APPENDIX B:

CATALOG OF COASTAL MENDOCINO COUNTY CULVERTS LOCATED ON FISH-BEARING STREAM REACHES

NOTE: This catalog contains two pages for each culvert included inventoried. The first page consists of location information, site-specific data, habitat notes, and a map. The second page has inlet and outlet photographs, with the inlet photo on the left side (or top) and the outlet photo on either the right side or bottom. Generally, sites are ordered in their location within Mendocino County from north to south, and from lowermost to uppermost road/stream intersection within a watershed.

For proposal development purposes, 8.5" x 11" full-scale USGS 7.5 Series copies are available on request.

Site #1: Ancestor Creek/Briceland Road; Mattole River **Ranking: #3 = High Priority**

Location: County Map #2F. T5S, R2E, Section 33. **Culvert Type:** Circular (2).

Dimensions: Diameters: 7.0' and 3.0'(overflow pipe) **Length:** 40.0' **Slope:** 3.85%

Modifications: None **Fill Estimate:** 320 cubic yards **Overall condition:** Poor.

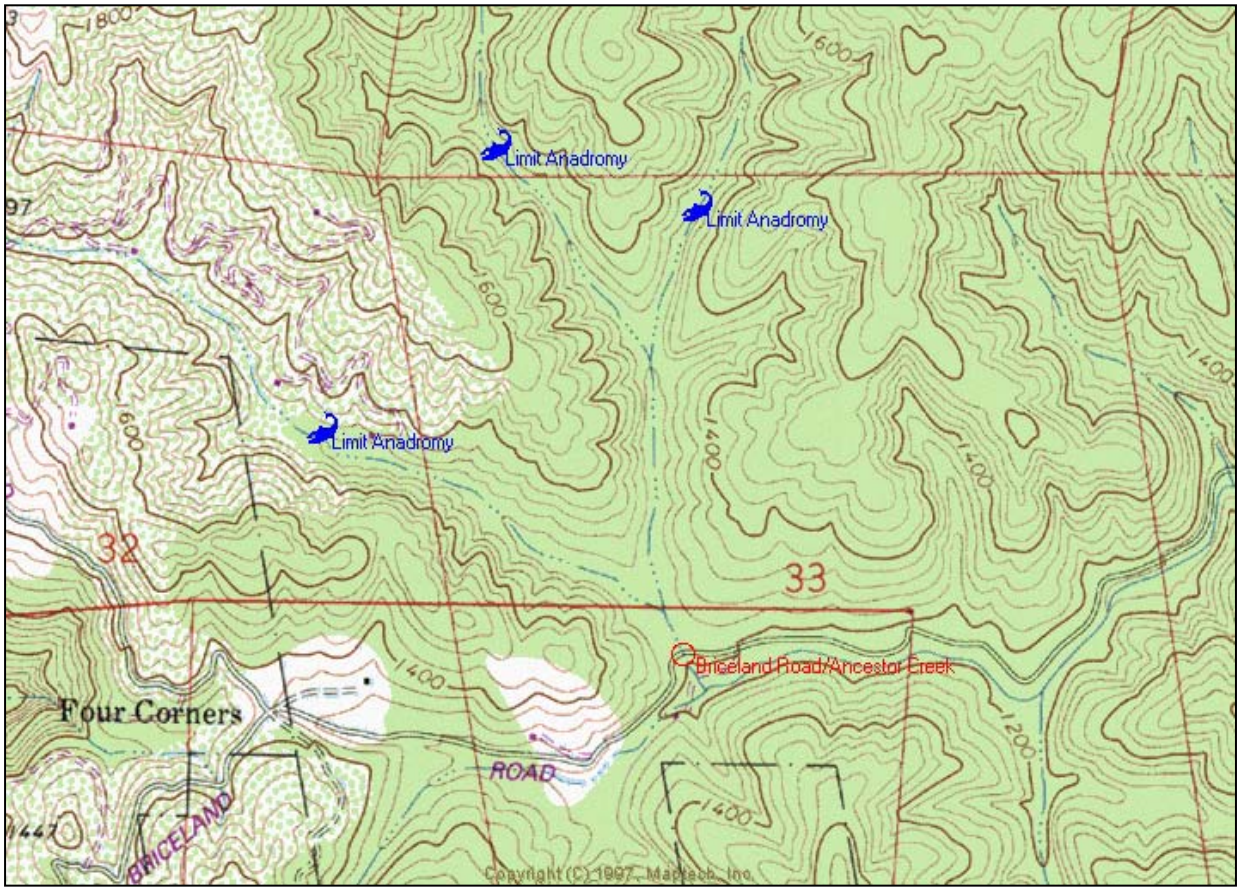
Sizing: Undersized; HW/D = 1 on a storm flow with approximately an eight-year recurrence interval. Briceland Road is overtopped on approximately a 13-year storm flow.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing predicted this crossing to be a 100% barrier for adult coho salmon and steelhead; and all age classes of juveniles (young-of-year coho and y-o-y, 1+ and 2+ steelhead).

Additional Road Crossings: Downstream, none. Upstream, no access, but none appear on available maps or aerial photos.

Habitat: No formal stream surveys were available. Quantity = 10,800' of potential fish-bearing habitat. Quality = Appears good, walked several hundred yards of creek above culvert: dense riparian of conifers and hardwoods, numerous pools, and ample areas of spawning-sized gravels. Cool water temperature during late-summer survey. Numerous juveniles observed in outlet pool (up to 10" in length); several young-of-year and 1+ steelhead observed above culvert. Known coho-bearing tributary to upper Mattole River.

Preferred Treatment: Properly-sized bridge or arch-culvert set on concrete footings.



Site #1: Ancestor Creek/Briceland Road; Mattole River

Site #2: Hotel Gulch/Usal Road; Usal Creek **Ranking: #25 = Low Priority**

Location: County Map #2F . T23N, R3E, Section 22. **Culvert Type:** Circular CSP.

Dimensions: 9.0' **Length:** 20.0' **Slope:** 1.80% **Modifications:** None, however culvert is embedded: 3.7' at inlet and 0.4' at outlet

Fill Estimate: 153 cubic yards **Overall condition:** Poor, from skewed angle of rustline appears crossing has failed and was reset.

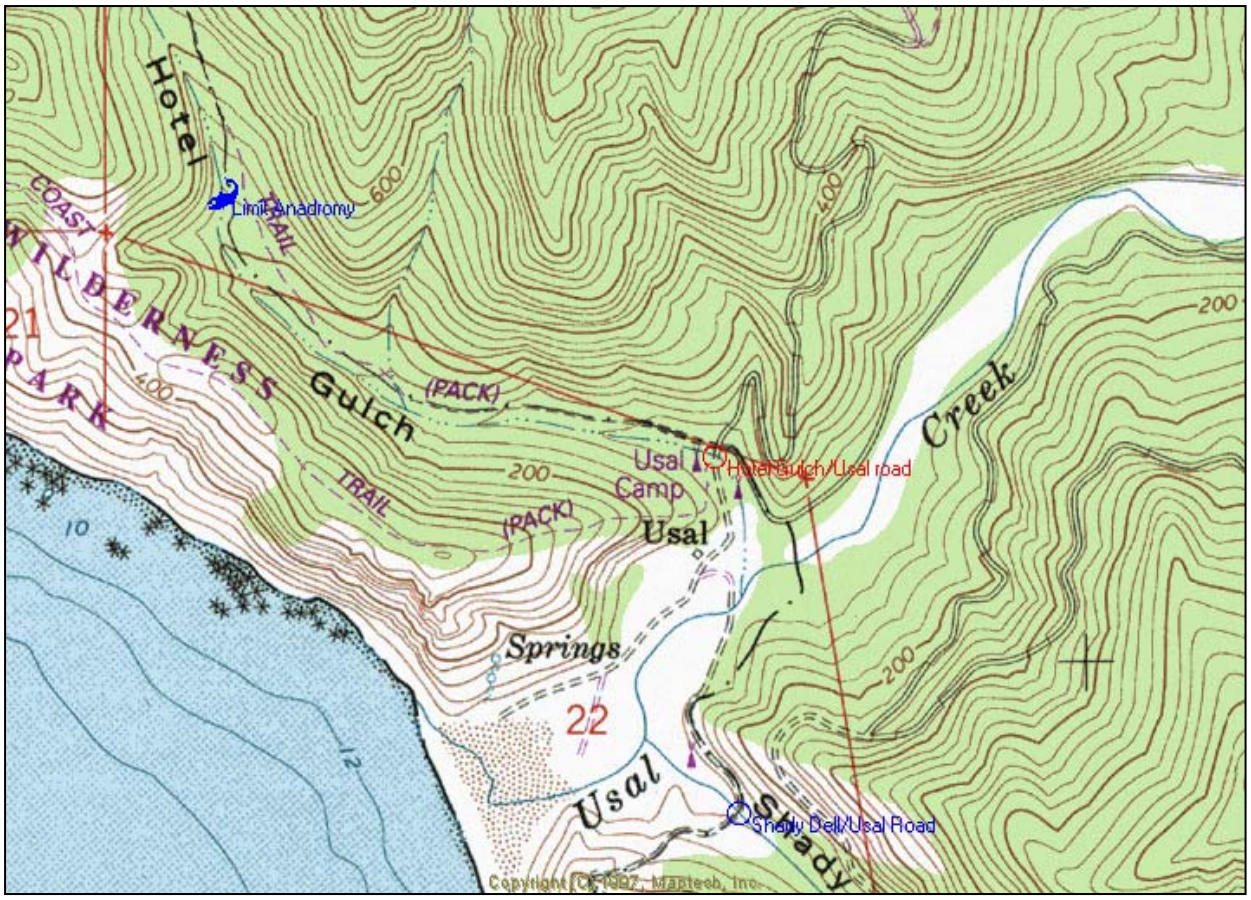
Sizing: Adequately sized; HW/D = 1 on a storm flow with approximately a 94-year recurrence interval.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing predicted this crossing to be 82% passable for adult coho salmon and steelhead, 75% passable for 2+ steelhead, 92% passable for 1+ steelhead, and 69% passable for young-of-year coho salmon and steelhead.

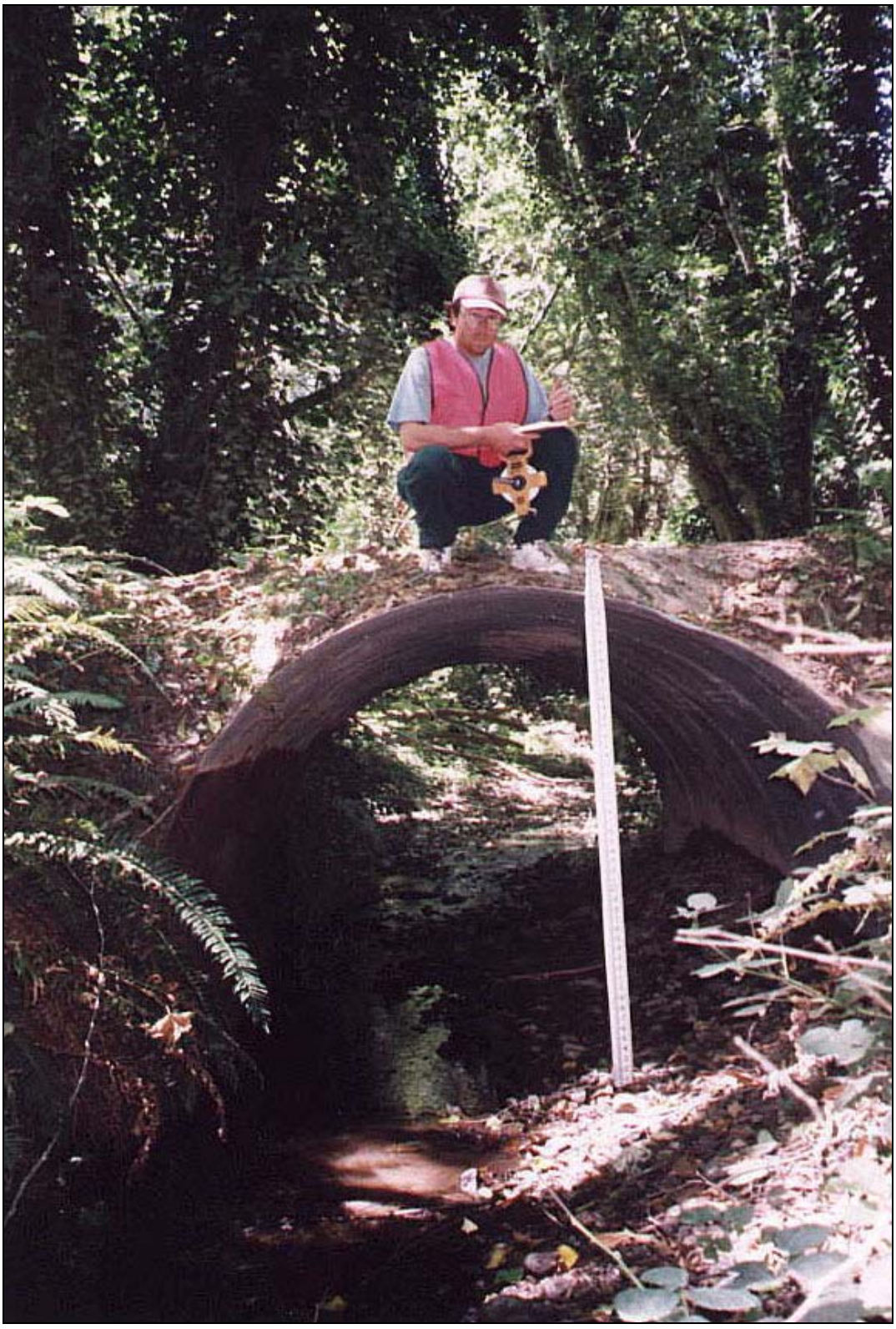
Additional Road Crossings: Downstream, none. Upstream, none appear on USGS topographic maps and none noted on CDFG stream survey.

