	**0%**	10 crossings upstream with at least 5 barriers. Enormous amount of habitat (43,000+ft). Inlet elevation 0.5 ft above upstream elevation. Upstream tailwater control and outlet pool tailwater have a 1.6% slope between the two.	Replace existing structure with a bridge would allow channel to establish lower elevation which it seems to be cutting to naturally. Interim fix raise tailwater elevation 2 ft with 2-3 rock weirs and install corner baffles.
S-099	Dutcher Creek #2	Dutcher Creek Road	Dry Ck-Russian R	3.0	100.0	**0%**	2.0	33.0	**0%**	1.0	16.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Next barrier 225 ft upstream. Minimal fill ~203 yd^3. Highly perched 3.5 ft. Enormous amount of upstream habitat (42,000+ft). Sized >100 yr flow.	Replace existing structure with a bridge would allow channel to establish lower elevation and inlet alignment corner could be straightened. Interim fix raise tailwater elevation 3.5 ft with 4 rock weirs and install corner baffles to reduce velocities and provide depth.
S-100	Dutcher Creek #3 - 1of3	Private Driveway	Dry Ck-Russian R	3.0	99.6	**91%**	2.0	32.9	**0%**	1.0	16.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between pipes 1of3 and 2of3 since pipe 3of3 is 0.6 ft higher than the inlet of the other two. High velocities due to concrete laid on bottom of pipe coupled with slope. Highly undersized <3 yr flow.	Full replacement is best option due to limited hydraulic capacity and low amount of fill making it realatively inexpensive. Recommend replacing with an open arch or bridge with 20 ft span.
S-100	Dutcher Creek #3 - 2of3	Private Driveway	Dry Ck-Russian R	3.0	99.6	**91%**	2.0	32.9	**0%**	1.0	16.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between pipes 1of3 and 2of3 since pipe 3of3 is 0.6 ft higher than the inlet of the other two. High velocities due to concrete laid on bottom of pipe coupled with slope. Highly undersized <3 yr flow.	Full replacement is best option due to limited hydraulic capacity and low amount of fill making it realatively inexpensive. Recommend replacing with an open arch or bridge with 20 ft span.
S-100	Dutcher Creek #3 - 3of3	Private Driveway	Dry Ck-Russian R	3.0	99.6	**84%**	2.0	32.9	**0%**	1.0	16.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between pipes 1of3 and 2of3 since pipe 3of3 is 0.6 ft higher than the inlet of the other two, however flow was split evenly to determine an approximate range of flows passable. Highly undersized <3 yr flow.	Full replacement is best option due to limited hydraulic capacity and low amount of fill making it realatively inexpensive. Recommend replacing with an open arch or bridge with 20 ft span.
S-101	Dutcher Creek #4	Dutcher Creek Road	Dry Ck-Russian R	3.0	78.8	**0%**	2.0	26.0	**0%**	1.0	12.7	**0%**	Outlet perched >5ft. Undersized for storm events <14 yr flow. Rip rap at outlet extending jump. High velocitites due to concrete floor.	Recommend full replacement due to limited hydraulic capacity and outlet conditions. Replace with embedded pipe arch, open arch or bridge with 16-18 ft span.
S-102	Dutcher Creek #5	Dutcher Creek Road	Dry Ck-Russian R	3.0	76.4	**78%**	2.0	25.2	**57%**	1.0	12.3	**0%**	Assumed Q1%=active channel flow in outlet pool. Increased culvert roughness to 0.025 due to amount of partial embeddedness. Little dam 20 ft upstream which is a barrier to all lifestages. Partially backwatered. Slightly undersized ~32 yr flow. Poor channel allingment. Left bank wingwall is being scoured probably due to overtopping of culvert.	If culvert is fixed then upstream dam structure needs to be addressed also. Interim fix either raise tailwater elevation 0.8 ft with 1 rock weir or install corner baffles to provide depth and reduce velocities. Full replacement is best long term option, structure should span 16-18 ft.
S-103	Dutcher Creek #6	Dutcher Creek Road	Dry Ck-Russian R	3.0	50.7	**12%**	2.0	16.7	**0%**	1.0	8.2	**0%**	Assumed Q1%=active channel flow in outlet pool. Adequately sized >100 yr flow. Perched 2.4 ft. Old abandoned county road crossing 200 ft upstream. Culvert width is close to active channel width (12.1 vs. 12.7). Right bank inlet is heavily rip rapped.	Current structure can be modified by raising tailwater elevation 3 ft with 4 rock weirs and install corner baffles. Full replacement is advisable since culvert width is desired at 1.5 Xs active channel width. Low amount of road fill makes full replacement relatively inexpensive. Recommend replacement structure with 16-18 ft span.
S-104	Schoolhouse Creek	Dry Creek Road	Dry Ck-Russian R	3.0	20.5	**0%**	2.0	6.8	**0%**	1.0	3.3	**0%**	Assumed Q1%=active channel flow in outlet pool. Very steep drop in upstream channle profile (18%) at inlet due to deposition from undersized culvert. Highly undersized <3 yr flow. Steep slope 4.44%.	Full replacement only feasible option. Low priority due to amount of habitat. Replacement should have 14 ft width.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-105	Brooks Creek	Spurgeon Road	Russian R	3.0	45.0	**36%**	2.0	12.3	**0%**	1.0	5.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Reservoirs upstream limit anadromy. Adequately sized >100 yr flow. Perched 2.5 ft. Close to confluence with Martin creek. Outlet pool exposed to bedrock.	Can modify structure by raising tailwater elevation 3 ft with 4 rock weirs and install corner baffles or nothced beam to provide depth and reduce velocities.
S-106	Martin Creek	Private Drive off Spurgeon Road	Barnes Cr-Brooks Cr-Russian R	3.0	86.4	**87%**	2.0	23.6	**47%**	1.0	11.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Roughness increased to 0.028 n due to broken floor. FishXing can not model negative slopes so the inlet elevation was set higher than the outlet elevation. Culvert in poor condition. Minimal fill ~349 yd^3. No upstream crossings.	Modification not recommended due to condition of pipe. Full replacement best option, low amount of fill making it relatively inexpensive. Recommend replacing with an open arch with 16 ft width.
S-107	Unnamed Tributary to Barnes Creek 1of3	Private Driveway-Lawton Shurtleff	Barnes Cr-Brooks Cr-Russian R	3.0	32.2	**0%**	2.0	8.8	**0%**	1.0	4.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow split evenly between the three pipes. Perched 3.5 ft. Highly undersized <5 yr flow. Minimal fill ~145 yd^3.	Full replacement only feasible option. Recommend replacing with flat car bridge with a 15 ft span.
S-107	Unnamed Tributary to Barnes Creek 2of3	Private Driveway-Lawton Shurtleff	Barnes Cr-Brooks Cr-Russian R	3.0	32.2	**0%**	2.0	8.8	**0%**	1.0	4.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Perched 3.5 ft. Highly undersized <5 yr flow. Minimal fill ~145 yd^3.	Full replacement only feasible option. Recommend replacing with flat car bridge with a 15 ft span.
S-107	Unnamed Tributary to Barnes Creek 3of3	Private Driveway-Lawton Shurtleff	Barnes Cr-Brooks Cr-Russian R	3.0	32.2	**0%**	2.0	8.8	**0%**	1.0	4.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Perched 3.5 ft. Highly undersized <5 yr flow. Minimal fill ~145 yd^3.	Full replacement only feasible option. Recommend replacing with flat car bridge with a 15 ft span.
S-108	Little Briggs Creek 1of5	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	59.3	**78%**	2.0	16.2	**22%**	1.0	7.6	**0%**	Assumed flow is split evenly between the 5 pipes. Eventhough fishXing indicates a leap as a barrier this was ignored due to the outlet configuration which is a riffle and does not require a leap. Pipes may pass adequate flow but are not allowing the active channel to move since there are 5 pipes with 5.5 ft width each.	Raising tailwater elevation 2 ft with 2-3 rock weirs would be a sufficent temporary fix. Full replacement required to provide adequate width to transport bedload and for full passage. Recommend an open arch or bridge with a 25 ft span.
S-108	Little Briggs Creek 2of5	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	59.3	**0%**	2.0	16.2	**0%**	1.0	7.6	**0%**	Assumed flow is split evenly between the 5 pipes. Leap is the limiting factor from pool depth. Pipes may pass adequate flow but are not allowing the active channel to move since there are 5 pipes with 5.5 ft width each.	Raising tailwater elevation 2 ft with 2-3 rock weirs would be a sufficent temporary fix. Full replacement required to provide adequate width to transport bedload and for full passage. Recommend an open arch or bridge with a 25 ft span.
S-108	Little Briggs Creek 3of5	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	59.3	**0%**	2.0	16.2	**0%**	1.0	7.6	**0%**	Assumed flow is split evenly between the 5 pipes. Leap is the limiting factor from pool depth. Pipes may pass adequate flow but are not allowing the active channel to move since there are 5 pipes with 5.5 ft width each.	Raising tailwater elevation 2 ft with 2-3 rock weirs would be a sufficent temporary fix. Full replacement required to provide adequate width to transport bedload and for full passage. Recommend an open arch or bridge with a 25 ft span.
S-108	Little Briggs Creek 4of5	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	59.3	**8%**	2.0	16.2	**0%**	1.0	7.6	**0%**	Assumed flow is split evenly between the 5 pipes. Leap is the limiting factor from pool depth. Pipes may pass adequate flow but are not allowing the active channel to move since there are 5 pipes with 5.5 ft width each.	Raising tailwater elevation 2 ft with 2-3 rock weirs would be a sufficent temporary fix. Full replacement required to provide adequate width to transport bedload and for full passage. Recommend an open arch or bridge with a 25 ft span.
S-108	Little Briggs Creek 5of5	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	59.3	**77%**	2.0	16.2	**44%**	1.0	7.6	**0%**	Assumed flow is split evenly between the 5 pipes. Eventhough fishXing indicates a leap as a barrier this was ignored due to the outlet configuration which is a riffle and does not require a leap. Pipes may pass adequate flow but are not allowing the active channel to move since there are 5 pipes with 5.5 ft width each.	Raising tailwater elevation 2 ft with 2-3 rock weirs would be a sufficent temporary fix. Full replacement required to provide adequate width to transport bedload and for full passage. Recommend an open arch or bridge with a 25 ft span.
S-109	Coon Creek 1of4	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	60.7	**72%**	2.0	16.6	**14%**	1.0	7.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between 4 pipes due to rustline heights and inlet configuration. There are 2 seperate outlet pools with different active channel elevations and a fifty foot wide gravel bar between the 2 pools. Pipes 1of4 and 2of4 go into one pool and 3of4 and 4of4 into another pool. The stream connects about 150 ft downstream of the outlets. Steep drop in channel profile at inlet due to deposition from udersized pipes. Large bedload in stream. Large amount of fill ~1682 yd^3.	Recommend full replacement due to undersizing of pipes as compared to the natural active channel width. Best option for replacement is a bridge due to active channel width (26.3 ft).

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-109	Coon Creek 2of4	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	60.7	**80%**	2.0	16.6	**45%**	1.0	7.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Assumed flow is split evenly between 4 pipes due to rustline heights and inlet configurations. Steep drop in channel profile at inlet due to deposition from udersized pipes. Large amount of fill ~1682 yd^3. Pipe roughness increased to 0.03 n due to partial embeddedness. There are 2 seperate outlet pools with different active channel elevations and a fifty foot wide gravel bar between the 2 pools. Pipes 1of4 and 2of4 go into one pool and 3of4 and 4of4 into another pool. The stream connects about 150 ft downstream of the outlets. Large bedload in stream.	Recommend full replacement due to undersizing of pipes as compared to the natural active channel width. Best option for replacement is a bridge due to active channel width (26.3 ft).
S-109	Coon Creek 3of4	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	60.7	**80%**	2.0	16.6	**0%**	1.0	7.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Steep drop in channel profile at inlet due to deposition from udersized pipes. Pipes 3of4 and 4of4 are in poor shape and rusted through. This pipe is perched over 3 ft. Large bedload in stream.	Recommend full replacement due to undersizing of pipes as compared to the natural active channel width. Best option for replacement is a bridge due to active channel width (26.3 ft).
S-109	Coon Creek 4of4	Santa Angelina Ranch	Briggs Cr-Maacama Cr-Russian R	3.0	60.7	**71%**	2.0	16.6	**0%**	1.0	7.8	**0%**	Assumed Q1%=active channel flow in outlet pool. Steep drop in channel profile at inlet due to deposition from udersized pipes. Pipes 3of4 and 4of4 are in poor shape and rusted through. Large bedload in stream.	Recommend full replacement due to undersizing of pipes as compared to the natural active channel width. Best option for replacement is a bridge due to active channel width (26.3 ft).
S-110	Gird Creek #1	Geysers Road	Russian R	3.0	87.1	**100%**	2.0	28.8	**100%**	1.0	14.1	**100%**	Suitable for fish passage. Cocrete ceiling is bowing and has cracks in it. Road department may want to investigate strucrural integrity of box. Adequately sized >100 yr flow. Poor channel allingment.	Do nothing for fish passage however if structure needs to be replaced then it should be replaced with an open arch or bridge with 16-18 ft span.