Habitat: Surveyed in 1995 by CDFG habitat-typing crews; also walked by Ross Taylor and Associates (2/24/00). Quantity = approximately 4,500' of potential fish-bearing habitat. Quality = Fair; relative lack of pool habitat or in-channel complexity, dense riparian of predominantly hardwoods and young conifers, gravels were for the most part highly embedded with fines. Numerous y-o-y and 1+ steelhead juveniles observed in outlet pool; several y-o-y and 1+ observed above culvert. No adult or redds were observed on 2/24/00 survey, although timing and flow conditions were favorable for adult access and spawning.

Preferred Treatment: Properly-sized bridge or arch-culvert set on concrete footings.



Site #2: Hotel Gulch/Usal Road; Usal Creek: Outlet Photograph only.



Site #3: Shady Dell/Usal Road; Usal Creek **Ranking: #26 = Low Priority**

Location: County Map #2F . T23N, R3E, Section 22. **Culvert Type:** Circular .

Dimensions: ' **Length:** 46.0' **Slope:** 0.20% **Modifications:** None **Fill Estimate:** 595 cubic yards

Overall condition: Good.

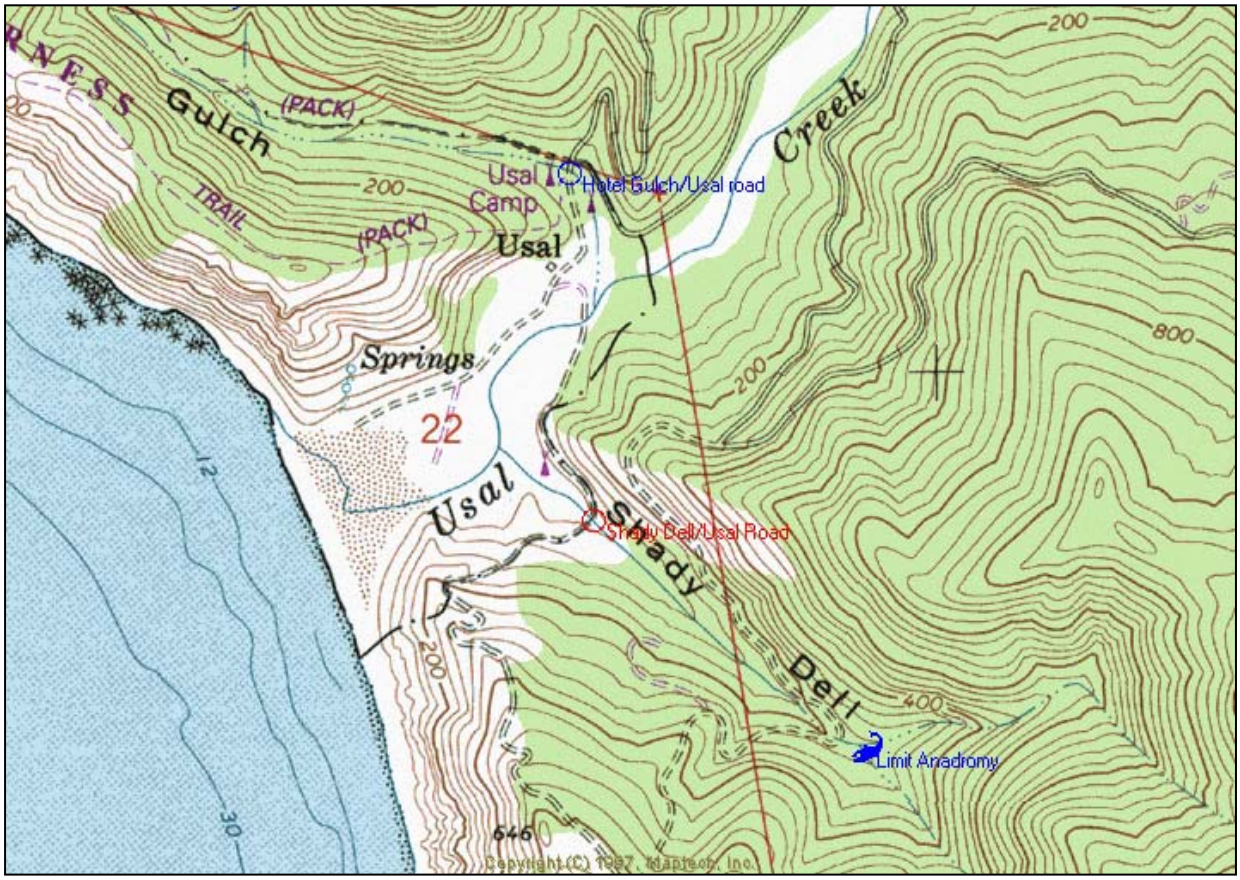
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a 20-year recurrence interval. Low point in Usal Road adjacent to culvert is also overtopped on approximately a 20-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing predicted this crossing to be 76% passable for adult coho salmon and steelhead, 67% passable for 2+ steelhead, 88% passable for 1+ steelhead, and 93% passable for young-of-year coho salmon and steelhead.

Additional Road Crossings: Downstream, none. Upstream, an old logging road crossing is on USGS topographic map; however this crossing is not mentioned in 1995 CDFG stream survey.

Habitat: Surveyed in 1995 by CDFG habitat-typing crews; also walked by Ross Taylor and Associates (2/24/00). Quantity = approximately 2,900' of potential fish-bearing habitat. Quality = Fair, relative lack of pool habitat or in-channel complexity, dense riparian of predominantly hardwoods and young conifers, gravels were for the most part highly embedded with fines. Numerous young-of-year and several 1+ steelhead/trout observed above and below Usal Road. No adults or redds were observed on 2/24/00 survey, although timing and flow conditions were favorable for adult access and spawning.

Preferred Treatment: Properly-sized bridge or arch-culvert set on concrete footings.



Site #3: Shady Dell/Usal Road; Usal Creek

Site #4: Deer Creek/Wilderness Lodge Road; South Fork Eel River **Ranking: #8 = Moderate Priority**

Location: County Map #2F. T21N, R16W, Section 4. **Culvert Type:** Circular CSP.

Dimensions: Diameter = 7.0' **Length:** 30.0' **Slope:** 3.27% **Modifications:** None

Fill Estimate: 511cubic yards **Overall condition:** Fair.

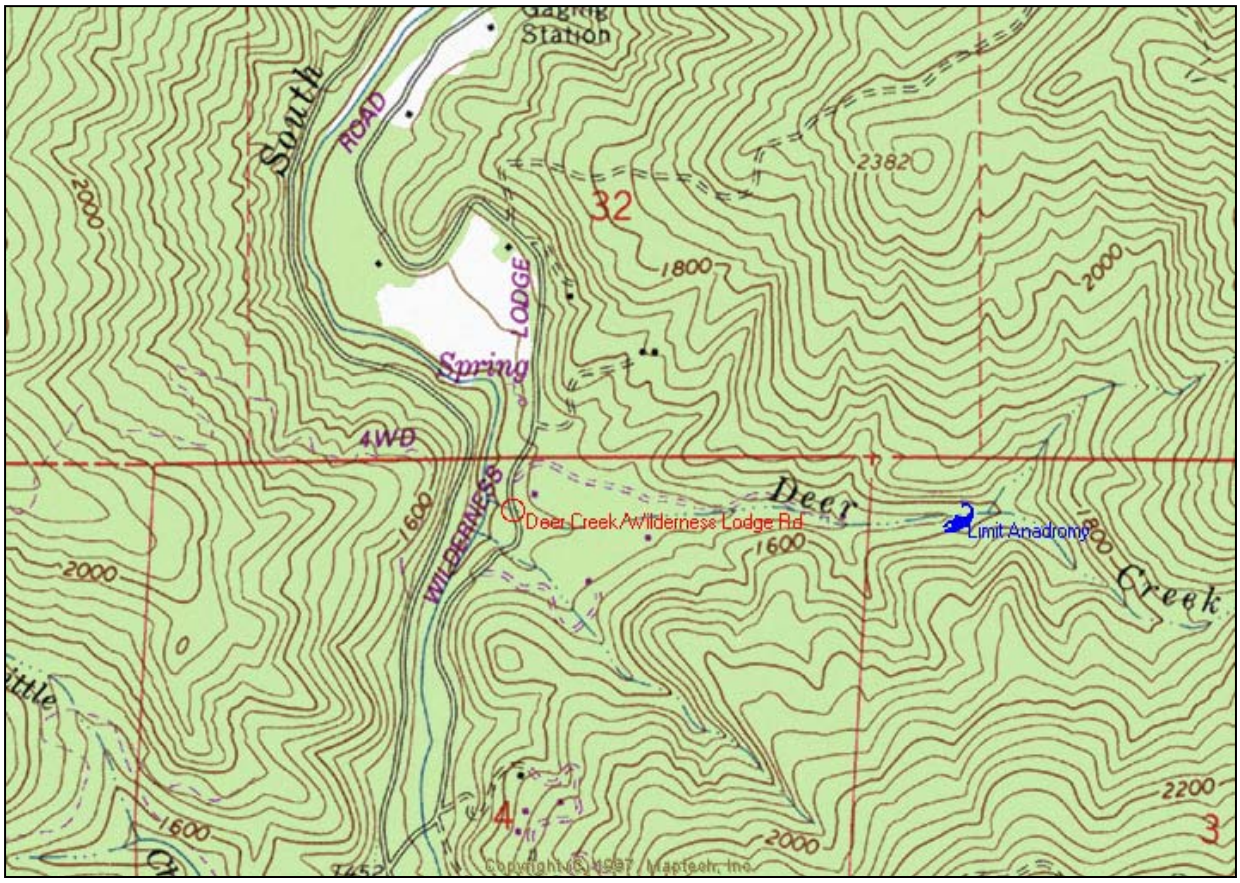
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a six-year recurrence interval. Wilderness Lodge Road is overtopped on approximately a 19-year storm discharge. Poor channel alignment at the culvert inlet probably increases likelihood of culvert plugging and erosion of road fill.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing predicted this crossing to be a 100% barrier for adult coho salmon and steelhead; and all age classes of juveniles (young-of-year coho and y-o-y, 1+ and 2+ steelhead). Slope through culvert and steep drop at inlet create excessive velocities over most of the migration flows. Lack of depth on the lower range of flows is a concern for adults too.

Additional Road Crossings: Downstream, none. Upstream, no access to private property, but none appear on available maps or aerial photos.

Habitat: No known surveys (recent or historic) of Deer Creek by CDFG. Quantity = from USGS topographic maps, approximately 3,700' of potential fish-bearing habitat. Quality = Adjacent to county road appears good/fair. Immediate upstream property posted "No Trespassing". Very cool summer water temperature (59°F) present on 8/99 visit with air temperature = 95°F. Two age-classes of juvenile steelhead observed only below culvert. CDFG should identify upstream property owners and request access for stream survey.

Preferred Treatment: Properly-sized bridge or arch-culvert set on concrete footings.



Site #4: Deer Creek/Wilderness Lodge Road; South Fork Eel River

Site #5: Taylor Creek/Branscomb Road; South Fork Eel River **Ranking: 14 = Moderate Priority**

Location: County Map #2F . T20N, R16W, Section 25 **Culvert Type:** Circular SSP.

Dimensions: Effective diameter = 8.4' **Length:** 132.0' **Slope:** 4.20%

Modifications: Yes, 12 sets of notched redwood baffles. Appear to retain substrate and break-up steep slope, three sets have completely failed and others are close to failure. Floor is lined with concrete.

Fill Estimate: 11,548 cubic yards **Overall condition:** Fair, but baffles need repair/replacement.

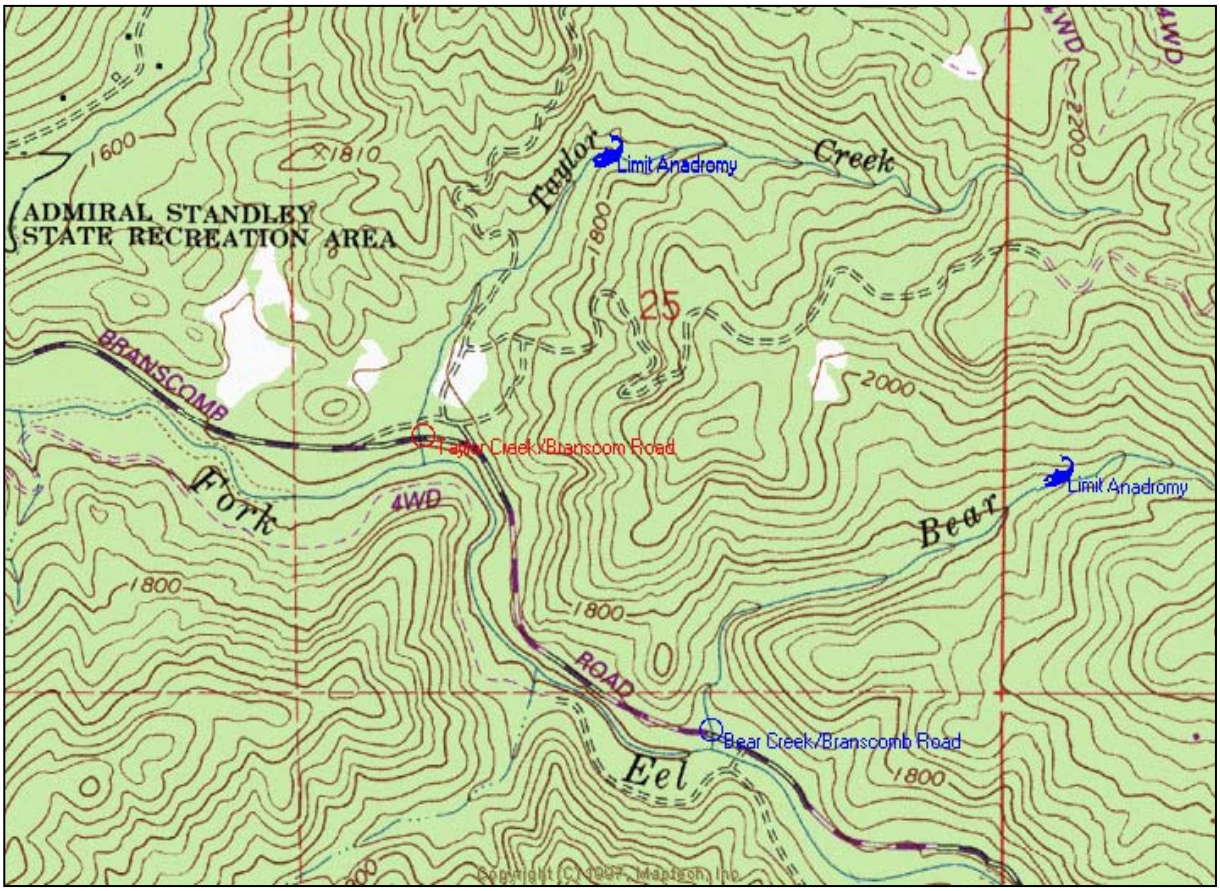
Sizing: Adequately sized; HW/D = 1 on approximately a storm flow with an 83-year recurrence interval. Branscomb Road is overtopped on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing predicted this crossing to be 99% passable for adult coho salmon and steelhead; and 100% passable for all age classes of juveniles (young-of-year coho and y-o-y, 1+ and 2+ steelhead. The passage analyses assumed all 12 baffles were functioning properly; however three sets of baffles have failed and others are deteriorating.