S-111	Gird Creek #2	Wilson Road	Russian R	3.0	77.4	**82%**	2.0	25.6	**57%**	1.0	12.5	**2%**	FishXing can not model negative slopes therefore culvert inlet elevation was set above the outlet elevation. Culvert would be backwatered at low flows and would allow greater fish passage then modeled. Culvert roughness set a 0.03 n since culvert is almost completely embedded. Adequately sized >100 yr flow. May impinge on the active channel width a little.	Improved tailwater conditions would increase fish passage. Raise tailwater elevation 1ft with one rock weir. If full replacement is considered, recommend replacement structure with 16-18 ft span.
S-112	Gird Creek #3	Geysers Road	Russian R	3.0	64.6	**100%**	2.0	21.3	**100%**	1.0	10.4	**100%**	Culvert width vs Active channel width, 19.2 vs 11.7 ft. Sized >100 yr flow. Natural bottom which appears to be backwatered starting within pipe (from pictures) however surveyed inlet does not capture this.	Recommend to leave as is.
S-113	Indian Creek	Hwy 128	Russian R	3.0	15.6	**0%**	2.0	5.2	**0%**	1.0	2.5	**0%**	Assumed Q1%=active channel flow in outlet pool. Sized >100 yr flow. Culvert width impinges on active channel width. Poor channel allingment. Downstream channel is in poor shape due to vineyards and needs restoration.	Can modify structure by raising tailwater elevation 3 ft with 4 rock weirs and install corner baffles to provide depth and reduce velocities. Full replacement would be best optioon due to leap conditions and channel allingment.
S-114	Crocker Creek	River Road	Russian R	3.0	113.5	**96%**	2.0	37.5	**92%**	1.0	18.3	**31%**	Culvert is highly embedded and severly undersized <2 yr flow. Minimal fill ~160 yd^3.	Only feasible solution is full replacement. Recommend replacement structure have a 18 ft span.
S-115	Barrelli Creek	Dutcher Creek Road	Russian R	3.0	39.6	**0%**	2.0	13.1	**0%**	1.0	6.4	**0%**	Culvert allows 0% passage due to slope (2.2%) and length (111 ft) of the concrete bottom. Large amount of habitat to open up (11,000+ ft).	Modification necessary to allow any type of passage. Recommend raising the tailwater elevation 1ft with 1 rock weir and installing corner baffles. Amount of fill (3200 yd^3) makes replacement cost prohibitive.
S-116	Un-named Tributary #1 on River Road	River Road	Russian R	3.0	18.7	**98%**	2.0	6.2	**0%**	1.0	3.0	**0%**	Perched outlet 1.6 ft with lack of pool depth. Highly undersized <5 yr flow. Minimal fill ~248 yd^3.	Recommend full repalcement due to limited hydraulic capacity and low amount of fill making replacement relatively inexpensive.
S-117	Icaria Creek	Asti Road	Russian R	3.0	179.8	**100%**	2.0	59.4	**72%**	1.0	29.0	**35%**	FishXing can not model negative slopes therefore culvert inlet elevation was set above the outlet elevation. Large amount of habitat to open. Culvert roughness increased to 0.024 due to condition of floor and sediment present. 6 upstream and 3 downstream crossings. Sized <50 yr flow.	If culvert is adequately sized then modification will be sufficent. Install corner baffles to retain bedload. If hydraulic capacity is too limited for modification then replacement structure should have 18 ft width.
S-118	Un-named Tributary #2 on River Road	River Road	Russian R	3.0	30.6	**0%**	2.0	10.1	**0%**	1.0	4.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Steep slope for concrete box (3.9%). Undersized <15yr flow. Minimal fill ~136 yd^3. Very low amount of habitat to open.	Low priority due to limited habitat. Due to hydraulic capacity full replacement is best option. Full replacement would be realatively inexpensive due to lack of fill and size of creek.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-119	Porterfield Creek	South Cloverdale Blvd	Russian R	3.0	55.6	**70%**	2.0	18.3	**0%**	1.0	9.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Culvert roughness increased to 0.02 n due to condition of floor. Tailwater control of jump pool created by weir 1.4 ft high with no jump pool. Sized > 100 yr flow.	Modify existing structure by installing corner baffles and raising outlet pool elevation. Existing outlet pool weir would have to be removed and then the tailwater elevation would need to be raised 4 ft with 5 rock weirs.
S-120	North Branch	Cherry Creek Road	Porterfield Cr Russian R	3.0	12.8	**54%**	2.0	4.2	**0%**	1.0	2.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Steep slope 5.6%. Highly undersized <8 yr flow. Culvert rusted through. Not much habitat to open. Locals say stream only flows during rain events.	Full replacement only feasible option due to limited hydraulic capacity and culvert may be prone to failure.
S-121	Cloverdale Creek #1	East First Street	Russian R	3.0	68.1	**71%**	2.0	22.5	**0%**	1.0	11.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Fairly steep drop in channel profile upstream (7.9%). Tree growing at inlet may obstruct passage of LWD. Sized >100 yr flow.	Can be retrofitted by raising tailwater elevation 1.5 ft with 2 jump pool weirs and install corner baffles. Inlet should be monitored for plugging.
S-122	Cloverdale Creek #2 - 1of2	Vista View Drive	Russian R	3.0	61.8	**77%**	2.0	20.4	**0%**	1.0	10.0	**0%**	Assumed majority of flow goes through the left bay. Assumed Right bay does not receive flow until headwater depth = 1.27 ft, approximately 24 cfs. Right bay does not pass adult steelhead within migration flows.	Installing corner baffles into the left bay culvert would improve passage conditions for all lifestages.
S-122	Cloverdale Creek #2 - 2of2	Vista View Drive	Russian R	3.0	61.8	**0%**	2.0	20.4	**0%**	1.0	10.0	**0%**	Assumed right bay does not receive flow until headwater depth = 1.27 ft, approximately 24 cfs.	Leave this bay as is due to depth of embeddedness.
S-123	Un-named Tributary to Big Sulphur Creek	Geysers Road	Big Sulphur Cr-Russian R	3.0	21.6	**0%**	2.0	5.9	**0%**	1.0	2.8	**0%**	Severly undersized, large drop at outlet, steep drop in channel profile upstream and steep slope. Eventhough its very close to main stem Big Sulphur creek, it only flows during peak events. Definite grade control issue for replacement.	Low priority due to amount and quality of upstream habitat. Full replacement only feasible option. Recommend replacing with circular pipe, pipe arch, open arch or bridge with 10 ft width.
S-124	Anna Belcher Creek	Pine Flat Road	Little Sulphur Cr-Big Sulphur Cr-Russian R	3.0	38.8	**0%**	2.0	10.6	**0%**	1.0	5.0	**0%**	Assumed Q1%=active channel flow in outlet pool. Steep sloped for concrete floor (3.5%). Apron at same slope of floor get wider past outlet, thus decreasing depth. Creek is overgrown with grasses and other vegetation. Sized >100 yr flow.	Raise tailwater elevation 2.5 ft with 3 rock weirs and install corner baffles. Slope of culvert couple with the width may be difficult to retrofit. Outlet apron needs to be modified with baffles or a nothced weir at the edge to provide depth. If retrofitting poses difficulty full replacement would be advisable.
S-125	Hurley Creek	Pine Flat Road	Little Sulphur Cr-Big Sulphur Cr-Russian R	3.0	23.1	**0%**	2.0	6.3	**0%**	1.0	2.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Floor of open arch is boulders concreted into place. Fish have a small window of flows for mitgration. Depth is limiting factor.	Hydraulic capacity and width make modifing existing structure best option. Raising tailwater elevation 0.5 ft with 1 rock weir will provide adequate depth for adults.
S-126	Boyd Creek (b)	Annapolis Road	Wheatfield Fork Gualala R-South Fork Gulala R-Gualala R	3.0	6.2	**0%**	2.0	1.9	**0%**	1.0	0.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Large amount of fill. Sized <15yr peak flow. >10% channel profile below culvert.	Low priority for fish due to lack and quality of habitat. However pipe is in very poor quality, undersized and has an enormous amount of fill and should be looked at from a water quality point.
S-127	Tobacco Creek	Skaggs Springs Road	Wheatfield Fork Gualala R-South Fork Gulala R-Gualala R	3.0	44.6	**0%**	2.0	13.7	**0%**	1.0	6.5	**0%**	Low amount of fill <800 yd^3. Extremely undersized <5yr peak flow. Severly perched >7ft. Very good cold water refuge to open up from warm water Wheatfield Gualala R.	Full replacement only feasible option due to size and location with confluence. Recommend replacing with an open arch or bridge with an 18 ft span. Definte grade control issue upstream due to perched outlet.
S-128	Bohan Dillon Creek	Fort Ross Road	South Fork Gulala R-Gualala R	3.0	24.7	**0%**	2.0	7.6	**0%**	1.0	3.6	**0%**	Assumed Q1%=active channel flow in outlet pool. Low amount of fill <250 yd^3. Extremely undersized <5yr peak flow. Road fill indicates culvert gets overtopped. Pipe in very poor condition.	Full replacement only feasible option due to size and conditon of pipe. Recommend replacing with structure with 10 ft width.
S-129	Fay Creek	Salmon Creek Road	Salmon Cr	3.0	115.1	**100%**	2.0	35.3	**100%**	1.0	16.8	**100%**	Culvert width impinges on active channel width. Sized >100 yr peak flow.	Remove mangled cattle guard from outlet. Nothing needs to be done to improve fish passage. When the structure is replaced a wider structure should be installed to pass LWD and bedload.
S-130	Thurston Creek	Joy Road	Nolan Cr-Salmon Cr	3.0	18.2	**0%**	2.0	5.6	**0%**	1.0	2.7	**0%**	Assumed Q1%=active channel flow in outlet pool. Upper limit of coho. Sized >100yr peak flow. Channel profile drops after tailwater control possible making weirs more difficult.	Recommend retrofitting box culvert with corner baffles and an outlet nothced beam and raising tailwater elevation 3 ft with 3-4 rock weirs.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)				
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable	Comments	Recommendations from interpreting model output
S-131	Unnamed Trib #1 to Salmon Creek	Bodega Highway	Salmon Cr	3.0	28.4	**0%**	2.0	8.7	**0%**	1.0	4.1	**0%**	Assumed Q1%=active channel flow in outlet pool. Flow in stream during survey seemed to be at active channel margin, possibly a reservoir upstream contributes to year round flow. Sized >100yr peak flow. ~1,325 yd^3 fill. Questionable if fish bearing.	Retrofit might be best solution due to amount of fill. Raise tailwater elevation 3ft and install baffles.
S-132	Vina Creek	Bodega Highway	Salmon Cr	3.0	27.0	**14%**	2.0	8.3	**0%**	1.0	3.9	**0%**	Assumed Q1%=active channel flow in outlet pool. Moderate amount of fill ~1,800 yd^3. Culvert width vs. active channel width: 6' vs 10.6'. ~100ft to confluence with Salmon Cr.	Interim fix, raise tailwater elevation 4ft and install baffels. Full replacement with 15ft wide structure best long term solution.
S-133	Salmon Creek #1	Bohemian Highway	Salmon Cr	3.0	90.7	**100%**	2.0	27.8	**100%**	1.0	13.2	**89%**	Very high percent passable for all lifestages. Sized <50yr peak flow. Culvet width restricts active channel width.	At current condition culvert seems to be adequate for passage. To improve natrual channel conditions a structure larger than the active channel width should be installed, ideally a bridge with 20-22ft span.
S-134	Unnamed Trib #2 to Salmon Creek	Bohemian Highway	Salmon Cr	3.0	8.3	**0%**	2.0	2.6	**0%**	1.0	1.2	**0%**	Very steep sloped with 2 break in slopes. Outlet directly into Salmon Cr. Small amount of habitat to open <1000ft.	Low priority due to amount of habitat and large amount of fill ~3,200 yd^3. Full repalcement only feasible option due to slope. Replace with structure with 12ft span.
S-135	Salmon Creek #2	Bittner Road	Salmon Cr	3.0	67.5	**0%**	2.0	20.7	**0%**	1.0	9.8	**0%**	Sized <20yr peak flow. Road fill ~2,400 yd^3. Severly perched 5.75 ft. Very sloped 4.7% and 82 ft long. Crossing is a strict barrier to 1.5 miles of habitat. Outlet tailwater control already heavily riprapped.	Full replacement is best option. Recommend replacing with open arch or bridge with 22 ft span.
S-136	Salmon Creek #3	Bittner Road	Salmon Cr	3.0	58.3	**11%**	2.0	17.9	**0%**	1.0	8.5	**0%**	100% barrier. Small weir at outlet provides ~0.1 ft depth not accounted for by fishXing and does not significantly affect passage. Sized >100yr peak flow.	Recommend retrofitting with corner baffels. Leaving the mini outlet weir may also help with low flow passage for juveniles.
S-137	Salmon Creek #4	Marra Road	Salmon Cr	3.0	49.8	**0%**	2.0	15.3	**0%**	1.0	7.3	**0%**	100% barrier. Sized >100yr peak flow.	Recommend retrofiiting by installing corner baffles and raising tailwater elevation 2ft.