Additional Road Crossings: Downstream, none. Upstream, two crossings appear on USGS map no mention of crossings in CDFG's 1969 sampling (Jones 2001).

Habitat: No recent CDFG stream surveys. In 1969, CDFG reported steelhead in densities of 75 fish/100' of channel, with resident trout 0.7 miles upstream (Jones, 2001). Quantity = approximately 2,900' of potential fish-bearing habitat. Quality = Fair/good, dense riparian of second-growth conifers and hardwoods, cool summer water temperature, relative lack of in-stream LWD or habitat complexity. Young-of-year steelhead observed only below county culvert.

Preferred Treatment: Modify existing culvert by replacing all 12 sets of baffles.



Site #5: Taylor Creek/Branscomb Road; South Fork Eel River

Site #6: Bear Creek/Branscomb Road; South Fork Eel River **Ranking: #12 = Moderate Priority**

Location: County Map #2F. T20N, R16W, Section 36 **Culvert Type:** SSP Circular .

Dimensions: Effective diameter = 9.4' **Length:** 68.4' **Slope:** 2.92% **Modifications:** Bottom lined with steel plates running parallel to entire length of culvert (see photos).

Fill Estimate: 1,963 cubic yards **Overall condition:** Good.

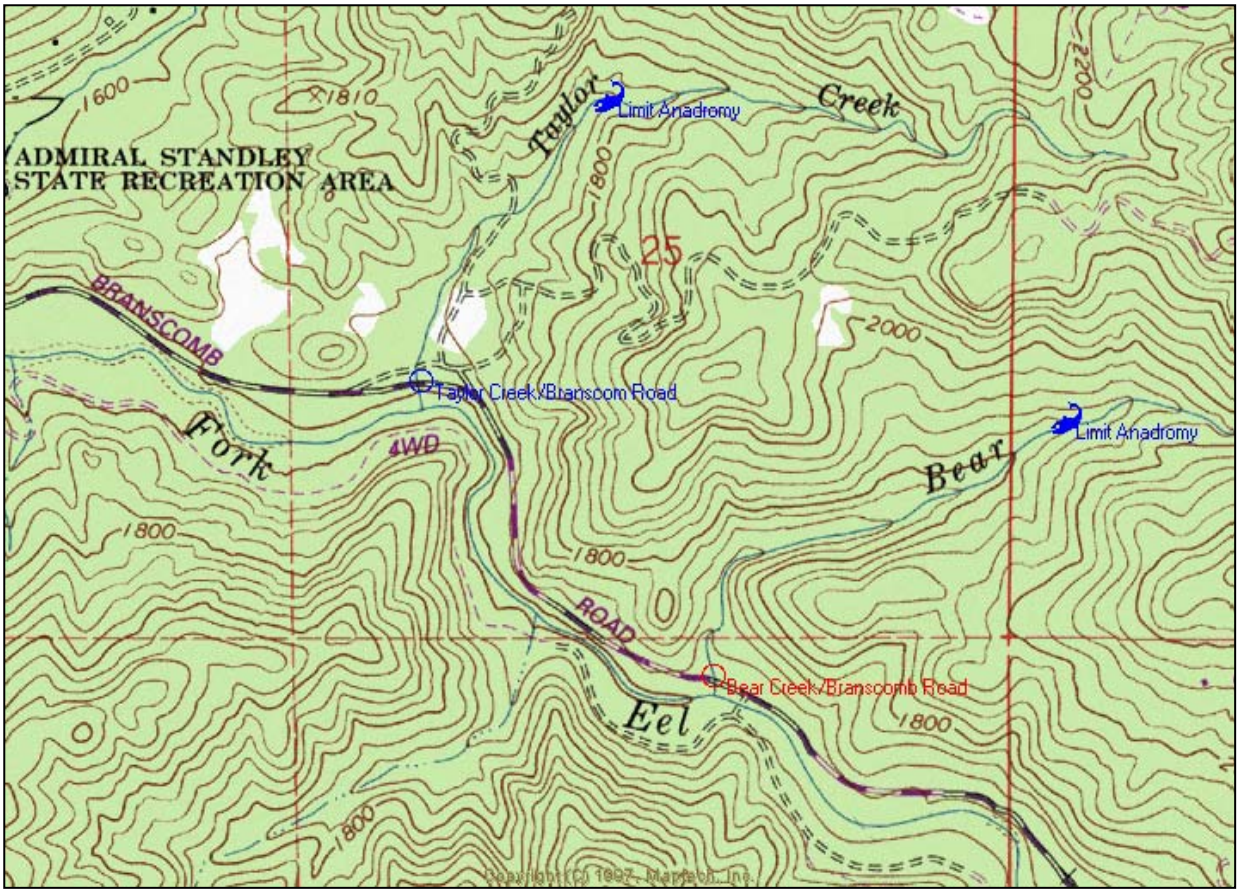
Sizing: Adequately sized; HW/D = 1 on a storm flow with approximately an 82-year recurrence interval. Branscomb Road is overtopped on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined for juveniles (all age classes) = 100% barrier due to excessive velocities caused by steep slope. Adults (coho salmon and steelhead) = 100% barrier due to excessive velocities. Culvert also lacks adequate depth on lower range of migration flows. A single steelhead young-of-year observed below road crossing.

Additional Road Crossings: Downstream, none. Upstream, no crossings appear on available maps or aerial photos.

Habitat: No recent surveys by CDFG habitat-typing crews. CDFG reported an adult chinook near mouth in 1979 and juvenile steelhead 1.0 miles upstream in 1986 (Jones 2001). Quantity = approximately 4,100' of potential fish-bearing habitat; however mostly with a channel gradient of four to six percent. Quality = Fair/good; dense riparian of hardwoods and second-growth conifers; cool summer water temperatures; relatively unembedded substrate.

Preferred Treatment: Remove steel plates and install series of weirs similar to Taylor Creek culvert.



Site #6: Bear Creek/Branscomb Road; South Fork Eel River

Site #7: Windem Creek/Branscomb Road; South Fork Eel River **Ranking: #13** = **Moderate Priority**

Location: County Map # . T20N, R15W, Section 33 **Culvert Type:** Concrete rectangular box – two bays.

Dimensions: Each bay = 10.0 W' x 6.0'H **Length:** 33.0' **Slope:** 2.87% **Modifications:** None

Fill Estimate: 405 cubic yards **Overall condition:** Good.

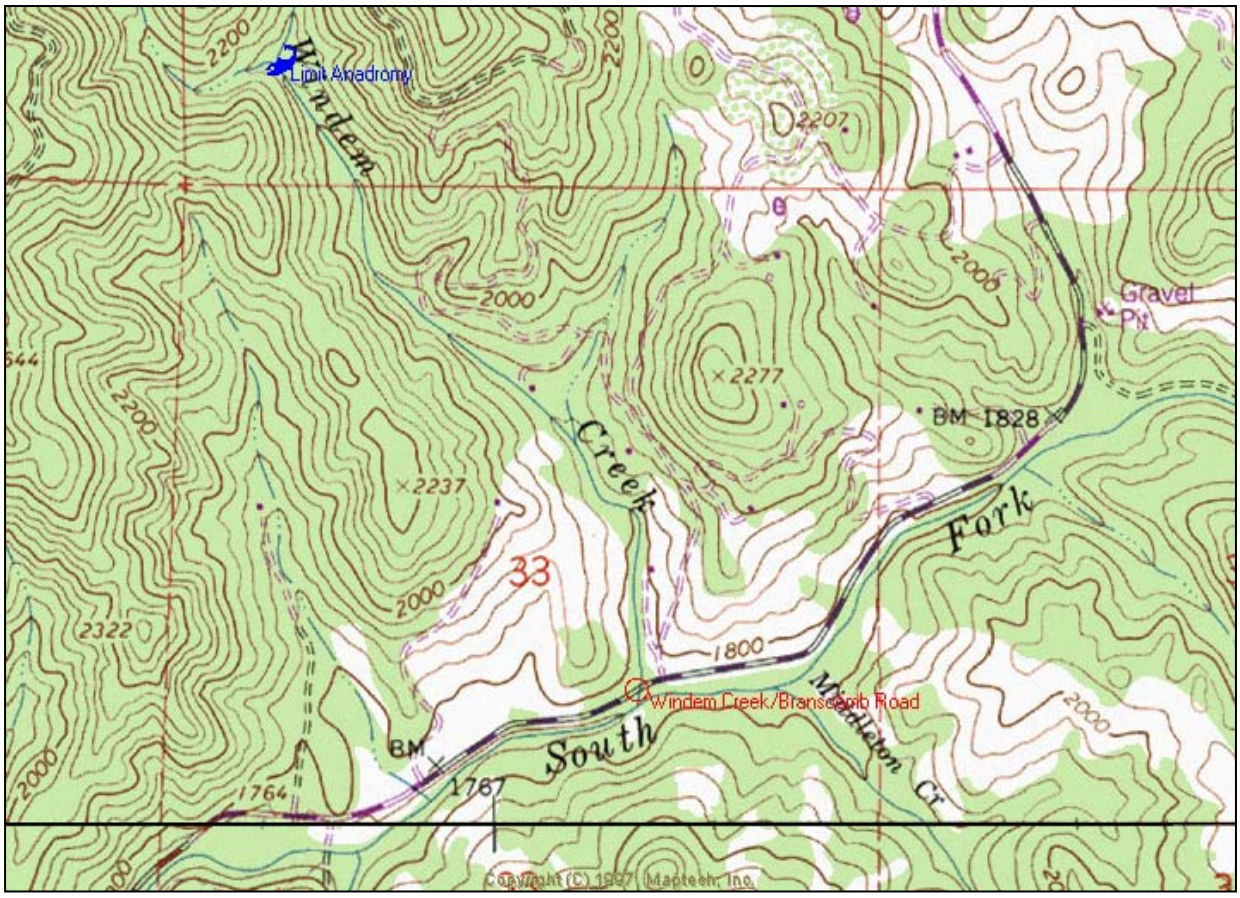
Sizing: Adequately sized; HW/D = 1 on a storm flow with approximately 177-year recurrence interval. Branscomb Road is overtopped on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined for juveniles (all age classes) = 100% barrier due to excessive velocities caused by steep slope and smooth floor. Adults (coho salmon and steelhead) = 20% passable; barrier due to lack of depth on lower flows and excessive velocities on higher migration flows. Steep drop over riprap below outlet may impede passage too.

Additional Road Crossings: Downstream, none. Upstream, no access, but none appear on available maps or aerial photos.

Habitat: Surveyed in 1995 by CDFG habitat-typing crews. Quantity = approximately 3,200' of potential fish-bearing habitat. Quality = Fair/good; dense riparian of predominantly hardwoods (86%); low shelter rating in pools (score = 28); gravels were moderately embedded; and summer water temperatures were cool (<60°F). Numerous young-of-year steelhead observed above and below culvert on 8/16/99 survey (South Fork Eel River was dry channel).

Preferred Treatment: Modify both bays of existing box culvert with a notched outlet beam and baffles within each bay. Riprap at outlet may require some modification too.



Site #7: Windem Creek/Branscomb Road; South Fork Eel River

Site #8: Ryan Creek/Ryan Creek Road; Outlet Creek/South Fork Eel River **Ranking: #2 = High Priority**

Location: County Map #3G22 . T19N, R14W, Section 24.

Culvert Type: Concrete box with downstream apron and concrete wing-walls on both upstream and downstream ends. **Dimensions:** 10.0' W x 6.0' H **Length:** 82.2' **Slope:** 2.73% **Modifications:** None

Fill Estimate: 7,975 cubic yards **Overall condition:** Poor; outlet apron cracked and slumped (see photo).