Mendocino County within the Russian River Basin - Summary of Fish Passage Analysis for Existing Passage Conditions

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-001	Un-named tributary on Mtn House Rd	Mountain House road	Russian R	3.0	25.6	**34%**	2.0	7.8	**0%**	1.0	3.9	**0%**
M-002	La Franchi Creek	Mountain House road	Russian R	3.0	51.0	**100%**	2.0	15.5	**100%**	1.0	7.7	**100%**
M-003	Un-named tributary to Feliz Cr	Feliz Creek Road	Feliz Cr-Russian R	3.0	32.5	**96%**	2.0	9.9	**0%**	1.0	4.9	**0%**
M-004	Un-named Trib#1 on East Side Rd	East Side Road	Russian R	3.0	39.0	**100%**	2.0	11.9	**100%**	1.0	5.9	**100%**
M-005	Pratt Ranch Creek #1	Pratt Ranch Road	Dooley Cr-Russian R	3.0	59.2	**0%**	2.0	18.0	**0%**	1.0	8.9	**0%**
M-006	Pratt Ranch Creek #2	Pratt Ranch Road	Dooley Cr-Russian R	3.0	18.6	**0%**	2.0	5.6	**0%**	1.0	2.8	**0%**
M-007	McDowell Creek #1	Hooper Ranch Road	Dooley Cr-Russian R	3.0	94.8	**0%**	2.0	28.8	**0%**	1.0	14.3	**0%**
M-008	McDowell Creek #2	HWY 175	Dooley Cr-Russian R	3.0	77.4	**0%**	2.0	23.6	**0%**	1.0	11.6	**0%**
M-009	Un-named trib #2 on East Side Rd	East Side Road	Russian R	3.0	18.0	**87%**	2.0	5.5	**0%**	1.0	2.7	**0%**

Mendocino County within the Russian Rive

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-001	Un-named tributary on Mtn House Rd	Mountain House road	Russian R	Increased culvert rougness to 0.018 n due to worn floor and sediment present. Small amount of habitat to open. Culvert width impinges on active channel width. Steep drop in channel profile upstream of inlet from aggredation. Sized <50 yr flow.	Interim fix- raise tailwater elevation 1 ft with 1-2 rock weirs to backwater pipe. Recommend full replacement with open arch or bridge with 12 ft span.
M-002	La Franchi Creek	Mountain House road	Russian R	Culvert width impinges on active channel width. Mininmal fill ~114 yd^3. Very undersized (5 yr flow). Culvert appears to be filling up with sediment.	Culvert passes fish in current condition, however if culvert is high maintainance due to over topping the road then cosider replacing with a bridge with 20 ft span.
M-003	Un-named tributary to Feliz Cr	Feliz Creek Road	Feliz Cr-Russian R	Rip rap at outlet may provide roughness sufficent for adults to enter pipe, although concreted bottom and slope will pose problem for passage. Culvert highly undersized. Private culvert 40 ft upstream.	Full replacement only feasible option due to limited hydraulic capacity (<5 yr flow). Recommend replacing with embedded pipe arch or open arch with 15 ft span.
M-004	Un-named Trib#1 on East Side Rd	East Side Road	Russian R	Culvert adequately backwatered for passage. Moderate hydraulic capacity ~70 yr flow. Debris accumulating at inlet due to culvert width impinging on active channel width.	If culvert plugs regularly recommend replacing with a structure with 14 ft span.
M-005	Pratt Ranch Creek #1	Pratt Ranch Road	Dooley Cr-Russian R	Highly perched (4.4 ft). Severly undersized <5 yr flow. Poor channel allingment. Culvert rusted through.	Full replacement only feasible option. Low priority due to amount of fill making repalcement cost prohibative. When culvert is replaced install structure with 14 ft span.
M-006	Pratt Ranch Creek #2	Pratt Ranch Road	Dooley Cr-Russian R	Rip rap at outlet may provide roughness sufficent for adults to enter pipe however pipe has steep slope (3.9%). Culvert highly undersized and rusted through.	Full replacement required due limited hydraulic capacity and pipe condition. Miminal fill and small stream make repalcement relatively inexpensive. Recommend embedded pipe arch, open arch or bridge with 10 ft span.
M-007	McDowell Creek #1	Hooper Ranch Road	Dooley Cr-Russian R	Apron and concrete floor make passage extremely difficult. Undersized for storm flows <5 yr flow. Moderate amount of fill ~1,175 yd^3. High velocities through pipe are creating large drop at outlet and large scour pool.	Full replacement is best option. Recommend installing open arch or bridge with 20 ft span.
M-008	McDowell Creek #2	HWY 175	Dooley Cr-Russian R	Very steep slope for concrete floor. Moderate amount of road fill ~1,580 yd^3.	Hydraulic capacity (~41 yr flow) may be possible to retrofit. Raising tailwater elevation 3.5 ft with 4 rock weirs would patially backwater pipe for improved adult passage. Due to hydraulic capacity 100% passage needs full replacement.
M-009	Un-named trib #2 on East Side Rd	East Side Road	Russian R	Perched 2.5 ft. Severly undersized <5yr flow.	Low priority due to quanity and quality of habitat. Full replacement only feasible option with 13-15 ft wide structure.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-010	Romers Dairy Creek	Romers Dairy Rd	Russian R	3.0	12.9	**100%**	2.0	3.9	**100%**	1.0	1.9	**47%**
M-011	Un-named trib to Howell Cr 1of2 (LB)	East Side Road	Howell Cr-Russian R	3.0	23.8	**0%**	2.0	7.2	**0%**	1.0	3.6	**0%**
M-011	Un-named trib to Howell Cr 2of2 (RB)	East Side Road	Howell Cr-Russian R	3.0	23.8	**0%**	2.0	7.2	**0%**	1.0	3.6	**0%**
M-012	Howell Creek 1of2 (LB)	East Side Road	Russian R	3.0	78.0	**51%**	2.0	23.7	**0%**	1.0	11.7	**0%**
M-012	Howell Creek 2of2 (RB)	East Side Road	Russian R	3.0	78.0	**85%**	2.0	23.7	**59%**	1.0	11.7	**54%**
M-013	Un-named trib #1 to Robinson Cr	Robinson Creek Road	Robinson Cr-Russian R	3.0	49.3	**50%**	2.0	15.0	**0%**	1.0	7.4	**0%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
				Assumed Adults and residents could swim through the lack of depth at the outlet. Assumed culvert outlet was dry until culvert becomes completely backwatered. Difficult to determine percent passage since fishXing does not model negative sloped culverts. Inlet elevation was set above the outlet elevation since fishXing can not model negative slopes. Inlet is bacwater to a depth of 1.3 ft therfore depth and velocities are very different then the results display.	
M-010	Romers Dairy Creek	Romers Dairy Rd	Russian R	Adequately sized >100 yr flow.	Low priority due to high percentage of passage. Full repalcement recommended due to small culvert width compared to active channel width. Replacement structure should be 12 ft wide.
M-011	Un-named trib to Howell Cr 1of2 (LB)	East Side Road	Howell Cr-Russian R	Assumed flow split even between two bays. Assumed Q1%=active chanel flow in outlet pool. Perched 3.4 ft. Minimal fill ~225 yd^3. Sized <40yr flow.	Culvert probably can not be retrofitted with baffles due to hydraulic capacity. Full replacement with open arch or bridge with 14 ft width.
M-011	Un-named trib to Howell Cr 2of2 (RB)	East Side Road	Howell Cr-Russian R	Assumed flow split even between two bays. Assumed Q1%=active chanel flow in outlet pool. Perched 3.4 ft. Minimal fill ~225 yd^3. Sized <40yr flow.	Culvert probably can not be retrofitted with baffles due to hydraulic capacity. Full replacement with open arch or bridge with 14 ft width.
M-012	Howell Creek 1of2 (LB)	East Side Road	Russian R	Assumed flow is split evenly between two bays. Tailwater control may not be captured accurately. Adequately sized for storm flows >100yr flow.	Recommend raiseing tailwater elevation 1-1.5 ft with 2 rock weirs and installing baffles to reduce velocities and provide depth. If modification is done then culvert should be monitored to make sure it is not filling with sediment and debris. Full replacement recommended to maintain appropriate hydraulic capacity and provide complete passage.
M-012	Howell Creek 2of2 (RB)	East Side Road	Russian R	Assumed flow is split evenly between two bays. Assumed culvert is backwatered depth at station 0.0 at inlet. Eventhough culvert is adequately sized for storm flows capacity has been reduced from gravels retained within right bay. Culvert is backwatered 0.35 ft deep due to negative slope from embedded right bay which fishXing can not model. Real life velocities are probably lower due to embeddedness.	Recommend focusing on modifications for 1of2 (LB). Culvert should be monitored to make sure it is not filling with sediment and debris. Full replacement recommended to maintain appropriate hydraulic capacity and provide complete passage.
M-013	Un-named trib #1 to Robinson Cr	Robinson Creek Road	Robinson Cr-Russian R	Fairly undersized for storm flows and active channel width. Perched 2.3 ft. Minimal fill ~274 yd^3.	Full replacement would be relatively inexpensive due to limited amount of fill. Recommend replacing with embedded pipe arch, open arch or bridge with 15 ft span.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-014	Un-named trib #2 to Robinson Cr 1of3	Robinson Creek Road	Robinson Cr-Russian R	3.0	61.5	**52%**	2.0	18.7	**0%**	1.0	9.2	**0%**
M-014	Un-named trib #2 to Robinson Cr 2of3	Robinson Creek Road	Robinson Cr-Russian R	3.0	61.5	**0%**	2.0	18.7	**0%**	1.0	9.2	**0%**
M-014	Un-named trib #2 to Robinson Cr 3of3	Robinson Creek Road	Robinson Cr-Russian R	3.0	61.5	**0%**	2.0	18.7	**0%**	1.0	9.2	**0%**
M-015	Robinson Creek	Pine Ridge Road	Russian R	3.0	8.4	**0%**	2.0	2.6	**0%**	1.0	1.3	**0%**
M-016	Cleland Mountain Creek	South State Street	Russian R	3.0	24.9	**100%**	2.0	7.6	**100%**	1.0	3.7	**40%**
M-017	Mill Creek #1	Private Road-Parnum Paving Co.	Russian R	3.7	503.3	**28%**	2.0	153.1	**0%**	1.0	75.7	**0%**
M-018	McClure Creek #1 1of2(LB)	Sanford Ranch Road	Mill Cr-Russian R	3.0	216.7	**98%**	2.0	65.9	**95%**	1.0	32.6	**51%**
M-018	McClure Creek #1 2of2(RB)	Sanford Ranch Road	Mill Cr-Russian R	3.0	216.7	**97%**	2.0	65.9	**95%**	1.0	32.6	**49%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-014	Un-named trib #2 to Robinson Cr 1of3	Robinson Creek Road	Robinson Cr-Russian R	Assumed all flow is in bay 1of3 until flows exceed 50 cfs. Believe that passage is greater since cross section does not capture tailwater control accurately. Sized >100 yr flow.	Recommend installing corner baffels to provide depth, reduce velocities and possibly retain bedload. Culvert should be monitored annually to see that it remains embedded and also if it overtops road from becoming too embedded.
M-014	Un-named trib #2 to Robinson Cr 2of3	Robinson Creek Road	Robinson Cr-Russian R	Assumed all flow is in bay 1of3 until flows exceed 50 cfs. Cross section may not capture tailwater control accurately. Sized >100 yr flow.	Do nothing to this bay, follow recommendations made for bay 1of3.
M-014	Un-named trib #2 to Robinson Cr 3of3	Robinson Creek Road	Robinson Cr-Russian R	This bay is highly embedded.	Do nothing to this bay, follow recommendations made for bay 1of3.
M-015	Robinson Creek	Pine Ridge Road	Russian R	Very far up in system- Questionable if fish bearing stream.	Do nothing due to hydraulic capacity >100yr flow and location within watershed. If fish are ever observed then full replacement is only feasible option.
M-016	Cleland Mountain Creek	South State Street	Russian R	Pipe rusted through and undersized <20yr flow.	Full replacement recommended due to pipe condition and minimal fill (~271yd^3), making it relatively inexpensive. Recommend installing circular pipe (or better) at 0% with at least 9 ft span.
M-017	Mill Creek #1	Private Road-Parnum Paving Co.	Russian R	Downstream channel cleared and flattened by bulldozer from paving company. Long outlet apron. Severely undersized <3 yr flow.	Full replacement only feasible option. High priority due to amount of habitat upstream. Recommend replacing with open arch or bridge with 32 ft width to accommodate 100 yr flow.
M-018	McClure Creek #1 1of2(LB)	Sanford Ranch Road	Mill Cr-Russian R	Assumed flow is split evenly between the two bays. FishXing can not model negative slopes so inlet elevation was set above outlet elevation. Undersized <13 yr flow probably due to amount of sediment retained within culvert. Both bays are embedded 0 ft at inlet and ~2 ft at outlet.	Culvert already passes high percentage. Recommend full replacement with open arch or bridge with 24 ft span to mimic natural channel and for complete passage.