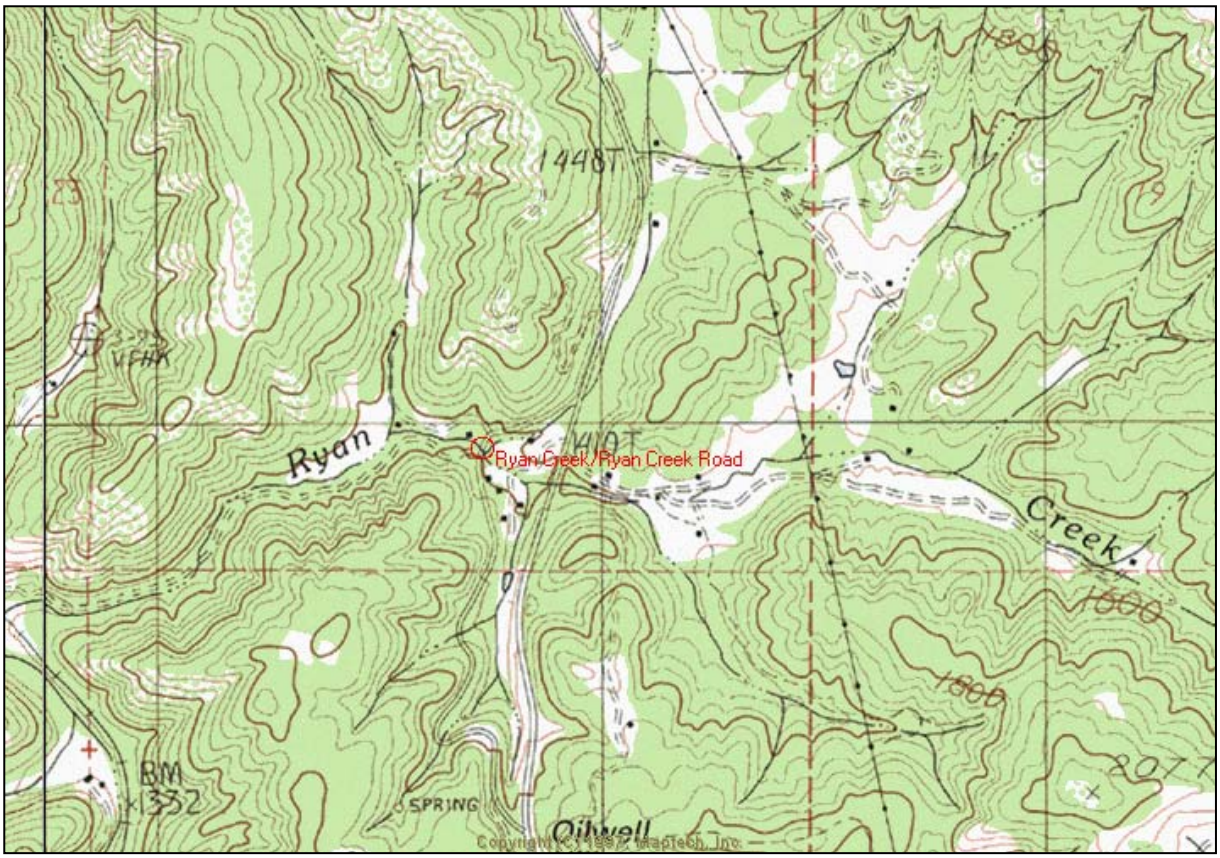
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a 12-year recurrence interval. Ryan Creek Road is overtopped on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined crossing is 20% passable for adults (coho salmon, chinook salmon, and steelhead). For juveniles (all age classes) = 100% barrier due to excessive velocities and entry jump required at outlet. Broken concrete apron at outlet is a major impediment to fish migration (Harris, pers. comm.).

Additional Road Crossings: Downstream, none. Upstream about 500': Highway 101 (two crossings: both approximately 150' long; 5.0 ' diameter CSPs; north fork is perched 2.5' = probable 100% barrier; south fork is backwatered; both in poor condition and undersized. Private road crossing about 450' upstream of Highway 101 southern crossing is a 100' long, 5.0' CSP perched about 2.0'.

Habitat: Partially surveyed in 1995 by CDFG habitat-typing crews (no access allowed on northern fork). Quantity = approximately 15,000' of potential fish-bearing habitat. Quality = Good; dense riparian of mostly hardwoods (86%); abundant pools with depths > 2.0'; relatively unembedded gravels; lack of LWD and pool habitat complexity. Three age-classes of juvenile steelhead, y-o-y coho, and adult Pacific lamprey observed only below culvert at Ryan Creek Road.

Preferred Treatment: Replace existing crossing with a properly-sized bridge or arch-culvert set on concrete footings. Removal of crossing is also an option since access to Highway 101 is possible in either direction.



Site #8: Ryan Creek/Ryan Creek Road; Outlet Creek/South Fork Eel River

Site #9: Davis Creek tributary/Eastside Road; Outlet Creek/So. Fork Eel River **Ranking: #23 = Low Priority**

Location: County Map #3G22. T18N, R13W, Section 16

Culvert Type: Circular SSP **Dimensions:** Diameter = 10.6' **Length:** 40.3' **Slope:** 2.21%

Modifications: Concrete weir about 20' downstream of outlet, and steel plate (0.5' high) six feet downstream of inlet

Fill Estimate: 1,044 cubic yards **Overall condition:** Poor; floor rusted through in several locations.

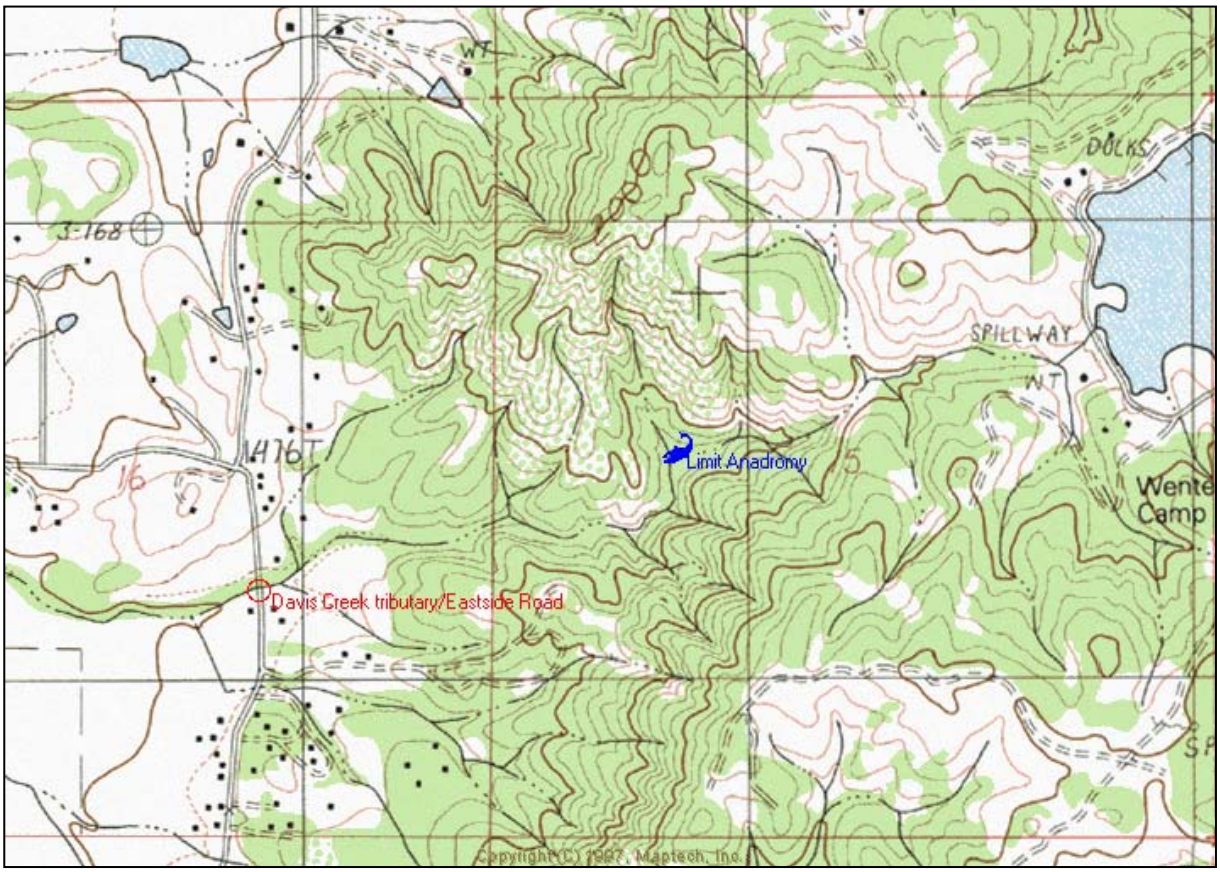
Sizing: Properly sized; HW/D = 1 on a storm flow with approximately a 143-year recurrence interval.

Barrier Status: For range of migration flows (Q_{lp} – Q_{hp}), FishXing determined crossing is 33% passable for adult steelhead. For juveniles: 2+ year-olds = 43% passable; for 1+ year-olds = 25% passable; and for young-of-year = 17% passable. Culvert was partially backwatered by concrete weir and fully-spanning LWD during winter survey (see photograph).

Additional Road Crossings: Downstream, none. No access upstream, but none appear on USGS topographic maps or available air photographs.

Habitat: No recent surveys by CDFG habitat-typing crews; no access for extensive walk away from Eastside Road. Quantity = approximately 3,700' of potential fish-bearing habitat. Quality = Poor; channel impacted by decades of unfenced grazing; denuded riparian zone, collapsed banks, minimal pool habitat, highly silted substrate. Talked to landowner who last saw adult steelhead in tributary prior to 1976-77 drought, none since then. Creek flows year-round out of upstream reservoir at Scout Camp (see map).

Preferred Treatment: When current crossing fails, replace with a properly-sized bridge or arch-culvert set on concrete footings.



Site #9: Davis Creek tributary/Eastside Road; Outlet Creek/South Fork Eel River

Site #10: Fulweiter Creek (northern fork) /Eastside Road; Outlet Creek/South Fork Eel River

Ranking: #20 = Low Priority **Location:** County Map #3G22. T18N, R13W, Section 16

Culvert Type: Circular SSP **Dimensions:** Diameter = 10.6' **Length:** 40.3' **Slope:** 2.21%

Modifications: None **Fill Estimate:** 1,044 cubic yards **Overall condition:** Poor; floor rusted through in several locations.

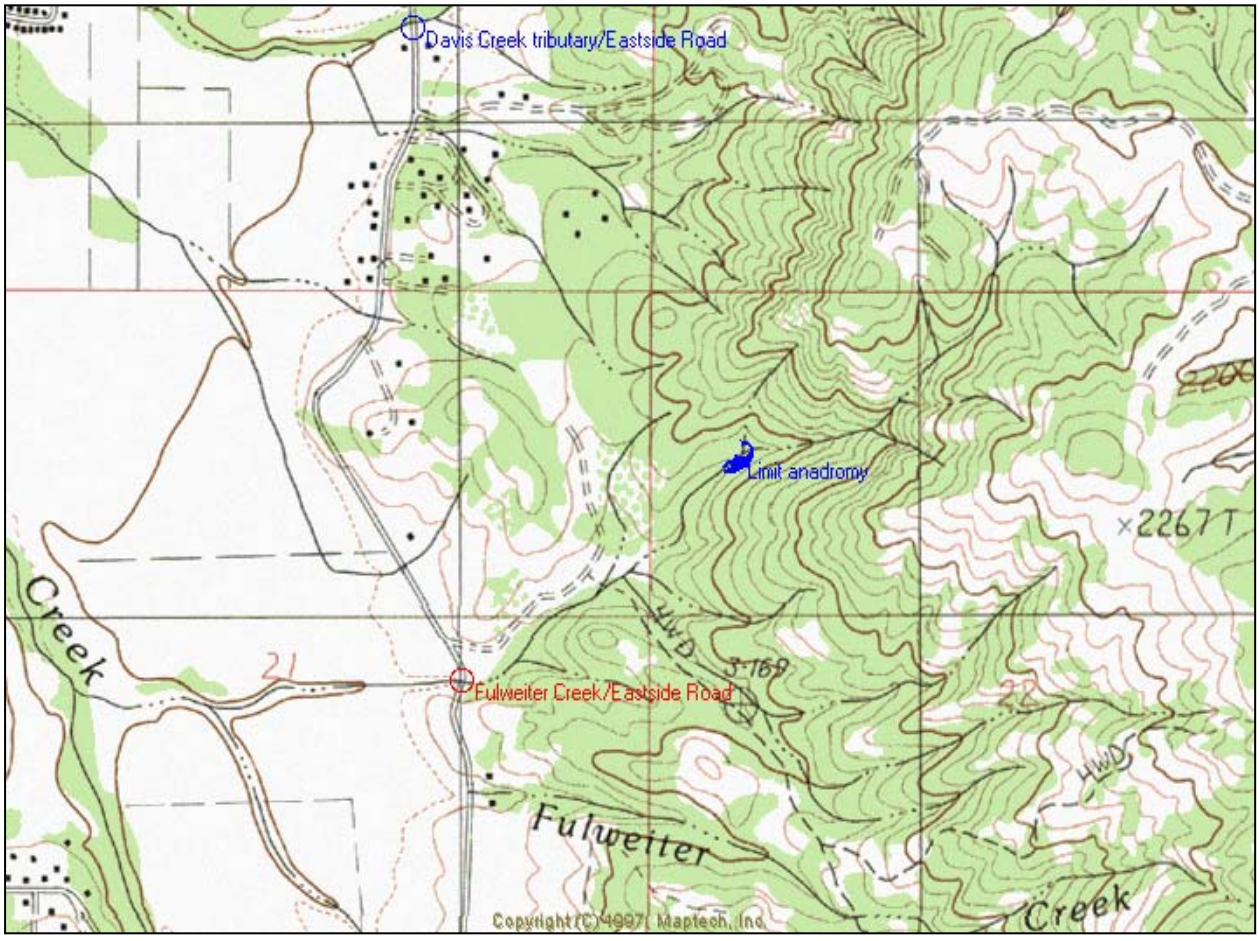
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a 3.4-year recurrence interval. Eastside Road is overtopped on approximately a seven-year storm flow.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined crossing is 23% passable for adult steelhead. For juveniles (all age classes) culvert is a complete barrier due to leap required to enter culvert and excessive velocities.