M-018	McClure Creek #1 2of2(RB)	Sanford Ranch Road	Mill Cr-Russian R	Assumed flow is split evenly between the two bays. FishXing can not model negative slopes so inlet elevation was set above outlet elevation. Undersized <13 yr flow probably due to amount of sediment retained within culvert. Both bays are embedded 0 ft at inlet and ~2 ft at outlet.	Culvert already passes high percentage. Recommend full replacement with open arch or bridge with 24 ft span to mimic natural channel and for complete passage.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-019	McClure Creek #2 1of2(LB)	Sanford Ranch Road	Mill Cr-Russian R	3.0	202.9	**0%**	2.0	61.7	**0%**	1.0	30.5	**0%**
M-019	McClure Creek #2 2of2(RB)	Sanford Ranch Road	Mill Cr-Russian R	3.0	202.9	**100%**	2.0	61.7	**100%**	1.0	30.5	**100%**
M-020	Mill Creek #2	HWY 222	Russian R	3.0	287.0	**100%**	2.0	87.3	**100%**	1.0	43.1	**100%**
M-021	North Fork Mill Creek	Guidiville road	Mill Cr-Russian R	3.0	140.1	**100%**	2.0	42.6	**100%**	1.0	21.1	**100%**
M-022	Mill Creek #3	Mill Creek Road	Russian R	3.0	114.2	**84%**	2.0	34.7	**0%**	1.0	17.2	**0%**
M-023	Doolin Creek #1 1of2(LB)	Bobcock Lane	Gibson Cr-Russian R	3.0	107.0	**93%**	2.0	32.6	**0%**	1.0	16.1	**0%**
M-023	Doolin Creek #1 2of2(RB)	Bobcock Lane	Gibson Cr-Russian R	3.0	107.0	**0%**	2.0	32.6	**0%**	1.0	16.1	**0%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-019	McClure Creek #2 1of2(LB)	Sanford Ranch Road	Mill Cr-Russian R	Assumed all flow goes through bay 2of2 since outlet elevation of 1of2 is 2.59 ft higher than outlet elevation 2of2 - FishXing not run and status changed from GRAY to RED.	Low priortiy for fish passage. Bay 2of2 does pass fish, however hydraulic capacity is limited (~15 yr flow), therefore recommend increasing crossings hydraulic capacity by installing a bridge or open arch with a 24 ft width.
M-019	McClure Creek #2 2of2(RB)	Sanford Ranch Road	Mill Cr-Russian R	Undersized ~15yr flow. Assumed all flow goes through bay 2of2 since outlet elevation of 1of2 is 2.59 ft higher than outlet elevation 2of2	Low priortiy for fish passage. Bay 2of2 does pass fish, however hydraulic capacity is limited (~15 yr flow), therefore recommend increasing crossings hydraulic capacity by installing a bridge or open arch with a 24 ft width.
M-020	Mill Creek #2	HWY 222	Russian R	Highly undersized <3 yr flow due to sediment filling in culvert. About 30 ft from confluence with McClure creek and Mill Cr is ~1 ft higher than McClure Cr. Stream may be aggrading due to crossing.	Full replacement only feasible option. Recommend bridge with 34 ft width and lower channel base to create movement of deposition upstream.
M-021	North Fork Mill Creek	Guidiville road	Mill Cr-Russian R	Undersized <10yr flow.	Not high priority since it passes fish currently. Replacement should be open arch or bridge with 20 ft span.
M-022	Mill Creek #3	Mill Creek Road	Russian R	Assumed Q1%=active channel flow in outlet pool. Pool is marginally too shallow for jumping into culvert. Perched 1.7 ft. Sized <30yr flow. Limited anadromy to open due to reservoirs upstream. Total barrier.	Interim fix- raise tailwater elevation 2 ft with 2 rock weirs. Due to limited hydraulic capacity recommend full replacement with open arch or bridge with 18 ft span.
M-023	Doolin Creek #1 1of2(LB)	Bobcock Lane	Gibson Cr-Russian R	Assumed all flow in bay 1of2 since outlet elevation of bay 2of2 is 0.72 ft higher. Assumed Q1%=active channel flow in outlet pool. FishXing can not model negative sloped culverts therefore the inlet elevation was wet above outlet elevation. Poor channel allingment. Lots of habitat to open. Numerous upstream crossings on Doolin cr and Gibson cr.	Full replacement only feasible option due to limited hydraulic capacity (<3 yr flow) and relatively inexpensive from lack of fill ~154 yd^3. Recommend open arch or bridge with 18 ft span and better channel allingment. Necessary replacement to open Doolin cr and Gibson cr habiat.
M-023	Doolin Creek #1 2of2(RB)	Bobcock Lane	Gibson Cr-Russian R	Assumed all flow in bay 1of2 since outlet elevation of bay 2of2 is 0.72 ft higher. Poor channel allingment. Lots of habitat to open. Numerous upstream crossings on Dooin cr and Gibson cr.	Full replacement only feasible option due to limited hydraulic capacity (<3 yr flow) and relatively inexpensive from lack of fill ~154 yd^3. Recommend installing bridge with 20 ft span, at least 7 ft high and better channel allingment.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-024	Doolin Creek #2	Lorraine Street	Gibson Cr-Russian R	3.0	80.0	**96%**	2.0	24.3	**92%**	1.0	12.0	**86%**
M-025	Doolin Creek #3	Betty Street	Gibson Cr-Russian R	3.0	79.4	**91%**	2.0	24.2	**77%**	1.0	11.9	**0%**
M-026	Doolin Creek #4	Cunningham Street	Gibson Cr-Russian R	3.0	77.2	**100%**	2.0	23.5	**100%**	1.0	11.6	**100%**
M-027	Doolin Creek #5	Talmage Road	Gibson Cr-Russian R	3.0	76.9	**92%**	2.0	23.4	**22%**	1.0	11.6	**0%**
M-028	Doolin Creek #6	Wabash Ave	Gibson Cr-Russian R	3.0	60.4	**80%**	2.0	18.4	**46%**	1.0	9.1	**0%**
M-029	Doolin Creek #7	Laurel Ave	Gibson Cr-Russian R	3.0	60.1	**21%**	2.0	18.3	**0%**	1.0	9.0	**0%**
M-030	Gibson Creek #1	Orchard Road	Russian R	3.0	73.7	**39%**	2.0	22.4	**0%**	1.0	11.1	**0%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
				FishXing can not model negative sloped culverts therefore the inlet elevation was wet above outlet elevation. Severly undersized <3yr flow.	Full replacement only feasible option due to limited hydraulic capacity (<3 yr flow). Recommend installing bridge with 18 ft span. Eventhough there is minimal fill, culvert width will have to be expanded by removing some surrounding road. Doolin creek through city should be restored by widening channel and removing paved stream bed.
M-024	Doolin Creek #2	Lorraine Street	Gibson Cr-Russian R		
M-025	Doolin Creek #3	Betty Street	Gibson Cr-Russian R	Severly undersized <3 yr flow. Within city of Ukiah and needs additional restoration for passage.	Full replacement only feasible option due to limited hydraulic capacity (<3 yr flow). Recommend installing a bridge with 16-18 ft span. Eventhough there is minimal fill, culvert width will have to be expanded by removing some surrounding road.
M-026	Doolin Creek #4	Cunningham Street	Gibson Cr-Russian R	Severly undersized <5 yr flow. Within city of Ukiah and needs additional restoration for passage.	Culvert passes fish however is highly undersized. Full replacement only feasible option due to limited hydraulic capacity (<5 yr flow). Recommend installing open arch or bridge with 16-18 ft span. Eventhough there is minimal fill, culvert width will have to be expanded by removing some surrounding road.
M-027	Doolin Creek #5	Talmage Road	Gibson Cr-Russian R	Severly undersized <3 yr flow. Poor channel allingment. Within city of Ukiah with numerous crossings up and downstream.	Full replacement only feasible option due to limited hydraulic capacity (<3 yr flow). Recommend installing a bridge with 16-18 ft span.
M-028	Doolin Creek #6	Wabash Ave	Gibson Cr-Russian R	Highly undersized <6 yr flow.	Full replacement only feasible option due to limited hydraulic capacity (<3 yr flow). Recommend installing a bridge with 16-18 ft span.
M-029	Doolin Creek #7	Laurel Ave	Gibson Cr-Russian R	Strict barrier for all age classes. Highly undersized <5 yr flow.	Full replacement only feasible option due to limited hydraulic capacity. Recommend installing a bridge with 16-18 ft span.
M-030	Gibson Creek #1	Orchard Road	Russian R	Strict barrier for all age classes. 14 upstream culverts recognized plus creek runs through city of Ukiah where it is confined in sections by concrete walls and floor. After city upper part of Gibson is very good habitat. Culvert is hydraulically limited by height, culvert width is greater than active channel width.	Full replacement best option due to limited hydraulic capacity ~16 yr flow. Recommend bridge with at least 18 ft span and 7 ft height.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-031	Gibson Creek #2	Warren Drive	Russian R	3.0	72.0	**68%**	2.0	21.9	**0%**	1.0	10.8	**0%**
M-032	Gibson Creek #3	Leslie Street	Russian R	3.0	70.9	**0%**	2.0	21.6	**0%**	1.0	10.7	**0%**
M-033	Gibson Creek #4	East Perkins Street	Russian R	3.0	68.9	**20%**	2.0	21.0	**0%**	1.0	10.4	**0%**
M-034	Gibson Creek #5	Mason Street	Russian R	3.0	66.9	**91%**	2.0	20.4	**73%**	1.0	10.1	**14%**
M-035	Gibson Creek #6 1of2	North State Street	Russian R	3.0	61.8	**39%**	2.0	18.8	**0%**	1.0	9.3	**0%**
M-035	Gibson Creek #6 2of2	North State Street	Russian R	3.0	61.8	**51%**	2.0	18.8	**0%**	1.0	9.3	**0%**
M-036	Gibson Creek #7 1of2	School Street	Russian R	3.0	60.6	**84%**	2.0	18.4	**57%**	1.0	9.1	**25%**
M-036	Gibson Creek #7 2of2	School Street	Russian R	3.0	60.6	**84%**	2.0	18.4	**57%**	1.0	9.1	**10%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-031	Gibson Creek #2	Warren Drive	Russian R	Assumed Q1%=active channel flow in outlet pool. Channel is confined by conrete walls and stream bed is paved but embedded. Total barrier. Severly undersized <5 yr flow.	Full replacement best option due to limited hydraulic capacity. Replacement should also involve other restoration steps such as widening the channel. Recommend bridge with 16 ft span and 7 ft height.
M-032	Gibson Creek #3	Leslie Street	Russian R	Severly undersized <3 yr flow. Channel is confined by conrete walls.	Full replacement best option due to limited hydraulic capacity. Replacement should also involve other restoration steps such as widening the channel. Recommend bridge with 16 ft span and 7 ft height.
M-033	Gibson Creek #4	East Perkins Street	Russian R	Assumed Q1%=active channel flow in outlet pool. Severly undersized <5 yr flow. Complete barrier due to length of culvert (323 ft) with wide concrete floor. Channel confined through city.	Full replacement best option due to limited hydraulic capacity. Replacement should also involve other restoration steps such as widening the channel. Recommend bridge with 16 ft span and 7 ft height.
M-034	Gibson Creek #5	Mason Street	Russian R	Assumed Q1%=active channel flow in outlet pool. Assumed fish could burst into pipe and would not need to leap. Undersized <20 yr flow.	Culvert is in fair passage condition compared to the rest of Gibson creek. Full replacement is best option due to limited hydraulic capacity. Recommend replacing with bridge with 16 ft span.
M-035	Gibson Creek #6 1of2	North State Street	Russian R	Assumed flow split evenly between 2 bays. Assumed Q1%=active channel flow in outlet pool. Culvert takes 30-45 degree turn half way through.	Full replacement is best option due to limited hydraulic capacity <10 yr flow. Recommend replacing with bridge with 16 ft span.
M-035	Gibson Creek #6 2of2	North State Street	Russian R	Assumed flow split evenly between 2 bays. Assumed Q1%=active channel flow in outlet pool. Roughness increases to 0.018 n due to gravels retained. Culvert takes 30-45 degree turn half way through.	Full replacement is best option due to limited hydraulic capacity <10 yr flow. Recommend replacing with bridge with 16 ft span.
M-036	Gibson Creek #7 1of2	School Street	Russian R	Assumed flow split evenly between 2 bays. Assumed Q1%=active channel flow in outlet pool. Assumed fish could swin into culvert due to outlet condition. FishXing can not model negative sloped culverts therefor the inlet elevation was set above the outlet elevation.	Full replacement is best option due to limited hydraulic capacity <5 yr flow. Recommend replacing with bridge with 16 ft span.
M-036	Gibson Creek #7 2of2	School Street	Russian R	Assumed flow split evenly between 2 bays. Assumed Q1%=active channel flow in outlet pool. Assumed fish could swin into culvert due to outlet condition. FishXing can not model negative sloped culverts therefor the inlet elevation was set above the outlet elevation.	Full replacement is best option due to limited hydraulic capacity <5 yr flow and minimal fill making repalcement relativeley inexpensive. Recommend replacing with bridge with 16 ft span.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-037	Gibson Creek #8 1of2	Oak Street	Russian R	3.0	59.8	**87%**	2.0	18.2	**29%**	1.0	9.0	**0%**
M-037	Gibson Creek #8 2of2	Oak Street	Russian R	3.0	59.8	**0%**	2.0	18.2	**0%**	1.0	9.0	**0%**
M-038	Gibson Creek #9	Pine Street	Russian R	3.0	59.5	**100%**	2.0	18.1	**100%**	1.0	8.9	**100%**
M-039	Gibson Creek #10	Bush Street	Russian R	3.0	59.2	**67%**	2.0	18.0	**1%**	1.0	8.9	**0%**
M-040	Gibson Creek #11	North Dora Street	Russian R	3.0	59.2	**59%**	2.0	18.0	**0%**	1.0	8.9	**0%**
M-041	Gibson Creek #12	Spring Street	Russian R	3.0	58.4	**39%**	2.0	17.8	**0%**	1.0	8.8	**0%**
M-042	Gibson Creek #13	Barnes Street	Russian R	3.0	58.1	**90%**	2.0	17.7	**38%**	1.0	8.7	**0%**
M-043	Gibson Creek #14	Standley Street	Russian R	3.0	48.1	**31%**	2.0	14.6	**0%**	1.0	7.2	**0%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-037	Gibson Creek #8 1of2	Oak Street	Russian R	Assumed all flow is in bay 1of2 since the inlet elevation of bay 2of2 is 1.18 ft higher than bay 1of2. Assumed Q1%=active channel flow in outlet pool. FishXing can not model negative sloped culverts therefor the outlet elevation was set below the inlet elevation.	Full replacement is best option due to limited hydraulic capacity <5 yr flow and minimal fill making repalcement relativeley inexpensive. Recommend replacing with bridge with 16 ft span.
M-037	Gibson Creek #8 2of2	Oak Street	Russian R	GRAY output from filter changed to RED since inlet elevation is 1.18 ft higher than the inlet of bay 1of2, thus bay 2of2 is assumed to not receive any water until flows exceed 35 cfs.	Full replacement is best option due to limited hydraulic capacity <5 yr flow and minimal fill making repalcement relativeley inexpensive. Recommend replacing with bridge with 16 ft span.
M-038	Gibson Creek #9	Pine Street	Russian R	Highly undersized ~5 yr flow. Channel confined through city of Ukiah.	Do nothing for fish passage. Increase hydraulic capacity with a bridge or open arch with 16 ft span and at least 6 ft height.
M-039	Gibson Creek #10	Bush Street	Russian R	Highly undersized ~5 yr flow.	Interim fix- install corner baffles. Recommend full replacement with open arch or bridge with 15 ft width.
M-040	Gibson Creek #11	North Dora Street	Russian R	Assumed Q1%=active channel flow in outlet pool. Highly undersized ~5 yr flow.	Interim fix- raise tailwater elevation 2 ft with 1 rock weir. Recommend full replacement with open arch or bridge with 15 ft width.
M-041	Gibson Creek #12	Spring Street	Russian R	Moderately sized ~36 yr flow. Weirs are not notched which retain excessive sediment and create 2.5 ft jump at outlet. Very poor inlet allingment probably due to sediment aggrading from weirs.	Interim fix- Cut notch into log weirs 0.8 ft deep and notch, or remove, concrete weir 1.2 ft to allow fish passage and move sediment retained at inlet through pipe. Also raise tailwater elevation 1.5 ft with 1 rock weir. Full replacement with open arch or bridge with 15 ft span is best long term solution.
M-042	Gibson Creek #13	Barnes Street	Russian R	Undersized <10yr flow. Upper end of passage slope (2.01%).	Interim fix raise tailwater elevation 1.5 ft with 1 rock weir to provide depth and reduce velocities. Full replacement with open arch or bridge with 16 ft span is best long term solution.
M-043	Gibson Creek #14	Standley Street	Russian R	Assumed Q1%=active channel flow in outlet pool. 100% barrier. Undersized <20 yr flow. Steep drop in channel profile above inlet (6.8%). Far up in Gibson creek system with little habitat to open.	Interim fix- install corner baffles and raise tailwater elevation 2 ft with 2-3 rock weirs. Recommend full replacement with open arch or bridge with 16 ft width.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-044	Orrs Creek 1of3	Oak Street	Russian R	3.0	246.0	**100%**	2.0	74.8	**100%**	1.0	37.0	**51%**
M-044	Orrs Creek 2of3	Oak Street	Russian R	3.0	246.0	**90%**	2.0	74.8	**74%**	1.0	37.0	**61%**
M-044	Orrs Creek 3of3	Oak Street	Russian R	3.0	246.0	**100%**	2.0	74.8	**100%**	1.0	37.0	**51%**
M-045	Un-named Trib#1 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	3.0	7.4	**45%**	2.0	2.2	**0%**	1.0	1.1	**0%**
M-046	Un-named Trib#2 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	3.0	20.4	**89%**	2.0	6.2	**0%**	1.0	3.1	**0%**
M-047	Un-named Trib#3 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	3.0	23.8	**10%**	2.0	7.2	**0%**	1.0	3.6	**0%**
M-048	Sulphur Creek #1	Vichy Springs Road	Russian R	3.0	194.7	**92%**	2.0	59.2	**0%**	1.0	29.3	**0%**
M-049	Sulphur Creek #2	Vichy Springs Road	Russian R	3.0	167.7	**0%**	2.0	51.0	**0%**	1.0	25.2	**0%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-044	Orrs Creek 1of3	Oak Street	Russian R	Assumed Q1%=active channel flow in outlet pool. Assumed flow split evenly between 3 pipes. Assumed depth is 0.84 ft at 3 cfs due to backwatered condition and thalweg present in pipe. FishXing can not model negative slopes therefor inlet elevation was set above outlet elevation. Assumed fish could swim into pipe and leaping would not be necessary.	Low priority due to high percentage of passage and adequate hydraulic capacity (>100 yr flow). Only suggestion would be to increase crossings width with a bridge 30 ft wide.
M-044	Orrs Creek 2of3	Oak Street	Russian R	Assumed Q1%=active channel flow in outlet pool. Assumed flow split evenly between 3 pipes. Channel cross section through pipe has a thalweg 0.62 ft deep and thus assumed inlet depths below thalweg depth were constant through pipe.	Low priority due to high percentage of passage and adequate hydraulic capacity (>100 yr flow). Only suggestion would be to increase crossings width with a bridge 30 ft wide.
M-044	Orrs Creek 3of3	Oak Street	Russian R	Assumed Q1%=active channel flow in outlet pool. Assumed flow split evenly between 3 pipes. Assumed depth is 1.02 ft at 3 cfs due to backwatered condition. FishXing can not model negative slopes therefor inlet elevation was set above outlet elevation. Assumed fish could swim into pipe and leaping would not be necessary.	Low priority due to high percentage of passage and adequate hydraulic capacity (>100 yr flow). Only suggestion would be to increase crossings width with a bridge 30 ft wide.
M-045	Un-named Trib#1 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	Small amount of habitat to open. Pipe is rusted through and undersized (<20 yr flow) and impinges on active channel width.	Full replacement best option due to pipe size and condition.
M-046	Un-named Trib#2 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	Very close proximity to Orrs Creek, outlet pool is in Orrs Creek. Pipe rusted through, highly perched (4 ft) and undersized <10yr flow.	Recommend full replacement with open arch or bridge with 15 ft span.
M-047	Un-named Trib#3 to Orrs Creek	Pine Ridge Road	Orrs Cr-Russian R	Perched 0.2 ft. Sized >100 yr flow and wide enough for active channel movement.	Recommend raiseing tailwater elevation 1.5 ft with 2 rock weirs and install corner baffles to reduce velocities and provide depth.
M-048	Sulphur Creek #1	Vichy Springs Road	Russian R	Assumed Q1%=active channel flow in outlet pool. Increased roughness to 0.03 n due to partial embeddedness of pipe. Natural barrier upstream before Sulphur Creek #2. Roughness at outlet from riprap should be adequate for adults to swim through.	Interim fix- Increase jump pool by raising tailwater elevation 1.5 ft with 2 rock weirs. Full replacement recommended due to limited hydraulic capacity (~13 yr flow) with 21 ft wide open arch or bridge.
M-049	Sulphur Creek #2	Vichy Springs Road	Russian R	Assumed Q1%=active channel flow in outlet pool. Shallow pool is limiting factor. Natural barrier downstream. Undersized <7 yr flow.	Low priority due to natural barrier downstream. Interim fix- raise tailwater elevation 1.5-2 ft with 3 rock weirs. Recommend full replacement due to minimal fill and limited hydraulic capacity.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-050	Un-named trib on Redemeyer Rd.	Redemeyer Road	Russian R	3.0	58.4	**0%**	2.0	17.8	**0%**	1.0	8.8	**0%**
M-051	Howard Creek	Redemeyer Road	Russian R	3.0	73.2	**0%**	2.0	22.3	**0%**	1.0	11.0	**0%**
M-052	Calpella Creek	North State Street	Russian R	3.0	21.0	**0%**	2.0	6.4	**0%**	1.0	3.2	**0%**
M-053	Bakers Creek 2 pipes	Northwestern Pacific RR	Forsythe Cr-Russian R	3.0	43.3	**1%**	2.0	13.2	**0%**	1.0	6.5	**0%**
M-054	Forsytyhe Creek 1of4	Black Bart Road	Russian R	3.0	22.8	**41%**	2.0	6.9	**0%**	1.0	3.4	**0%**
M-054	Forsytyhe Creek 2of4	Black Bart Road	Russian R	3.0	22.8	**41%**	2.0	6.9	**0%**	1.0	3.4	**0%**
M-054	Forsytyhe Creek 3of4	Black Bart Road	Russian R	3.0	22.8	**41%**	2.0	6.9	**0%**	1.0	3.4	**0%**
M-054	Forsytyhe Creek 4of4	Black Bart Road	Russian R	3.0	22.8	**91%**	2.0	6.9	**0%**	1.0	3.4	**0%**
M-055	North Fork Salt Hollow Creek	Road B	Salt Hollow Cr-Russian R	3.0	20.7	**97%**	2.0	6.3	**86%**	1.0	3.1	**0%**
M-056	Salt Hollow Creek#1	Road B	Russian R	3.0	75.2	**8%**	2.0	22.9	**0%**	1.0	11.3	**0%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-050	Un-named trib on Redemeyer Rd.	Redemeyer Road	Russian R	Severly perched (7.35 ft). Enormous amount of habitat to open >29,000 ft. Definite grade control issue if full replacement is persued.	Minimal fill (~237 yd^3) makes full replacement relatively inexpensive. Recommend full replacement with bridge or open arch with 16 ft span.
M-051	Howard Creek	Redemeyer Road	Russian R	Extremely perched (6.4 ft) over 17 ft of rip rap. Rip rap may provide enough roughness for adults to swim into culvert.	Full replacement may be best option due to fairly low amount of fill (~530 yd^3). Recommend installing open arch or bridge with 20 ft span.
M-052	Calpella Creek	North State Street	Russian R	Steep slope for concrete box (3.2%). Moderate hydraulic capacity ~73 yr flow. Scour at inlet and sediment aggrading at outlet.	Interim fix- raise tailwater elevation 2 ft with 1 rock weir to backwater pipe. Recommend full replacement to allow bedload transport and fish passge. Replacement structure should have at least 10 ft span.
M-053	Bakers Creek 2 pipes	Northwestern Pacific RR	Forsythe Cr-Russian R	Higly undersized <3 yr flow. Enormous amount of fill >31,000 yd^3. Pipes are rusted through. Current condition of pipes seem prone to failure. Left bay pipe is partially filled with sediment.	Full replacement is only feasible option however enormous amount of fill makes replacement cost prohibative. Recommend design where fill remains in place for installation of a 20 ft wide structure.
M-054	Forsytyhe Creek 1of4	Black Bart Road	Russian R	Undersized <15 yr flow.	Recommend full replacement with structure with a span of 15 ft.
M-054	Forsytyhe Creek 2of4	Black Bart Road	Russian R	Undersized <15 yr flow.	Recommend full replacement with structure with a span of 15 ft.
M-054	Forsytyhe Creek 3of4	Black Bart Road	Russian R	Undersized <15 yr flow.	Recommend full replacement with structure with a span of 15 ft.
M-054	Forsytyhe Creek 4of4	Black Bart Road	Russian R	Assumed Q1%=active channel flow in outlet pool. Assumed pipe 1of4 received flow above 2 cfs and pipes 2of4 and 3of4 received flow above 3.5 cfs. Fairly difficult to model due to different inlet elevations of 3 other pipes and different flows at which they become wetted. Pipe rusted through.	Recommend full replacement with structure with a span of 15 ft.
M-055	North Fork Salt Hollow Creek	Road B	Salt Hollow Cr-Russian R	Assumed Q1%=active channel flow in outlet pool. Highly undersized <5yr flow. Minimal fill ~99 yd^3. Reservoir upstream might further limit amount of habitat.	Interim fix- raise tailwater elevation 0.6 ft with 1 rock weir. Minimal fill makes full replacement relatively inexpensive. Recommend installing embedded circular or pipe arch with 10 ft span.
M-056	Salt Hollow Creek#1	Road B	Russian R	Perched 3.48 ft. Culvert width impinges on active channel width. Culvert outlet undercut.	Hydraulic capacity, >100 yr flow, makes it possible to retrofit. Would need to rasie tailwater elevation 3.5 ft with 3 rock weirs and install corner baffles or corner baffles within culvert. Full replacement should be an open arch or bridge with 15 ft span.