Additional Road Crossings: Downstream, none. No access upstream, but none appear on USGS topographic maps or available air photographs.

Habitat: No recent surveys by CDFG habitat-typing crews; no access for extensive walk away from Eastside Road. Quantity = approximately 2,800' of potential fish-bearing habitat. Quality = Poor; channel impacted by decades of unfenced grazing; denuded riparian zone, collapsed banks, minimal pool habitat, and highly silted substrate.

Preferred Treatment: When current crossing fails, replace with a properly-sized bridge or arch-culvert set on concrete footings.



Site #10: Fulweiter Creek (northern fork) /Eastside Road; Outlet Creek/South Fork Eel River

Site #11: Mill Creek tributary/ Westwood Drive; Coastal/Lake Cleone **Ranking: #17 = Low Priority**

Location: County Map #2G23 . T19N, R17W, Section 29. **Culvert Type:** Circular CSP.

Dimensions: Diameter = 4.0' **Length:** 85.5' **Slope:** 5.40% **Modifications:** None

Fill Estimate: 6,605 cubic yards **Overall condition:** Poor, floor is rusted through in numerous places.

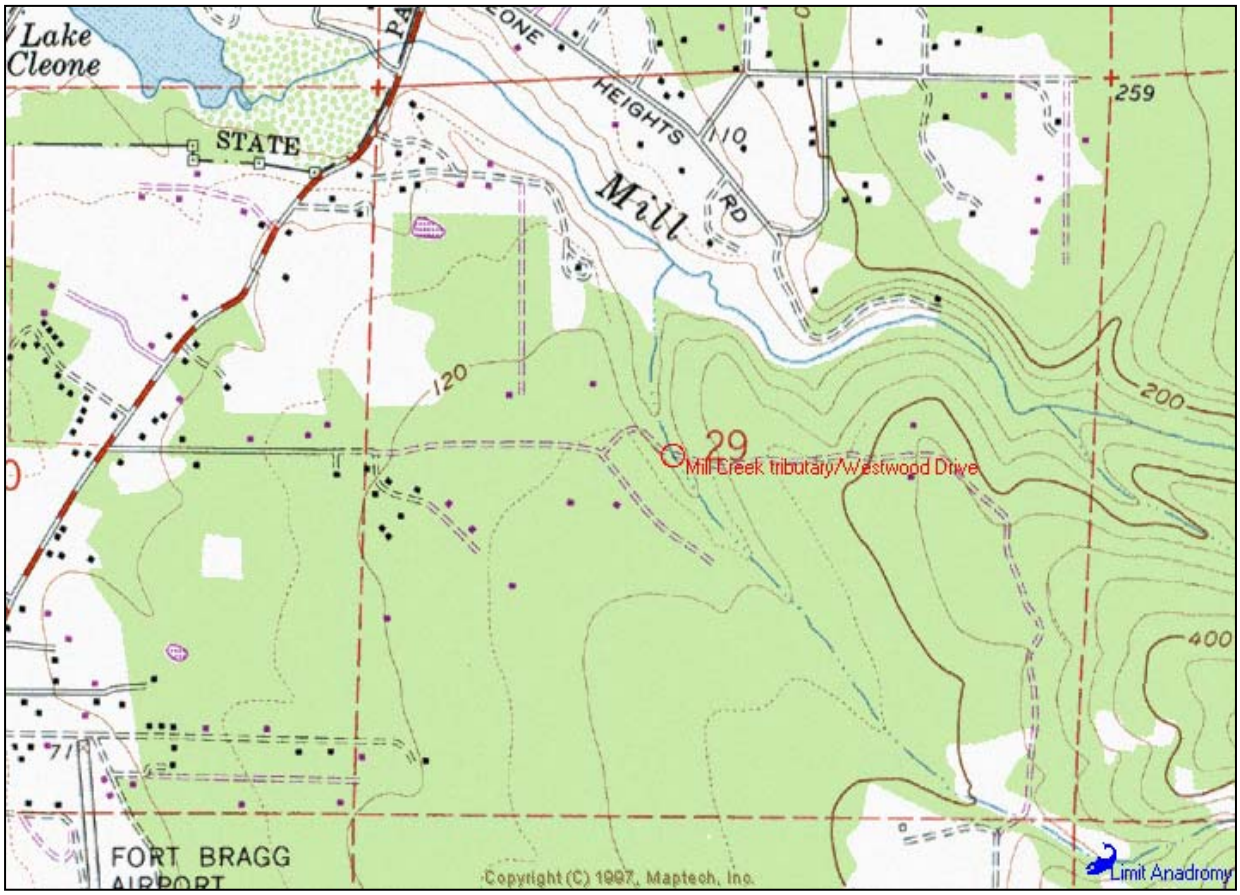
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a seven-year recurrence interval. Westwood Drive overtops on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a 100% barrier for all species and lifestages due to steep slope and length of culvert.

Additional Road Crossings: Downstream (4,300'), concrete culvert box at Highway 1 and (4,600' downstream) bridge at entrance road to McKerracher State Park; and outlet to Lake Cleone. Upstream (3,800'), culvert on private road near the upper limit of anadromy.

Habitat: No known recent CDFG surveys. Past CDFG survey in 1961 (by Crowdus and Santos) described habitat as extremely poor for fisheries; overgrown channel full of clays and silts; suitable spawning limited to a short reach of Mill Creek above Highway 1; fish densities very low; grated culvert at Lake Cleone described as a barrier. No fish observed during our initial survey or two winter visits. **Quantity =** approximately 4,700' of potential fish-bearing habitat. **Quality** = Fair/poor; dense riparian of hardwoods and second-growth conifers, limited pool habitat, minimal LWD or in-channel habitat complexity, dominant substrate is sand and silt, and tributary is quite small above Westwood Drive.

Preferred Treatment: When culvert fails, replace with a properly-sized arch-culvert set on concrete footings or countersunk pipe. Minimal potential for anadromous fisheries and high cost of fill removal make this crossing a low-priority site for restoration funding.



Site #11: Mill Creek tributary/ Westwood Drive; Coastal/Lake Cleone

Site #12: Virgin Creek/Airport Road; Coastal **Ranking: #24 = Low Priority**

Location: County Map #2G23 . T19N, R17W, Section 32. **Culvert Type:** Circular CSP.

Dimensions: Diameter = 5.0' **Length:** 38.0' **Slope:** not measured, but < 2% (inlet crushed at time of survey, but was repaired 9/99). Culvert was backwatered at low summer flow and during winter visit.

Modifications: None **Fill Estimate:** 1,069 cubic yards **Overall condition:** Poor, rusted floor; inlet was crushed when initially surveyed, but fixed by Mendocino DOT.

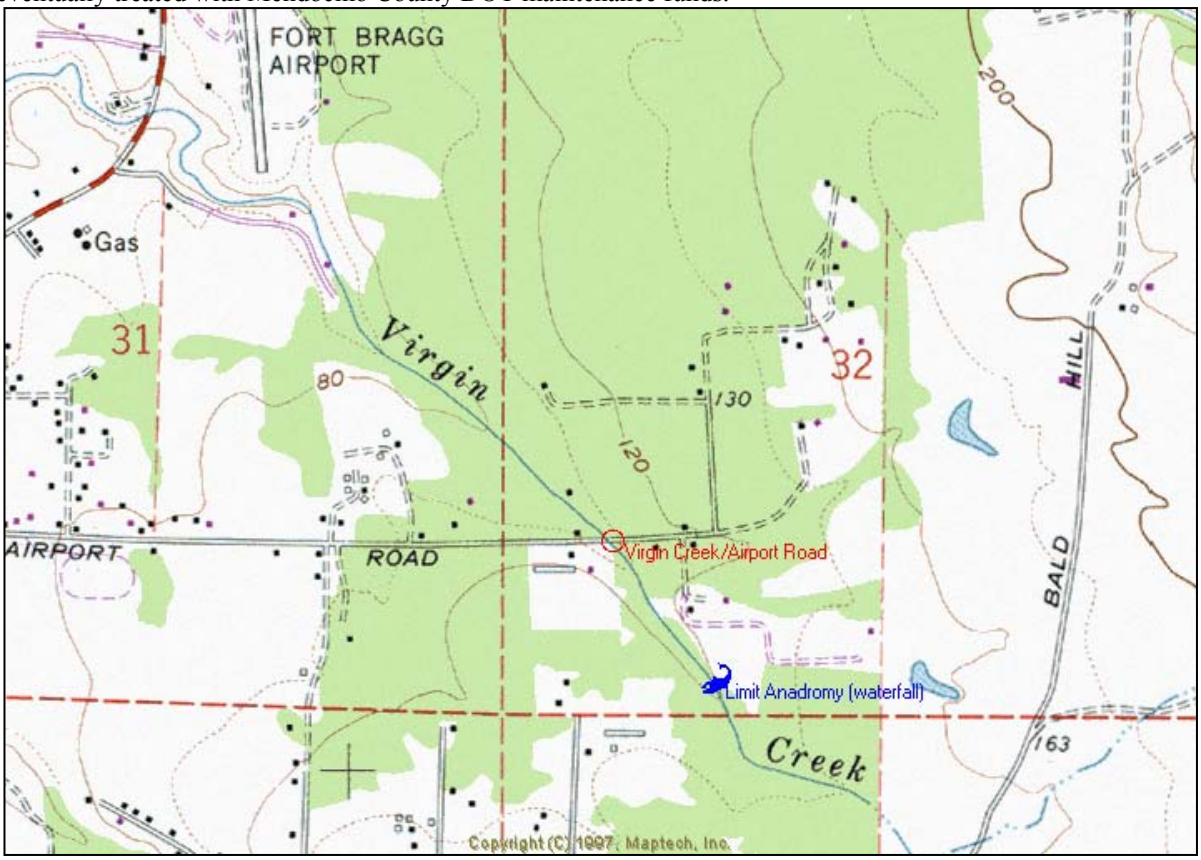
Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a two-year recurrence interval. Airport Road overtops on approximately a four-year storm discharge.

Barrier Status: For the range of migration flows (Q_{lp} – Q_{hp}), FishXing determined culvert is 96% passable for adult coho salmon and steelhead, 100% passable for 2+ year-old steelhead, 68% passable for 1+ year-old steelhead, and 40% passable for young-of-year steelhead and coho juveniles.

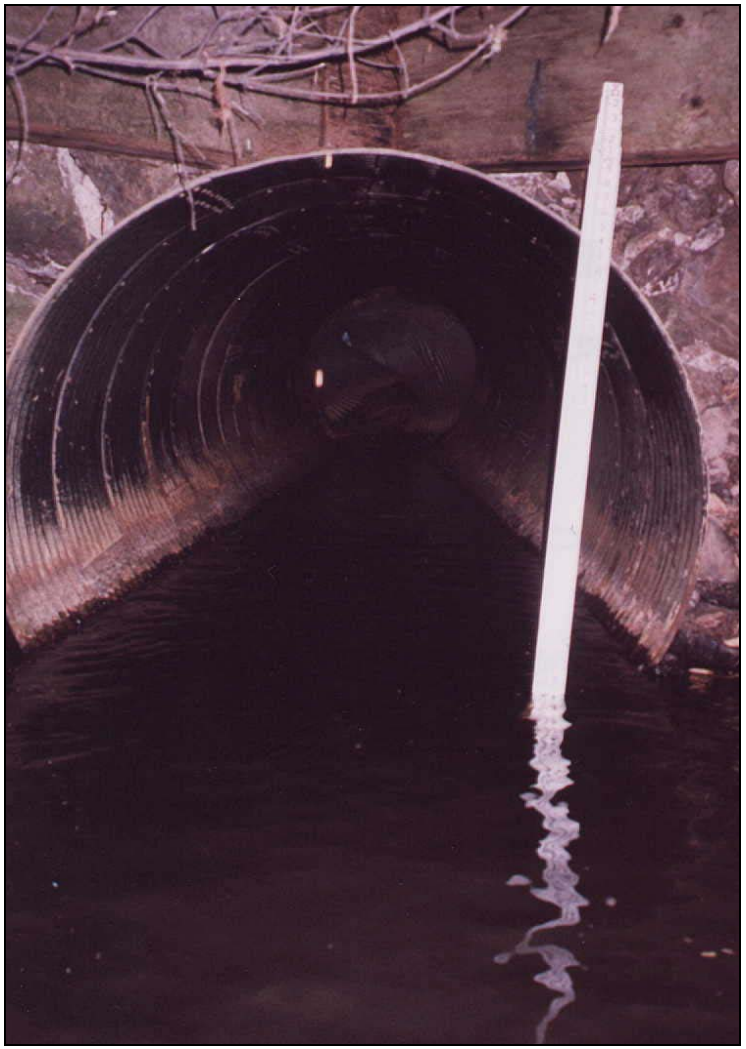
Additional Road Crossings: Downstream (5,400') culvert at Highway 1. Upstream (4,400') county crossing at Bald Hills Road – not surveyed because of known natural barrier (falls) downstream.

Habitat: No recent surveys by CDFG habitat-typing crews. Last surveyed in 1961 by W. Jones. He noted low numbers of juveniles (2-3 fish/100' of channel), bedrock channel with isolated pockets of gravel, and natural falls (6' high) about 0.5 miles above Airport Road. **Quantity =** approximately 1,600' of potential fish-bearing habitat. **Quality =** Fair/poor, no access to walk creek, but channel adjacent to Airport Road is entrenched with areas of bedrock, riparian zone of predominantly hardwoods, cool summer water temperatures, no fish observed in pools above and below culvert.

Preferred Treatment: Properly-sized bridge or arch-culvert set on concrete footings. Lack of potential upstream habitat gains makes this site a low priority for treatment with restoration funds, but should be eventually treated with Mendocino County DOT maintenance funds.



Site #12: Virgin Creek/Airport Road; Coastal



Site #13: Digger Creek/Ocean Drive; Coastal **Ranking: #6 = Moderate Priority**

Location: County Map #2G-1B . T18N, R18W, Section 24. **Culvert Type:** CSP Pipe arch.

Dimensions: 6.0' W x 3.9'H **Length:** 60.0' **Slope:** 1.20% **Modifications:** None

Fill Estimate: 1,443 cubic yards **Overall condition:** Poor

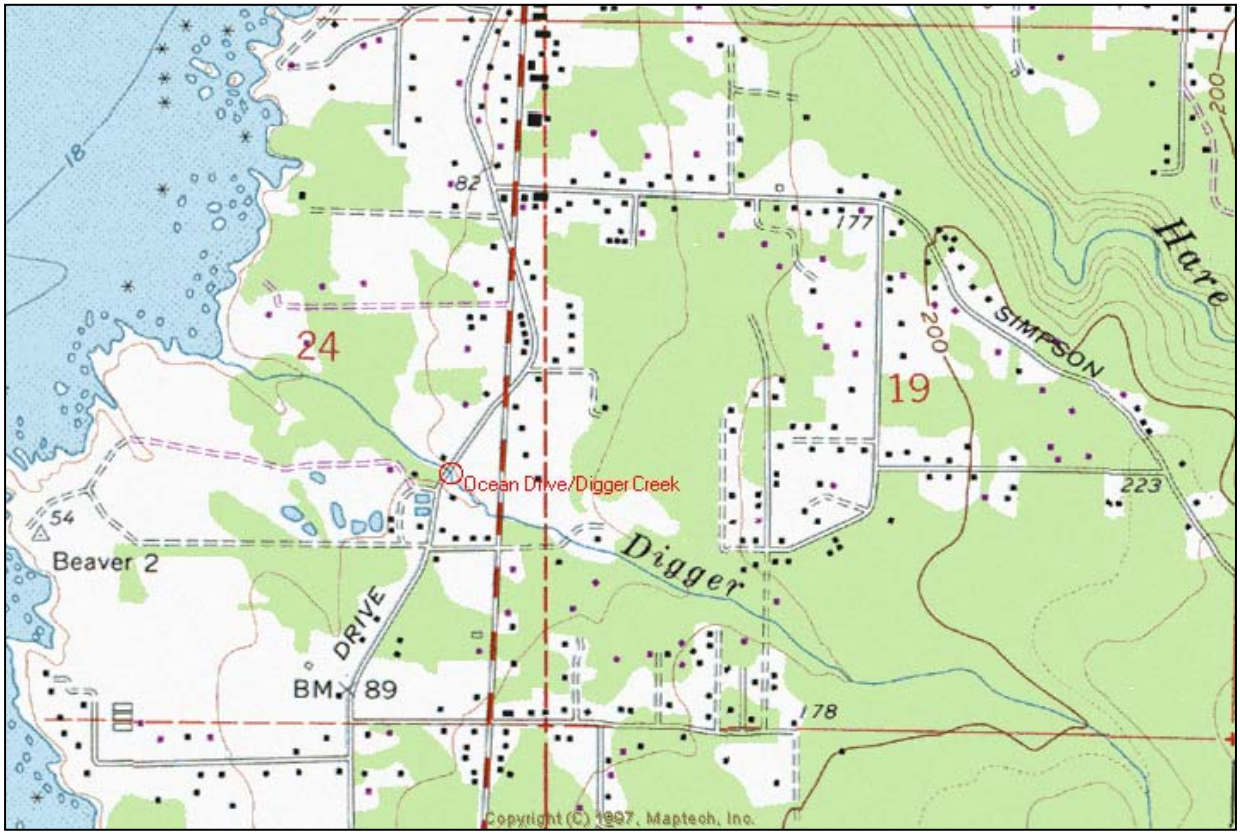
Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a two-year recurrence interval. Ocean Drive overtops on approximately a seven-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a 100% barrier for adult coho salmon and steelhead and all age classes of juveniles due to primarily to the perched outlet (2.9' at low flow) and lack of depth in outlet pool.

Additional Road Crossings: Downstream (950' and 2,000'): two culverts within the Mendocino Coast Botanical Gardens; both probable barriers scheduled for replacement with small bridges in 2001 and 2002. Upstream (600'): Highway 1; concrete box culvert with perched outlet (about 3'); probable 100% barrier. USGS map indicates crossings exist on private roads, 600' and 2,300' upstream of Highway 1.

Habitat: Digger Creek up to Highway 1 (length of 2,900') last surveyed by Thomas Payne and Assoc. in 1989. Sections of same reach were walked on 1/19/01. **Quantity =** approximately 12,000' of potential fish-bearing habitat above Ocean Drive. **Quality =** Fair/poor; adequate rearing habitat with numerous pools; however, spawning habitat is limited and available gravel substrate is highly embedded with fines. Lower channel through Gardens is of moderate gradient and highly confined. Discussion with long-time resident confirmed past presence of spawning coho and steelhead, but no observations since 1950-60's. Resident trout observed during initial site survey and recent stream walk. A trout farm pond is located on private property south of Digger Creek. Pond is supplied by diverted Digger Creek flow.

Preferred Treatment: Replace with a properly-sized pipe arch set on concrete footings.



Site #13: Digger Creek/Ocean Drive; Coastal

Site #14: Mitchell Creek/Mitchell Creek Road; Coastal **Ranking: #15 = Low Priority**

Location: County Map #2G33 . T18N, R17W, Section 32. **Culvert Type:** Circular CSP.

Dimensions: Diameter = 5.0' **Length:** 142.0' **Slope:** 0.33% **Modifications:** Outlet pool elevation controlled by rock/concrete weir. **Fill Estimate:** 26,015 cubic yards

Overall condition: Extremely poor; floor is rusted through, heavy seepage of flow under culvert.

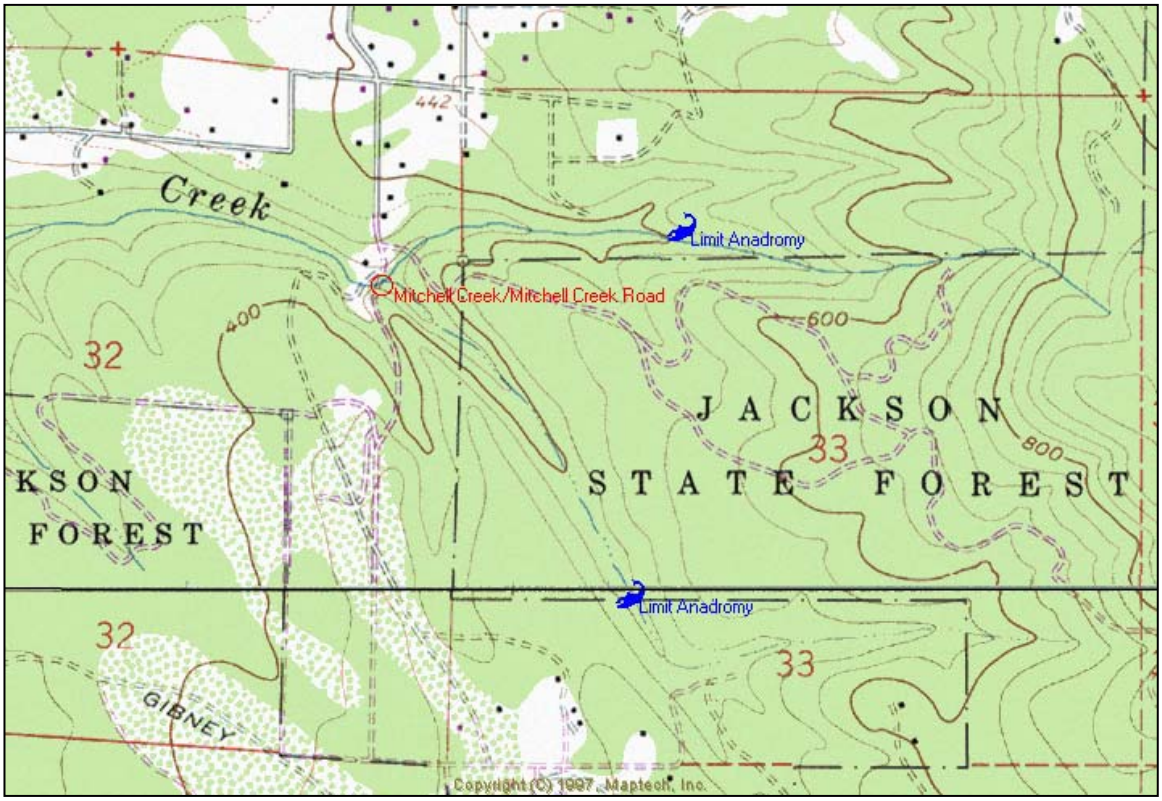
Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a three-year recurrence interval (note recent debris in first photograph). Mitchell Creek Road overtops on greater than a 250-year storm discharge (large road fill).

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is 71% passable for adult coho salmon and steelhead, but a total barrier for all age classes of juveniles due primarily to perched outlet (2.9' high at low flow) at rock and concrete weir (note third photograph).

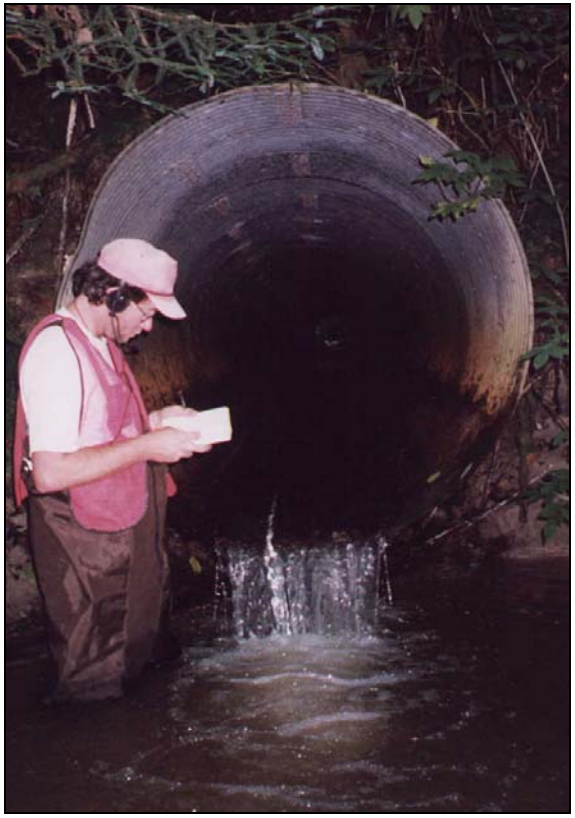
Additional Road Crossings: Downstream (2.6 miles), 250' long, 10.0' diameter culvert with concrete floor and aprons at Highway 1. Topographic maps suggest private road crossings exist between Highway 1 and county road. Upstream (400'), a private road crossing: a plastic circular culvert installed in 1999 to replace a failed Humboldt crossing – appears inadequately sized and probably a partial migration barrier.

Habitat: CDFG memos: (Macedo 2000) confirmed 6 juvenile steelhead in tributary above county road. Hendrix (2000) surveyed from mouth to Highway 1: noted a concrete weir 150' upstream of mouth (10'W x 2'H). Primbs (1965) sampled coho and steelhead juveniles, noted stream choked with slash, considered "low fisheries value". Jones (1963) documented six adult coho w/upper caudal clips above Highway 1, strays from either Pudding Ck or S.Fk. Noyo River. Nye (1959) observed no fish; "overall impacts from recent logging is terrible". **Quantity =** approximately 6,100' of potential fish-bearing habitat. **Quality =** Fair/poor: dense riparian of young conifers; cool summer water temperatures; channel filled with sand; observed several young-of-year above and below county road on initial site visit.

Preferred Treatment: Replace with bridge or properly-sized bottomless arch-culvert.



Site #14: Mitchell Creek/Mitchell Creek Road;



Site #15: Johnson Creek/Orr Springs Road; So.Fk. Big River; Big River **Ranking: #5 = High Priority**

Location: County Map #3G. T16N, R14W, Section 20. **Culvert Type:** Circular SSP.

Dimensions: Effective diameter = 10.8' **Length:** 50.0'

Slope: Overall = 3.66%; break-in-slope over lower 23.9' = 4.85% **Modifications:** None.

Fill Estimate: 906 cubic yards **Overall condition:** Good.