Culvert Location Information				Adult Salmon & Steelhead Fish Passage Criteria Flows (cfs)			Resident Trout Fish Passage Criteria Flows (cfs)			Juvenile Salmonids - Young of the Year Fish Passage Criteria Flows (cfs)		
ID#	Stream Name	Road Name	Drainage	Lower Q50% or 3 cfs	Upper Q1%	%Passable	Lower Q90% or 2 cfs	Upper Q5%	%Passable	Lower Q95% or 1 cfs	Upper Q10%	%Passable
M-057	Salt Hollow Creek#2	Road B	Russian R	3.0	73.2	**85%**	2.0	22.3	**0%**	1.0	11.0	**0%**
M-058	Marisposa Creek	Tomki Road	Russian R	3.0	93.4	**0%**	2.0	28.4	**0%**	1.0	14.0	**0%**

Culvert Location Information					
ID#	Stream Name	Road Name	Drainage	Comments	Recommendations from interpreting model output
M-057	Salt Hollow Creek#2	Road B	Russian R	Assumed Q1%=active channel flow in outlet pool. Sediment aggrading at inlet. Steep drop in channel profile at inlet. Increased roughness to 0.018 n due to poor condition of floor. Large outlet pool. Undersized <20 yr flow.	Interim fix- raise tailwater elevation 1 ft with 1 rock weir and install baffles. Recommend full replacement due to limited hydraulic capacity and conditions at inlet.
M-058	Marisposa Creek	Tomki Road	Russian R	Very large outlet pool. Perched 3.85 ft, sloped 2.89 %. Large amount of fill ~2,685 yd^3. Inlet is being undercut.	Size of outlet pool makes it difficult to raise tailwater elevation effectively. Full replacement is best option. Recommend replacing with a bridge with 16 ft span.

RANKING MATRIX FOR RUSSIAN RIVER CULVERTS IN SONOMA COUNTY AND COASTAL SONOMA CULVERTS																		
INITIAL RANK	**Site ID#**	**Stream Name**	**Road Name**	**Presumed Species Diversity**	**Species Diversity Score**	**Extent of Barrier Score**	**Current Sizing Score**	**Current Condition Score**	**Culvert Score (ave of sizing and condition)**	**Length of Upstream Habitat (ft) (by Coey)**	**Length of Upstream Habitat (ft) (by Taylor Assoc.)**	**Length of Habitat used for Scoring**	**Habitat Length Score**	**Habitat Quality Modifier**	**Basis of Habitat quality Modifier (+ = Coey p.j. # = Taylor p.j.)**	**Total Habitat Score**	**TOTAL SCORE**	**COMMENTS FOR COEY AND CDFG - mostly about habitat lengths and quality scores.**
#1	S-080	Porter Creek #1 (Russian R)- 2 circular pipes	Sweetwater Springs Road	Steelhead	2	14	5	5	5.0	11,800	9,300	11,800	10.0	0.63	Habitat Survey	6.32	27.3	Use CDFG habitat length. Good replacement project (undersized and in poor condition). Slightly perched, both pipes steep = 3.3% and 7.9%.
#2	S-008	Dutch Bill Creek#2	Footbridge over Dam	Coho, Steelhead	4	15	3	0	1.5	15,500	17,750	17,750	10.0	0.57	Habitat Survey	5.68	26.2	Still "RED" because of excessive drop over lowermost weir.
#3	S-101	Dutcher Creek #4	Dutcher Creek Road	Steelhead	2	15	3	1	2.0	900 (19,500)	29,750	19,500	10.0	0.62	Habitat Survey	6.20	25.2	Use CDFG values for habitat length. Perched outlet (5ft) with lots of riprap at toe of outlet is major migration impediment.
#4	S-009	Lancel Creek	Occidental Camp Meeker Road	Coho, Steelhead	4	14	2	1	1.5	9,900	12,250	12,250	10.0	0.53	Habitat Survey	5.35	24.8	Use Taylor and Assoc habitat length.CDFG length of anadromy appears to include the North Fork only up to the next xing (a bridge).
#5	S-007	Dutch Bill Creek#1	Market Street	Coho, Steelhead	4	15	0	0	0.0	200 (15,700)	17,950	17,950	10.0	0.57	Habitat Survey	5.70	24.7	NOTE: habitat quality of 0.39 for this site is just a 200' reach - doesn't seem prudent to use this in the ranking matrix - recommend using 0.57.
#6	S-010	Mission Creek #1 - 2 culverts	Camino Del Arroyo	Coho(historic), Steelhead	3	13	5	1	3.0	700 (9150)	7,050	9,150	9.2	0.60	+	5.49	24.5	Does the CDFG length-of-habitat estimate include the two right bank tribs? They seem to be small drainages.
#7	S-103	Dutcher Creek #6	Dutcher Creek Road	Steelhead	2	14	0	1	0.5	10,350	19,300	10,350	10.0	0.75	Habitat Survey	7.54	24.0	Use CDFG values for habitat length.
#8	S-011	Mission Creek #2	Old Cazadero Road	Coho(historic), Steelhead	3	15	0	1	0.5	8,450	6,350	8,450	8.5	0.60	Habitat Survey	5.10	23.6	Does the CDFG length-of-habitat estimate include the two right bank tribs? They seem to be small drainages.
#9	S-069	Linda Creek #1 (Palmer Creek?)	Mark West Springs Road	Steelhead	2	15	0	1	0.5	9,350 (13,050)	19,500	13,050	10.0	0.50	#	5.00	22.5	Use lesser habitat length. Habitat quality changed to fair. Severely perched outlet. On USGS there appears to be many potential private xings.
#10	S-099	Dutcher Creek #2	Dutcher Creek Road	Steelhead	2	15	0	1	0.5	250 (32,150)	42,850	32,150	10.0	0.49	Habitat Survey	4.91	22.4	Use CDFG values for habitat length. Extremely perched outlet and concrete apron.
#11	S-100	Dutcher Creek #3 - 3 pipes	Private Driveway	Steelhead	2	10	5	1	3.0	12,400 (31,900)	42,600	31,900	10.0	0.68	Habitat Survey	6.84	21.8	Use CDFG values for habitat length. Have two outlet pics - good contrast between dry channel and with winter flow.
#12	S-079	Press Creek	Sweetwater Springs Road	Steelhead	2	13	0	0	0.0	9,800	11,450	9,800	9.8	0.69	Habitat Survey	6.72	21.7	Use CDFG habitat length estimate. Good-quality habitat. Site would be a good retrofit project. Inlet plugged with LWD - impediment too.
#13	S-031	Pool Creek	Chalk Hill Road	Steelhead	2	15	3	1	2.0	11,550	11,600	11,600	10.0	0.25	+	2.50	21.5	Habitat score seems too low. On other assessments - 0.25 score given to "train-wreck" tribs or ones too small and/or steep. Outlet perched 4.1ft.
#14	S-089	Grape Creek #1	West Dry Creek Road	Steelhead	2	13	0	1	0.5	5,050 (15,950)	19,450	15,950	10.0	0.59	Habitat Survey	5.93	21.4	Use CDFG habitat length estimate. Slightly perched outlet and lack-of-depth, probably provides some passage. Needs further modification.
#15	S-029	Harrison Grade Creek #1	Green Valley Road	Coho, Steelhead	4	15	1	1	1.0	1,300 (4,750)	5,300	5,300	5.3	0.25	+	1.33	21.3	Hab qual score too low? In pic looks better than "poor". DFG sampled coho in 1995.Local has seen adult steelhead during the winter. Outlet perched 7ft.
Tie #16	S-082	Turtle Creek	West Side Road	Coho, Steelhead	4	13	0	0	0.0	10,200	9,800	10,200	10.0	0.41	Habitat Survey	4.13	21.1	Use CDFG habitat length estimate. Culvert has lack-of-depth, probably allows partial/temporal passage.
Tie #16	S-003	Pole Mountain Creek - 2 pipes	Fort Ross Road	Steelhead	2	12	2	3	2.5	8,300	7,900	8,300	7.9	0.58	Habitat Survey	4.59	21.1	There is a 10% sloped channel reach below the culvert - do fish get past this steep reach of channel?
Tie #16	S-026	Purrington Creek #1	Graton Road	Coho(historic), Steelhead	3	15	0	1	0.5	1,000 (4,700)	4,750	4,700	4.7	0.55	Habitat Survey	2.59	21.1	Use CDFG habitat length estimate. 11,000' downstream there is a splashboard dam approx. 5' high.
Tie #17	S-104	Schoolhouse Creek	Dry Creek Road	Steelhead	2	15	5	1	3.0	700	1,750	1,750	1.8	0.46	Habitat Survey	0.80	20.8	Use greater value for habitat length. Inlet ovetops on ~ 3yr flow.
Tie #17	S-107	Unnamed Tributary to Barnes Creek - 3 pipes	Private Driveway-Lawton Shurtleff	Steelhead	2	15	5	1	3.0	8,450	3,100	3,100	3.1	0.25	#	0.78	20.8	Lesser habitat length goes to base of upstream dam/reservoir. Habitat value score based on culvert survey crew's field notes.
#18	S-062	Blucher Creek #1 - 2 bays	Bloomfield Road	Steelhead	2	15	0	1	0.5	4,250 (6,450)	6,300	6,300	6.3	0.50	+	3.15	20.7	Use lesser estimate of habitat length. Downstream habitat = 3.6 miles to confluence with Laguna de Santa Rosa. 3.8ft drop - cascade over riprap.
#19	S-083	Wallace Creek	Mill Creek Road	Steelhead	2	13	1	1	1.0	26,050	25,400	26,050	10.0	0.46	Habitat Survey	4.58	20.6	Use CDFG habitat length estimate. Steeply sloped outlet apron = 52% over four feet. Would be a good site for retrofit project.
Tie #20	S-028	Green Valley Creek	Green Valley Road	Coho,Steelhead	4	11	2	0	1.0	14,300	11,550	11,550	10.0	0.45	Habitat Survey	4.54	20.5	Where did CDFG survey consider the end of anadromy? Tom and Anabel looked at upper Co. xing and said "not fish-bearing channel".
Tie #20	S-002	Kohute Gulch	Austin Creek Road	Steelhead	2	14	5	1	3.0	1,800	3,000	3,000	3.0	0.50	+	1.50	20.5	Use CDFG habitat length estimate.
Tie #21	S-043	Pauline Creek #9	Chanate Road	Steelhead	2	13	5	0	2.5	2,200 (10,300)	10,350	10,300	10.0	0.25	#	2.50	20.0	Use CDFG habitat lengths. Sized for less than a 5-yr storm flow.
Tie #21	S-097	Canyon Creek	Dry Creek Road	Steelhead	2	15	0	1	0.5	28,000	28,000	28,000	10.0	0.25		2.50	20.0	A local told survey crew there is a migration barrier prior to the Canyon Road xing. Severely perched outlet.
Tie #21	S-067	Crane Creek #3	Pressley Road	Steelhead	2	15	4	1	2.5	1650 (?)	1,150	1,150	1.2	0.40	+	0.46	20.0	CDFG length of anadromy seems too long. Severely perched outlet (5ft) w/concrete/rock apron. Hardened ford located 30ft u.s.
#22	S-072	Porter Ck (trib to Mark West) #2 - 2 bays	Calistoga Road	Steelhead	2	13	0	1	0.5	15,350	18,450	15,350	10.0	0.44	Habitat Survey	4.42	19.9	Culvert is severely perched and has a fish ladder installed in LB bay -not able to model w/FishXing - effectiveness not known - assumed partial adult passage.
Tie #23	S-092	Wine Creek #3	Koch Road	Coho, Steelhead	4	10	5	5	5.0	1,350	1,750	1,350	1.4	0.52	Habitat Survey	0.71	19.7	Although there is limited upstream habitat - this culvert is overdue for a replacement. Coho recently observed in creek.
Tie #23	S-014	Sweetwater Creek	Sweetwater Springs Road	Steelhead	2	15	0	0	0.0	5,350	5,300	5,350	5.4	0.50	+	2.68	19.7	
Tie #23	S-124	Anna Belcher Creek	Pine Flat Road	Steelhead	2	15	0	1	0.5	850	4,350	4,350	4.4	0.50	#	2.18	19.7	Not sure why CDFG length habitat was estimated at 850'. Lack-of-depth in box culvet and 3.5% slope, but probably allows some passage.
Tie #23	S-123	Un-named Tributary to Big Sulphur Creek	Geysers Road	Steelhead	2	15	4	1	2.5	650	650	650	0.7	0.25	#	0.16	19.7	Habitat quality of 0.25 based on culvert survey crew's field notes. Creek may not support salmonids.
Tie #24	S-013	Redwood Creek	Armstrong Woods Road	Steelhead	2	15	0	0	0.0	11,200 (16,550)	18,350	16,550	10.0	0.25	+	2.50	19.5	Perched concrete box culvert with a 0.4% slope.
Tie #24	S-115	Barrelli Creek	Dutcher Creek Road	Steelhead	2	15	0	0	0.0	13,200	12,900	13,200	10.0	0.25	+	2.50	19.5	Use CDFG values for habitat length. Box culvert has 2.2% slope over 111ft and lack-of-depth, may allow some passage for adults.
Tie #24	S-033	Windsor Creek #2	Brooks Road	Steelhead	2	15	0	0	0.0	6,800 (34,800)	32,500	32,500	10.0	0.25	+	2.50	19.5	Outlet drop over riprap actually appears passable for at least adult steelhead. Raising tailwater with weirs would improve conditions.
#25	S-059	Rincon Cr aka Brush Cr #4 - 2 bays	Amber Lane	Steelhead	2	14	0	1	0.5	5050 (11,700)	13,000	11,700	10.0	0.25	+	2.50	19.0	

INITIAL RANK	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Species Diversity Score	Extent of Barrier Score	Current Sizing Score	Current Condition Score	Culvert Score (ave of sizing and condition)	Length of Upstream Habitat (ft) (by Coey)	Length of Upstream Habitat (ft) (by Taylor Assoc.)	Length of Habitat used for Scoring	Habitat Length Score	Habitat Quality Modifier	Basis of Habitat quality Modifier (+ = Coey p.j. # = Taylor p.j.)	Total Habitat Score	TOTAL SCORE	COMMENTS FOR COEY AND CDFG - mostly about habitat lengths and quality scores.
#26	S-095	Un-named Tributary #2 to Dry Creek	Dry Creek Road	Steelhead	2	14	4	0	2.0	2,900	3,400	3,400	3.4	0.25	#	0.85	18.9	Use greater value for length of upstream habitat. Habitat quality rating of "poor" = 0.25 based on steepness and small size of channel.
#27	S-125	Hurley Creek	Pine Flat Road	Steelhead	2	15	0	1	0.5	5,200	6,300	5,200	5.2	0.25	#	1.30	18.8	Use lesser length value. Hab quality of 0.25 based on survey crew's notes. Site is very high in Little Sulphur Ck. Small window of passage flows.
Tie #28	S-098	Dutcher Creek #1	Dry Creek Road	Steelhead	2	11	0	1	0.5	550 (32,700)	43,350	32,700	10.0	0.52	Habitat Survey	5.23	18.7	Use CDFG values for habitat length.
Tie #28	S-071	Porter Ck (trib to Mark West) #1 - 2 bays.	Porter Creek Road	Steelhead	2	11	0	0	0.0	7,900 (23,250)	26,150	23,250	10.0	0.57	Habitat Survey	5.70	18.7	Use lesser habitat length value. Culvert is slightly perched and has lack-of-depth - probably allows some passage.
Tie #28	S-118	Un-named Tributary #2 on River Road	River Road	Steelhead	2	15	3	0	1.5	800	850	800	0.8	0.25	#	0.20	18.7	Use CDFG values for habitat length. Box culvert has 3.9% slope and lack-of-depth, probably allows temporal passage for some adults.
Tie #29	S-093	Grape Creek #2	Wine Creek Road	Steelhead	2	13	0	0	0.0	6,200	7,250	6,200	6.2	0.59	Habitat Survey	3.65	18.6	Lack-of-depth, probably provides better window of passage than estimated by FishXing.
Tie #29	S-078	Un-named trib to Mark West Ck #2	St.Helena Road	Steelhead	2	14	4	1	2.5	600	550	550	0.6	0.25	#	0.14	18.6	Might not be a fish-bearing stream reach - due to extremely steep channel gradient. For quality rating of "poor" see above for rationale.
Tie #29	S-077	Un-named trib to Mark West Ck #1	St.Helena Road	Steelhead	2	15	0	3	1.5	450	550	550	0.6	0.25	#	0.14	18.6	Habitat quality rating of "poor" based on a limited length of steep channel available for steelhead spawning and rearing. Above anadromy.
#30	S-068	Copeland Creek - 3 bays	Snyder Lane	Steelhead	2	14	0	0	0.0	25,100	22,200	22,200	10.0	0.25	+	2.50	18.5	Use lesser habitat length value - one upper trib is not fish-bearing. Lack-of-depth, xing probably allows for passage of most fish (all life stages).
Tie #31	S-070	Linda Creek #2	Riebli Road	Steelhead	2	15	0	1	0.5	3,700	5,950	3,700	3.7	0.25	#	0.93	18.4	Slightly perched outlet, probably lack-of-depth - allows some adult passage. Survey noted probable private barrier 100' upstream.
Tie #31	S-102	Dutcher Creek #5	Dutcher Creek Road	Steelhead	2	8	2	1	1.5	8250 (18,600)	28,800	18,600	10.0	0.69	Habitat Survey	6.86	18.4	Use CDFG values for habitat length. Survey crew took photo of a dam 30' upstream of Dutcher #5 that is a migration barrier.
Tie #32	S-120	North Branch of Porterfield Creek	Cherry Creek Road	Steelhead	2	12	4	3	3.5	3,150	3,100	3,100	3.1	0.25	#	0.78	18.3	Use lesser value for length of habitat estimate. Habitat quality of 0.25 based on culvert survey crew's field notes. Perched outlet and d.s. weir.
Tie #32	S-113	Indian Creek	Hwy 128	Steelhead	2	15	0	1	0.5	3,050	3,800	3,050	3.1	0.25	#	0.76	18.3	Cattle exclusion gate (board) hanging at perched outlet. Culvert crew described d.s.habitat as poor - channelized. Lower hab score to 0.25?
Tie #32	S-060	Unnamed Trib to Rincon Cr aka Brush Cr	Wallace Road	Steelhead	2	15	0	1	0.5	2,500	3,050	3,050	3.1	0.25	+	0.76	18.3	Probable barrier due primarily to 3ft perched outlet and 3% sloppe but also probable lack-of-depth and velocity too for juveniles.
#33	S-085	Boyd Creek (a)	Mill Creek Road	Steelhead	2	15	0	1	0.5	1,100	1,100	1,100	1.1	0.50	+	0.55	18.1	Extremely perched outlet that is a 100% barrier. From steep channel slope off of USGS map - recommend a lower quality score (.25).
Tie #34	S-119	Porterfield Creek	South Cloverdale Blvd	Steelhead	2	11	0	1	0.5	9,050	9,350	9,050	9.1	0.50	#	4.53	18.0	Use lesser value for length of habitat estimate. Habitat quality of 0.5 based on culvert survey crew's field notes.
Tie #34	S-021	Jonive Creek #3	Furlong Road	Steelhead	2	11	0	0	0.0	3,300 (14,750)	15,250	14,750	10.0	0.50	+	5.00	18.0	
Tie #34	S-030	Harrison Grade Creek #2	Harrison Grade Road	Coho, Steelhead	4	10	3	3	3.0	3,450	3,900	3,900	3.9	0.25	+	0.98	18.0	The habitat quality score is very low - in photos looks better than "poor". We talked to local that has seen adult steelhead during the winter.
#35	S-025	Jonive Creek #5	Wagnon Road	Steelhead	2	13	0	0	0.0	5,750	5,600	5,750	5.8	0.50	+	2.88	17.9	Use CDFG habitat length estimate.
#36	S-096	Un-named Tributary #3 to Dry Creek	Dry Creek Road	Steelhead	2	15	0	0	0.0	2,950	3,250	3,250	3.3	0.25	#	0.81	17.8	Use greater value for length of upstream habitat. Habitat quality rating of "poor" = 0.25 based on field assessment by culvert crew.
#37	S-081	Porter Creek #2 (Russian R) - 2 oval pipes	Hendren Driveway	Steelhead	2	11	5	3	4.0	1,050	1,100	1,050	1.1	0.58	Habitat Survey	0.61	17.6	Use CDFG habitat length. Undersized and in poor condition, but has limited upstream habitat.
Tie #38	S-073	Mark West Creek - 2 bays	Roehmer Road	Steelhead	2	9	0	0	0.0	53,600	73,850	53,600	10.0	0.65	Habitat Survey	6.54	17.5	Probably allows for some passage of adult steelhead.
Tie #38	S-076	Van Buren Creek	St.Helena Road	Steelhead	2	12	4	1	2.5	13,250	2,800	2,800	2.8	0.35	Habitat Survey	0.97	17.5	CDFG habitat length seems way too generous. Off of USGS map there is a 13% slope less than 3000' upstream of St. Helena Road.
#39	S-116	Un-named Tributary #1 on River Road	River Road	Steelhead	2	12	5	1	3.0	1,450	2,200	1,450	1.5	0.25	#	0.36	17.4	Use lesser value for hab length estimate. Habitat quality of 0.25 based on culvert survey crew's notes. FishXing adult output incorrect? (98%pass)
#40	S-091	Wine Creek #2	Koch Road	Coho, Steelhead	4	10	2	1	1.5	1,050 (2,400)	2,750	2,400	2.4	0.68	Habitat Survey	1.63	17.1	Probably allows for some passage of juvenile steelhead too.
Tie #41	S-018	Hobson Creek	Westside Road	Steelhead	2	11	0	0	0.0	10,750	13,900	10,750	10.0	0.40	+	4.00	17.0	Go with CDFG length estimate. A bridge is 2600' upstream of Westside Road and then 3100' more to next xing - status unknown.
Tie #41	S-042	Pauline Creek #8	Cleveland Avenue	Steelhead	2	12	1	0	0.5	2,950 (13,250)	13,250	13,250	10.0	0.25	#	2.50	17.0	Use CDFG habitat lengths.
Tie #41	S-058	Rincon Cr aka Brush Cr #3	Deer Trail Road	Steelhead	2	12	0	0	0.0	4,350 (16,050)	17,350	16,050	10.0	0.30	+	3.00	17.0	Probably is more passable than FishXing estimates - lack of depth. Xing is new bridge - barrier is remnant slab of old box culvert in channel - remove.
#42	S-063	Blucher Creek #2	Blucher Valley Road	Steelhead	2	10	5	3	4.0	2,200	1,700	1,700	1.7	0.50	+	0.85	16.9	Although provides adult passage, culvert is sized for <5yr flow and in poor condition.
#43	S-006	Grub Creek	Bohemian Highway	Coho, Steelhead	2	13	0	0	0.0	6,050	3,950	3,950	4.0	0.45	Habitat Survey	1.79	16.8	Taylor and Assoc stopped measurement when channel slope exceeded 10%.
#44	S-001	Unnamed Trib to Willow Creek	Willow Creek Road	Steelhead	2	13	1	0	0.5	2,050	2,350	2,050	2.4	0.50	+	1.18	16.7	Use CDFG habitat length estimate.
#45	S-061	Rincon Cr aka Brush Cr #5	Riebli Road	Steelhead	2	13	0	1	0.5	4,150	4,200	4,200	4.2	0.25	+	1.05	16.6	Probably is more passable than FishXing estimates - lack of depth..
#46	S-105	Brooks Creek	Spurgeon Road	Steelhead	2	13	0	1	0.5	1,600	1,650	1,600	1.6	0.50	+	0.80	16.3	Limit of anadromy is a dam/reservoir.
#47	S-049	Piner Creek #3	Coffey Lane	Steelhead	2	12	0	0	0.0	8,600	8,700	8,700	8.7	0.25	+	2.18	16.2	Lack-of-depth, probably provides better passage - juveniles too.
#48	S-051	Spring Creek #1	Summerfield Road	Steelhead	2	9	5	1	3.0	950(11,400)	8,200	8,200	8.2	0.25	#	2.05	16.1	Severely undersized - inlet overtops on less than a 1-yr flow!
Tie #49	S-052	Spring Creek #2	Stone Hedge Drive	Steelhead	2	9	5	1	3.0	10,500	7,250	7,250	7.3	0.25	#	1.81	15.8	Use lesser of two length estimates. Severely undersized - inlet overtops on less than a 1-yr flow! Habitat appears poor in photos.
Tie #49	S-075	Alpine Creek	St.Helena Road	Steelhead	2	12	3	0	1.5	6,900	1,250	1,250	1.3	0.25	#	0.31	15.8	USGS map indicates a dam/resevoir on Alpine Creek. CDFG habitat length extends upstream of reservoir.

INITIAL RANK	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Species Diversity Score	Extent of Barrier Score	Current Sizing Score	Current Condition Score	Culvert Score (ave of sizing and condition)	Length of Upstream Habitat (ft) (by Coey)	Length of Upstream Habitat (ft) (by Taylor Assoc.)	Length of Habitat used for Scoring	Habitat Length Score	Habitat Quality Modifier	Basis of Habitat quality Modifier (+ = Coey p.j. # = Taylor p.j.)	Total Habitat Score	TOTAL SCORE	COMMENTS FOR COEY AND CDFG - mostly about habitat lengths and quality scores.
Tie #49	S-004	Tyrone Gulch - 2 pipes	Tyrone Road	Steelhead	2	10	5	1	3.0	550	1,050	1,050	1.1	0.76	Habitat Survey	0.79	15.8	This has one of the highest habitat quality scores - does this really make sense for a tiny, very steep creek?
#50	S-122	Cloverdale Creek #2 - 2 bays	Vista View Drive	Steelhead	2	11	1	0	0.5	9,950	8,400	8,400	8.4	0.25	+	2.10	15.6	May consider raising quality score to 0.5 based on culvert crew's field notes and presence of y-o-y salmonids. Looks like provides some passage.
Tie #51	S-023	Un-named Jonive Branch #2	Furlong Road	Steelhead	2	11	3	0	1.5	900	2,050	2,050	2.1	0.50	#	1.03	15.5	Use Taylor and Assoc habitat length estimate. Appears to have a private xing about 400' upstream - status unknown.