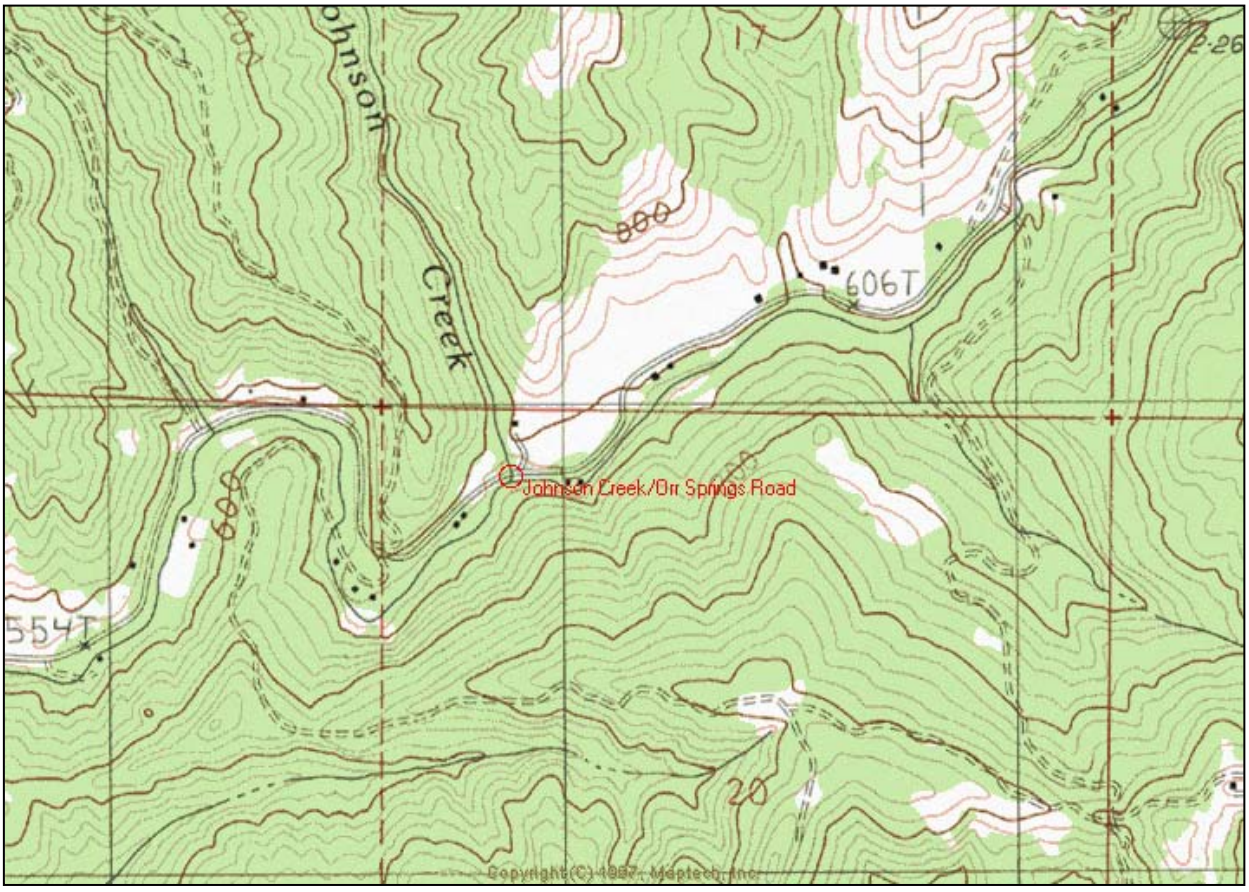
Sizing: Slightly undersized; HW/D = 1 on a storm flow with approximately a 30-year recurrence interval (note recent debris in first photograph). Orr Springs Road overtops on about a 155-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a total barrier for adult coho salmon and steelhead, and all age classes of juveniles due primarily to excessive velocities over steep slope, lack of depth at lower migration flows, and leap required to enter culvert. At higher flows, water level in South Fork Big River may backwater Johnson Creek culvert.

Additional Road Crossings: Downstream, none. Upstream: potential private crossing (1.4 miles).

Habitat: Jones (2001) summarized Holman et al. (1959) survey: sampled juvenile steelhead up to 1.4 miles above Orr Springs Road, Holman also noted culvert as a migration barrier. In 1980's Nat Bingham raised and released coho in Johnson Creek. **Quantity =** approximately 8,900' of channel above county road. **Quality =** Good. No fish observed during initial site visit, walked about 500' upstream, dense riparian of conifers and hardwoods, numerous pools with LWD and bedrock. Landowner reported "lots of steelhead way up creek" in years of good rainfall.

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings.



Site #15: Johnson Creek/Orr Springs Road; South Fork Big River; Big River

Site #16: Dark Gulch/Orr Springs Road; So.Fk. Big River; Big River **Ranking: #7 = Moderate Priority**

Location: County Map #3G. T16N, R14W, Section 16. **Culvert Type:** Circular SSP.

Dimensions: Effective diameter = 7.7' **Length:** 89.2' **Slope:** 3.29%

Modifications: Culvert bottom lined with concrete; boulder weir at outlet pool control (held together with cable and epoxy).

Fill Estimate: 3,200 cubic yards **Overall condition:** Poor, culvert floor is rusted through in numerous places.

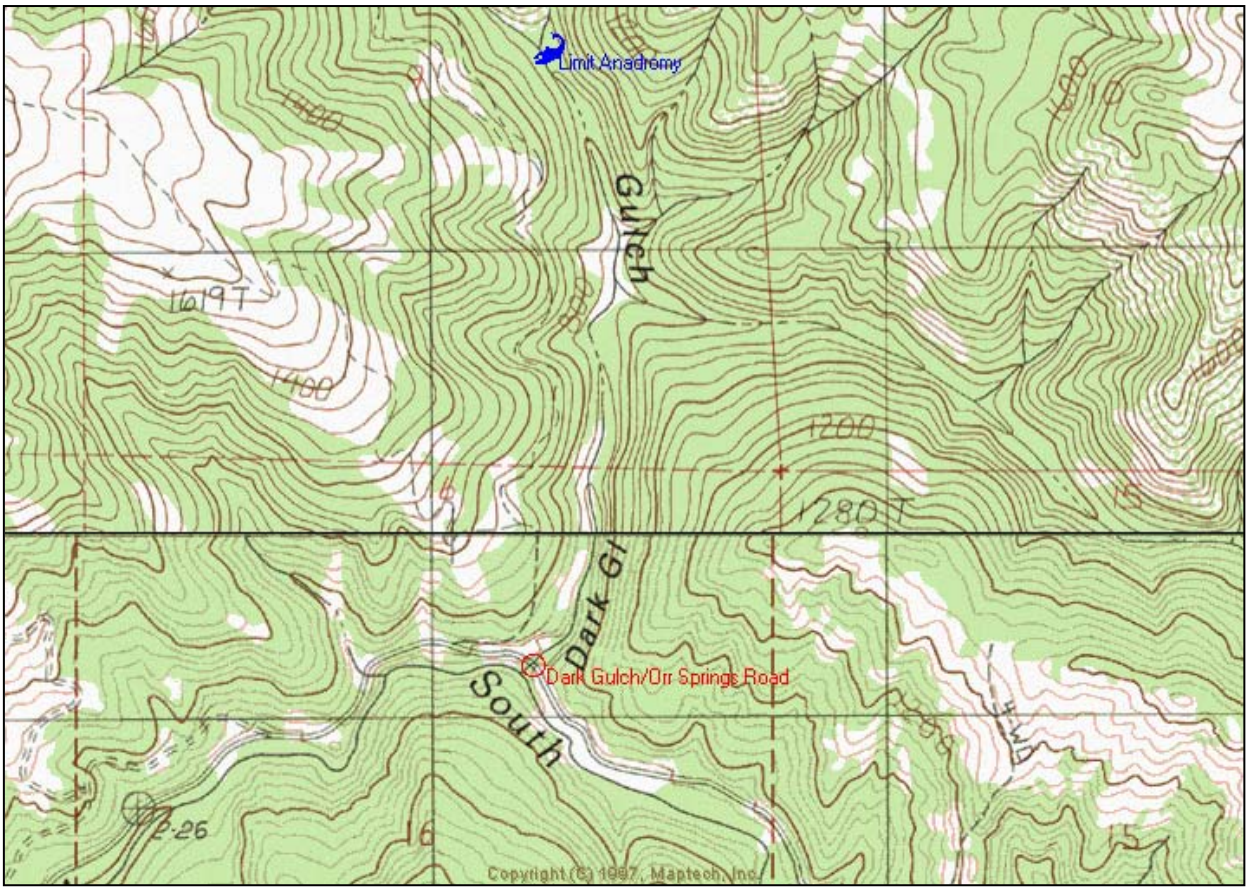
Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a two-year recurrence interval. Orr Springs Road overtops on about a 22-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a total for adult coho salmon and steelhead, as well as all age classes of juveniles due primarily to excessive velocities over steep slope, lack of depth at lower migration flows, and leap required to enter culvert. At higher flows, water level in South Fork Big River may backwater Dark Gulch culvert.

Additional Road Crossings: Downstream, none. Upstream, none.

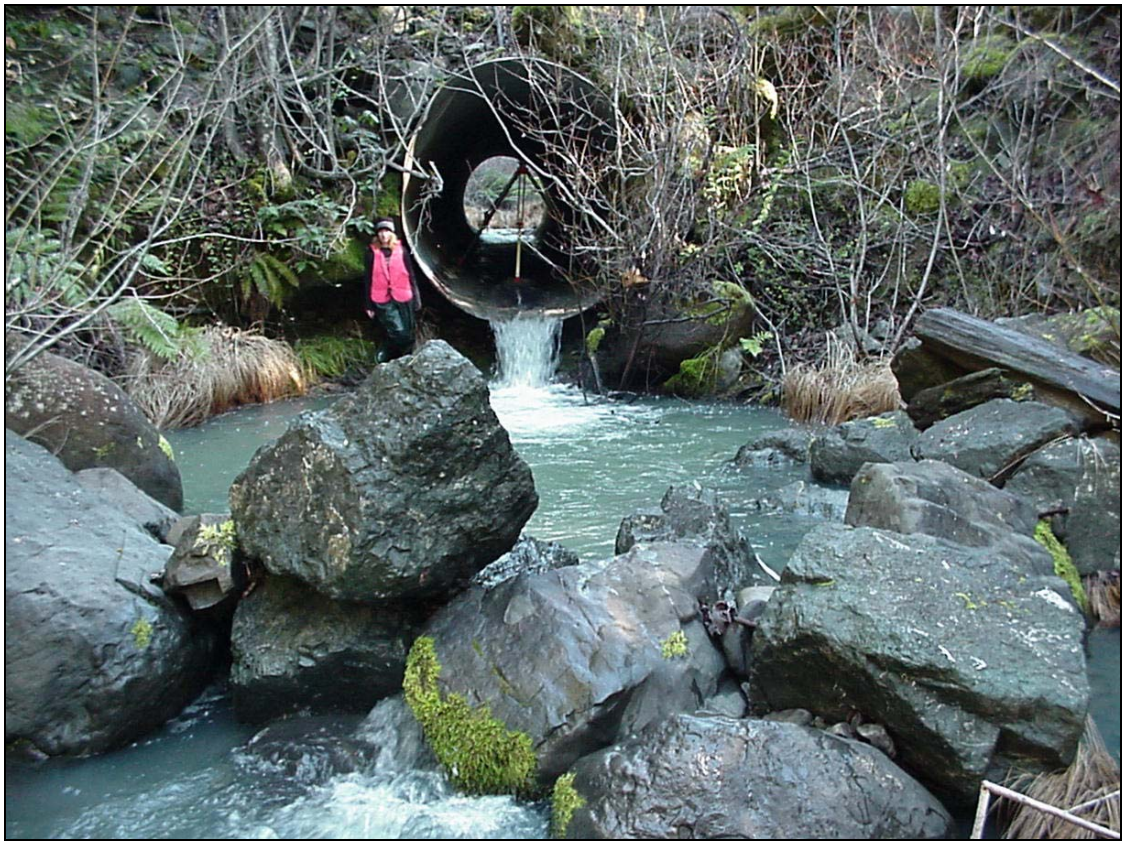
Habitat: Jones (2001) summarized Elwell (1958) survey: no fish observed, distance of survey not provided. Jones (1999) noted Orr Springs Road culvert as a barrier. **Quantity =** approximately 8,900' of channel above county road. **Quality =** Fair. No fish observed during initial site visit, walked only about 500' upstream, dense riparian of conifers and hardwoods, small bedrock-formed pools. Upstream property is posted, no access.

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings.



NOTE: Front cover photograph of final report is outlet at Dark Gulch/Orr Springs Road.

Site #16: Dark Gulch/Orr Springs Road; So.Fk. Big River; Big River



Site #17: Unnamed tributary/Orr Springs Road; S.Fk. Big River; Big River **Ranking: #10 = Moderate Priority**

Location: County Map #3G. T18N, R14W, Section 23. **Culvert Type:** Rectangular concrete box with sloped apron at outlet.

Dimensions: 12.0'W x 10.0'H **Length:** 50.0' **Slope:** Within culvert = 0.83%; concrete apron = 18.1%.

Modifications: None. **Fill Estimate:** No fill material. **Overall condition:** Good.

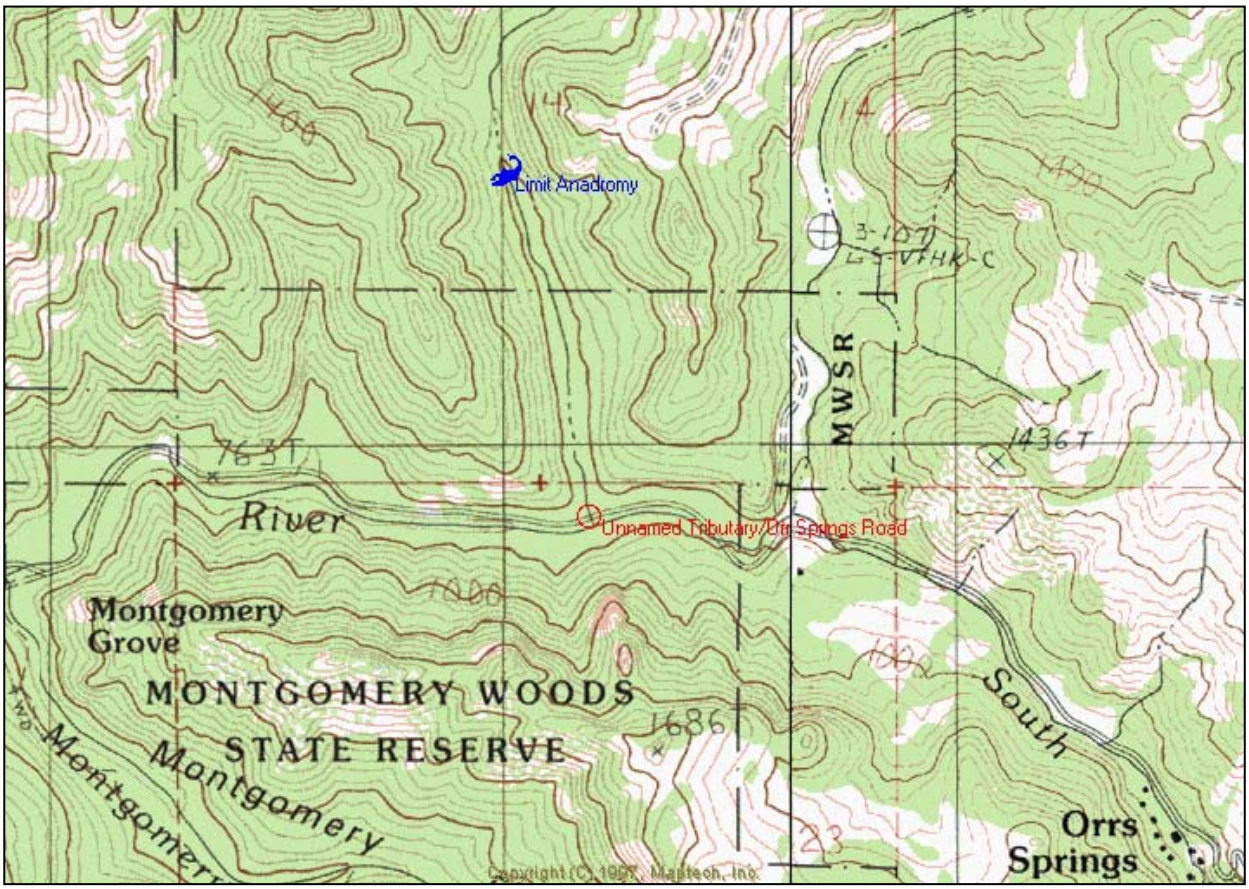
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a 23-year recurrence interval (note recent debris in first photograph). Orr Springs Road overtops on about a 79-year storm discharge.