Tie #51	S-094	Un-named Tributary #1 to Dry Creek	West Dry Creek Road	Steelhead	2	12	3	0	1.5	100	450	100	0.1	0.25	#	0.03	15.5	Use lesser value for length of upstream habitat. Habitat quality rating of "poor" = 0.25 based on steepness and small size of channel.
Tie #51	S-065	Crane Creek #1 - 2 bays	Snyder Lane	Steelhead	2	11	0	0	0.0	6,400(21,150)	22,300	22,300	10.0	0.25	#	2.50	15.5	
Tie #51	S-121	Cloverdale Creek #1	East First Street	Steelhead	2	11	0	0	0.0	11,800	14,100	11,800	10.0	0.25	+	2.50	15.5	May consider raising quality score to 0.5 based on culvert crew's field notes and presence of y-o-y salmonids. Slightly perched box.
Tie #51	S-074	Weeks Creek - 2 bays	Calistoga Road	Steelhead	2	10	0	0	0.0	9,500	9,600	9,500	9.5	0.36	Habitat Survey	3.45	15.5	LB meets adult criteria on 95% of migration flows. Hardware cloth fencing across inlet could lead to plugging and flooding of crossing.
#52	S-086	Kelley Creek	West Dry Creek Road	Steelhead	2	11	0	0	0.0	12,300	8,650	8,650	8.7	0.25	+	2.16	15.2	Use lesser value for length of habitat. Lack-of-depth, probably provides better window of passage than estimated by FishXing.
Tie #53	S-044	Pauline Creek #10	Chanate Road	Steelhead	2	10	2	0	1.0	3,650 (8,100)	8,850	8,100	8.1	0.25	#	2.03	15.0	Use CDFG habitat lengths. Three planks across culvert inlet could cause debris plugging.
Tie #53	S-106	Martin Creek	Private Drive off Spurgeon Road	Steelhead	2	7	1	3	2.0	14,100	8,050	8,050	8.1	0.50	+	4.03	15.0	Use lesser value for habitat length estimate = to dam/reservoir. Crossing probably provides adequate juvenile passage too.
Tie #53	S-087	Lytton Springs Creek - 2 bays	Dry Creek Road	Steelhead	2	10	0	1	0.5	22,800	20,650	20,650	10.0	0.25	+	2.50	15.0	Use lesser value for length of habitat - numerous upstream tribs, that may, or may not be fish-bearing.
Tie #54	S-057	Rincon Cr aka Brush Cr #2	Brush Creek Road	Steelhead	2	10	0	0	0.0	2,250 (18,300)	19,750	18,300	10.0	0.25	+	2.50	14.5	Probably only a partial barrier to adults - slightly perched outlet that spills onto riprap.
Tie #54	S-064	Hinebaugh Creek - 4 bays	Commerce Boulevard	Steelhead	2	10	0	0	0.0	100 (54,250)	68,100	54,250	10.0	0.25	+	2.50	14.5	Probably provides for some juvenile passage too - all four bays are at stream grade. Only 8100' of hab is in mainstem Hinebaugh Ck.
Tie #54	S-005	Devoul Creek	Bohemian Highway	Coho, Steelhead	4	8	4	0	2.0	650	800	650	0.8	0.61	Habitat Survey	0.49	14.5	
#55	S-050	Piner Creek #4	Hopper Avenue	Steelhead	2	11	0	0	0.0	4,600	3,400	3,400	3.4	0.25	+	0.85	13.9	Lack-of-depth, probably provides better passage - juveniles too.
#56	S-015	Mays Canyon	Neeley Road	Steelhead	2	7	4	0	2.0	11,100(45,900)	46,550	45,900	10.0	0.25	+	2.50	13.5	
#57	S-053	Matanzas Creek	Bethnards Drive	Steelhead	2	7	1	0	0.5	14,700	15,100	14,700	10.0	0.37	Habitat Survey	3.70	13.2	Use CDFG habitat length estimate. Culvert is backwatered - probably allows juvenile passage too.
#58	S-108	Little Briggs Creek - 5 pipes	Santa Angelina Ranch	Steelhead	2	8	0	1	0.5	3,600	3,650	3,600	3.6	0.51	Habitat Survey	1.82	12.3	Use CDFG values for habitat length.
#59	S-090	Wine Creek #1	Wine Creek Road	Coho, Steelhead	4	3	5	0	2.5	2,300 (4,700)	5,100	4,700	4.7	0.53	Habitat Survey	2.49	12.0	For all Wine Creek sites - use CDFG habitat length estimates.
#60	S-109	Coon Creek - 4 pipes	Santa Angelina Ranch	Steelhead	2	7	0	3	1.5	2,300	3,250	2,300	2.3	0.59	Habitat Survey	1.36	11.9	Use CDFG values for habitat length. At least one of the four pipes provides decent passage (two are extremely perched).
#61	S-019	Jonive Creek #1	Bodega Highway	Steelhead	2	3	0	3	1.5	12,850(28,850)	25,200	28,850	10.0	0.50	+	5.00	11.5	
Tie #62	S-056	Rincon Cr aka Brush Cr #1 - 2 bays	Montecito Blvd	Steelhead	2	6	0	0	0.0	18,500(36,800)	39,550	36,800	10.0	0.25	+	2.50	10.5	Use lesser habitat length estimate.
Tie #62	S-048	Piner Creek #2	Marlow Road	Steelhead	2	6	0	0	0.0	13600 (26,800)	23,350	23,350	10.0	0.25	+	2.50	10.5	
#63	S-027	Purrington Creek #2	Private Driveway	Coho(historic), Steelhead	3	5	0	1	0.5	3,700	3,800	3,700	3.7	0.50	+	1.85	10.4	Use CDFG habitat length estimate.
Tie #64	S-084	Mill Creek	Mill Creek Road	Steelhead	2	0	5	1	3.0	16,200	14,250	16,200	10.0	0.49	Habitat Survey	4.91	9.9	Use CDFG habitat length estimate. At stream grade with natural channel-bed through xing.
Tie #64	S-114	Crocker Creek	River Road	Steelhead	2	3	5	1	3.0	10,500	4,600	4,600	4.6	0.41	Habitat Survey	1.87	9.9	Use lesser value for habitat length -13% slope over 600' reach at 4600ft. Highly aggraded box culvert, probably from KOA dam's 1995 blow-out.
#65	S-088	Crane Creek (tributary to Dry Cr)	West Dry Creek Road	Steelhead	2	2	0	0	0.0	14,950	16,700	14,950	10.0	0.58	Habitat Survey	5.77	9.8	Use CDFG habitat length estimate.
#66	S-017	Korbel Tributary	River Road	Steelhead	2	3	0	0	0.0	9,350	9,400	9,350	9.4	0.50	+	4.70	9.7	Three xings upstream of River Road - status unknown.
#67	S-117	Icaria Creek	Asti Road	Steelhead	2	4	2	0	1.0	47,050	42,250	42,250	10.0	0.25		2.50	9.5	Use lesser value for length of habitat estimate. Upstream = 7 private xings not surveyed and d.s. = 3 xings not surveyed (1 under RR and 2 at Airport).
#68	S-111	Gird Creek #2	Wilson Road	Steelhead	2	5	0	0	0.0	1,900 (6,150)	6,900	6,150	6.2	0.25	+	1.54	8.5	Use CDFG values for habitat length. Not sure if the tributary that has 1100' of habitat upstream of site #3 can suppport anadromous fish.
Tie #69	S-055	Ducker Creek #2 - 2 bays	Rinconada Drive	Steelhead	2	4	0	0	0.0	7,250	7,600	7,250	7.3	0.25	+	1.81	7.8	
Tie #69	S-046	Pauline Creek #12	Chanate Road	Steelhead	2	4	0	0	0.0	3,550	4,300	3,550	3.6	0.50	#	1.78	7.8	Use CDFG habitat lengths.
#70	S-012	Fife Creek	Watson Road	Steelhead	2	0	0	0	0.0	15800 (32,350)	35,200	32,350	10.0	0.53	Habitat Survey	5.34	7.3	CDFG listed is the "upstream potential", not length surveyed. Any clue to what the State Park xings are like?
Tie #71	S-016	Pocket Canyon	Mays Canyon Road	Steelhead	2	0	5	0	2.5	34,800	35,200	34,800	10.0	0.25	+	2.50	7.0	
Tie #71	S-020	Jonive Creek #2	Bodega Highway	Steelhead	2	0	0	0	0.0	1,250 (16,000)	16,450	16,000	10.0	0.50	+	5.00	7.0	
Tie #71	S-066	Crane Creek #2	Petaluma Hill Road	Steelhead	2	0	0	0	0.0	13,100	15,600	15,600	10.0	0.50	+	5.00	7.0	
Tie #71	S-032	Windsor Creek #1 - 2 bays	Natalie Road	Steelhead	2	0	0	0	0.0	2000 (36,800)	34,550	34,550	10.0	0.50	#	5.00	7.0	At channel grade = 100% passage.

INITIAL RANK	Site ID#	Stream Name	Road Name	Presumed Species Diversity	Species Diversity Score	Extent of Barrier Score	Current Sizing Score	Current Condition Score	Culvert Score (ave of sizing and condition)	Length of Upstream Habitat (ft) (by Coey)	Length of Upstream Habitat (ft) (by Taylor Assoc.)	Length of Habitat used for Scoring	Habitat Length Score	Habitat Quality Modifier	Basis of Habitat quality Modifier (+ = Coey p.j. # = Taylor p.j.)	Total Habitat Score	TOTAL SCORE	COMMENTS FOR COEY AND CDFG - mostly about habitat lengths and quality scores.
#72	S-110	Gird Creek #1	Geysers Road	Steelhead	2	0	0	3	1.5	4,400 (10,550)	11,500	10,550	10.0	0.25	+	2.50	6.0	Use CDFG values for habitat length. Not sure if the two tributaries that total 5100' of habitat upstream of site #1 can suppport anadromous fish.
#73	S-024	Jonive Creek #4	Bodega Highway	Steelhead	2	0	0	0	0.0	1,700 (7,450)	7,350	7,450	7.5	0.50	+	3.73	5.7	Use CDFG habitat length estimate.
#74	S-041	Pauline Creek #7	McBride Lane	Steelhead	2	0	1	0	0.5	550 (13,800)	13,750	13,800	10.0	0.25	#	2.50	5.0	Use CDFG habitat lengths.
#75	S-022	Un-named Jonive Branch #1	Furlong Road	Steelhead	2	0	0	0	0.0	3100 (4,000)	5,100	5,100	5.1	0.50	#	2.55	4.6	Use Taylor and Assoc habitat length estimate. Habitat appears fairly good in site photos.
Tie #76	S-034	Windsor Creek #3	Brooks Road	Steelhead	2	0	0	0	0.0	28,000	26,350	26,350	10.0	0.25	+	2.50	4.5	At channel grade = 100% passage.
Tie #76	S-035	Pauline Creek #1	Marlow Road	Steelhead	2	0	0	0	0.0	1,700 (21,000)	21,050	21,050	10.0	0.25	#	2.50	4.5	Use CDFG habitat lengths.
Tie #76	S-036	Pauline Creek #2 - 2 bays	Steele Lane	Steelhead	2	0	0	0	0.0	1,150 (19,300)	19,350	19,350	10.0	0.25	#	2.50	4.5	Use CDFG habitat lengths.
Tie #76	S-037	Pauline Creek #3 - 2 pipes	Apache Way	Steelhead	2	0	0	0	0.0	1,050 (18,150)	18,150	18,150	10.0	0.25	#	2.50	4.5	Use CDFG habitat lengths.
Tie #76	S-038	Pauline Creek #4	Coffey Lane	Steelhead	2	0	0	0	0.0	1,900 (17,100)	17,100	17,100	10.0	0.25	#	2.50	4.5	Use CDFG habitat lengths.
Tie #76	S-039	Pauline Creek #5	Mardie's Lane	Steelhead	2	0	0	0	0.0	750 (15,200)	15,150	15,200	10.0	0.25	#	2.50	4.5	Use CDFG habitat lengths.
Tie #76	S-040	Pauline Creek #6	Range Avenue	Steelhead	2	0	0	0	0.0	650 (14,450)	14,450	14,450	10.0	0.25	#	2.50	4.5	Use CDFG habitat lengths.
Tie #76	S-047	Piner Creek #1	Valdes Drive	Steelhead	2	0	0	0	0.0	4,250 (31,050)	28,100	28,100	10.0	0.25	+	2.50	4.5	Use lesser of two length estimates. Habitat appears poor.
#77	S-054	Ducker Creek #1 - 2 bays	Benicia Drive	Steelhead	2	0	0	0	0.0	350 (7,600)	8,000	7,600	7.6	0.25	+	1.90	3.9	Use lesser habitat length estimate. Probably allows for juvenile passage too.
Tie #78	S-045	Pauline Creek #11	County Farm Road	Steelhead	2	0	0	0	0.0	900 (4,450)	5,200	4,450	4.5	0.25	#	1.11	3.1	Use CDFG habitat lengths.
Tie #78	S-112	Gird Creek #3	Geysers Road	Steelhead	2	0	0	0	0.0	4,250	4,750	4,250	4.3	0.25	+	1.06	3.1	Use CDFG values for habitat length. Not sure if the tributary that has 1100' of habitat upstream of site #3 can suppport anadromous fish.