Barrier Status: For the range of migration flows (Q_{lp} – Q_{hp}), FishXing determined culvert is a total barrier for adult coho salmon and steelhead and all age classes of juveniles due primarily to excessive velocities and a lack of depth at lower migration flows within culvert. At higher flows, water level in South Fork Big River may backwater this road crossing and unnamed tributary.

Additional Road Crossings: Downstream, none. Upstream: private crossing (1.8 miles).

Habitat: CDFG files and Jones (2001): no information for this unnamed creek that flows through Montgomery State Park property. **Quantity =** approximately 2,900' of channel until a 400' reach at 10%; then 5,300' reach at 3-5%. **Quality =** Good. No fish observed during initial site visit, walked about 750' upstream, dense riparian of conifers and hardwoods, numerous pools with LWD and bedrock. About 300' above Orr Springs Road is a natural bedrock cascade that drops about four feet over a 20' distance; at higher flows looks passable for adults; may prohibit upstream juvenile migration. Talked to Park Ranger that has only noticed spawning fish in South Fork Big River; said tributary usually flowed in the summer with at least isolated pools.

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings.



Site #17: Unnamed tributary/Orr Springs Road; South Fork Big River; Big River

Site #18: Marsh Creek/ Flynn Creek Road; Albion River **Ranking: #4 = High Priority**

Location: County Map #2G. T16N, R15W, Section 13. **Culvert Type:** Circular CSP.

Dimensions: Effective diameter = 7.8' **Length:** 81.0' **Slope:** 1.88%

Modifications: Culvert floor lined with concrete; riprap placed at outlet.

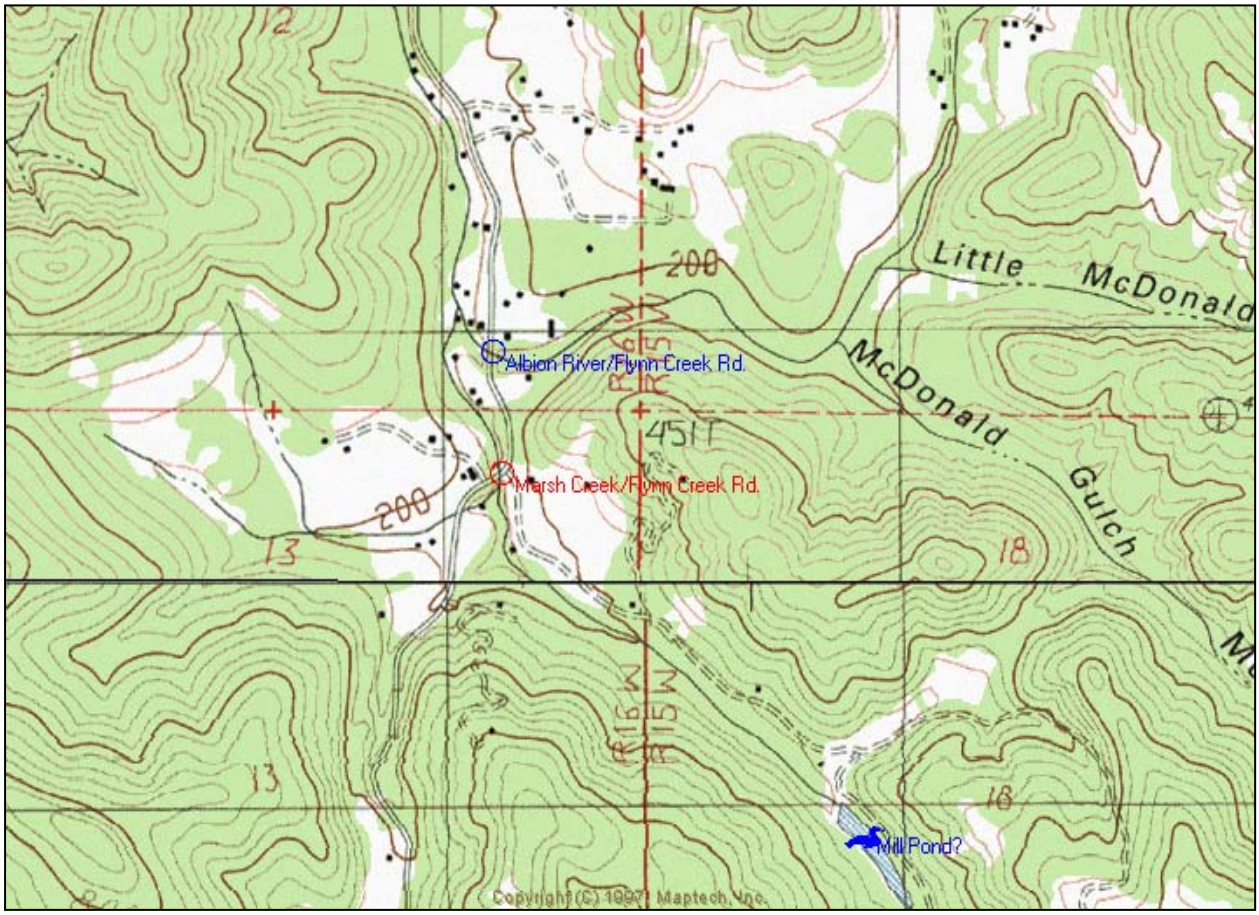
Fill Estimate: 2,955 cubic yards **Overall condition:** Poor, concrete used to patch rusted-out floor. Culvert is poorly aligned with stream channel; flow takes about 45° turn (left) at inlet.

Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a three-year recurrence interval (note recent debris in first photograph). Flynn Creek Road overtops on about a 30-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is 8% passable for adult coho salmon and steelhead, but a total barrier for all age classes of juveniles due primarily to excessive velocities over the smooth concrete lining. On 2/24/00, five timed-floats produced an average velocity of 8.1 feet/second; velocity appears faster near outlet with turbulent flow at riprap.

Habitat: Limited information in CDFG files: Cunningham (1977) stream survey; no fish observed during drought year. **Quantity =** approximately 3,900' of channel to old mill pond; or 12,900' if no barrier exists at pond. **Quality =** Fair; property posted "Private", adjacent to county road, dense riparian of young conifers and hardwoods, dry channel with isolated pools in summer (no fish observed). Several young-of-year and 1+ year-old steelhead observed below culvert on 3/30/00 (also two kingfishers at outlet pool).

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings.



Site #18: Marsh Creek/ Flynn Creek Road; Albion River

Site #19: Albion River/Flynn Creek Road; Albion River **Ranking: #1 = Top Priority**

Location: County Map #2G. T16N, R15W, Section 12. **Culvert Type:** Circular CSP.

Dimensions: Effective diameter = 13.6' **Length:** 60.0' **Slope:** 2.45% **Modifications:** Culvert floor lined with concrete.

Fill Estimate: 2,663 cubic yards **Overall condition:** Fair, floor rusted-out, but the lined with concrete.

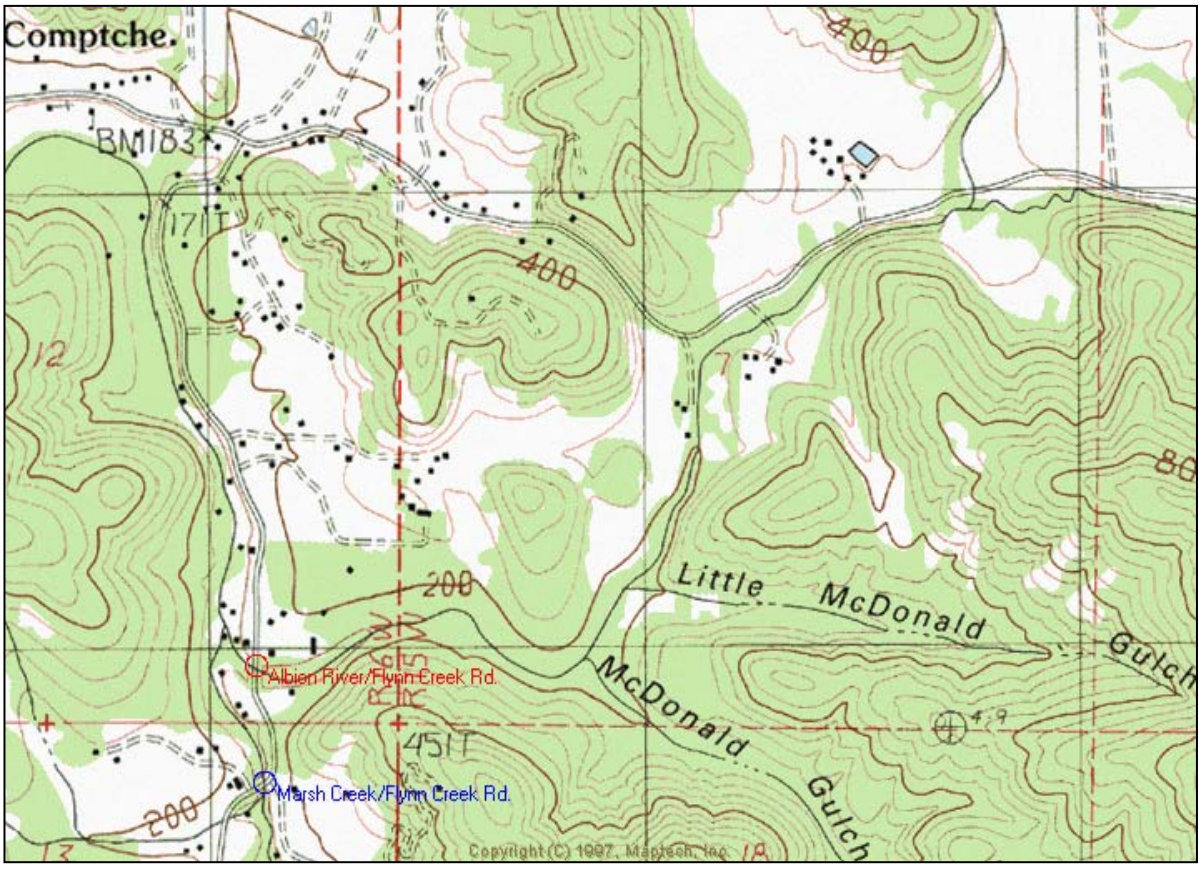
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a 21-year recurrence interval (note recent debris in first photograph). Flynn Creek Road overtops on about a 48-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a total barrier to adult coho salmon and steelhead and all age classes of juveniles due primarily to excessive velocities over the smooth concrete lining, lack of depth at lower migration flows, and leap required to enter culvert. On 2/24/00, observed moderate velocities, 4" depth in culvert and 1.5' drop at outlet. However, on 3/30/00 observed numerous newly-emerged fry in channel margins above and below Flynn Creek Road.

Additional Road Crossings: Downstream, none. Upstream: private crossing (1.1.miles from Flynn Ck. Road) two crossings on Comptche/Ukiah Road after channel splits (1.5 and 2.1 miles from Flynn Ck. Road). On 2/24/00 it appeared most Albion River flow was from channel south of Comptche Road.

Habitat: Habitat-typed and electrofished in 1996 using CDFG protocols. Dense canopy cover (93%); deep pools (23% > 3' deep); and good spawning gravels (94% of pooltails w/embeddedness ratings of #1 and #2). In 1996, Jones sampled 24 steelhead and 19 coho young-of-year in a single pool above Flynn Creek. Road. Fish observed in most pools. **Quantity** = approximately 24,100' of channel above county road. **Quality** = Good. Observed several y-o-y and crayfish on initial site visit (10/21/99) and numerous fry on 3/30/00.

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings.



Site #19: Albion River/Flynn Creek Road; Albion River

Site #20: Witherell Creek/Anderson Valley Way; Anderson Ck., Navarro River **Ranking: #16 = Low Priority**

Location: County Map #3H22. T14N, R14W, Section 34. **Culvert Type:** Circular CSP.

Dimensions: diameter = 6.0 ' **Length:** 84.3' **Slope:** 1.86% **Modifications:** None.

Fill Estimate: 3,341 cubic yards **Overall condition:** Good, relatively new installation.

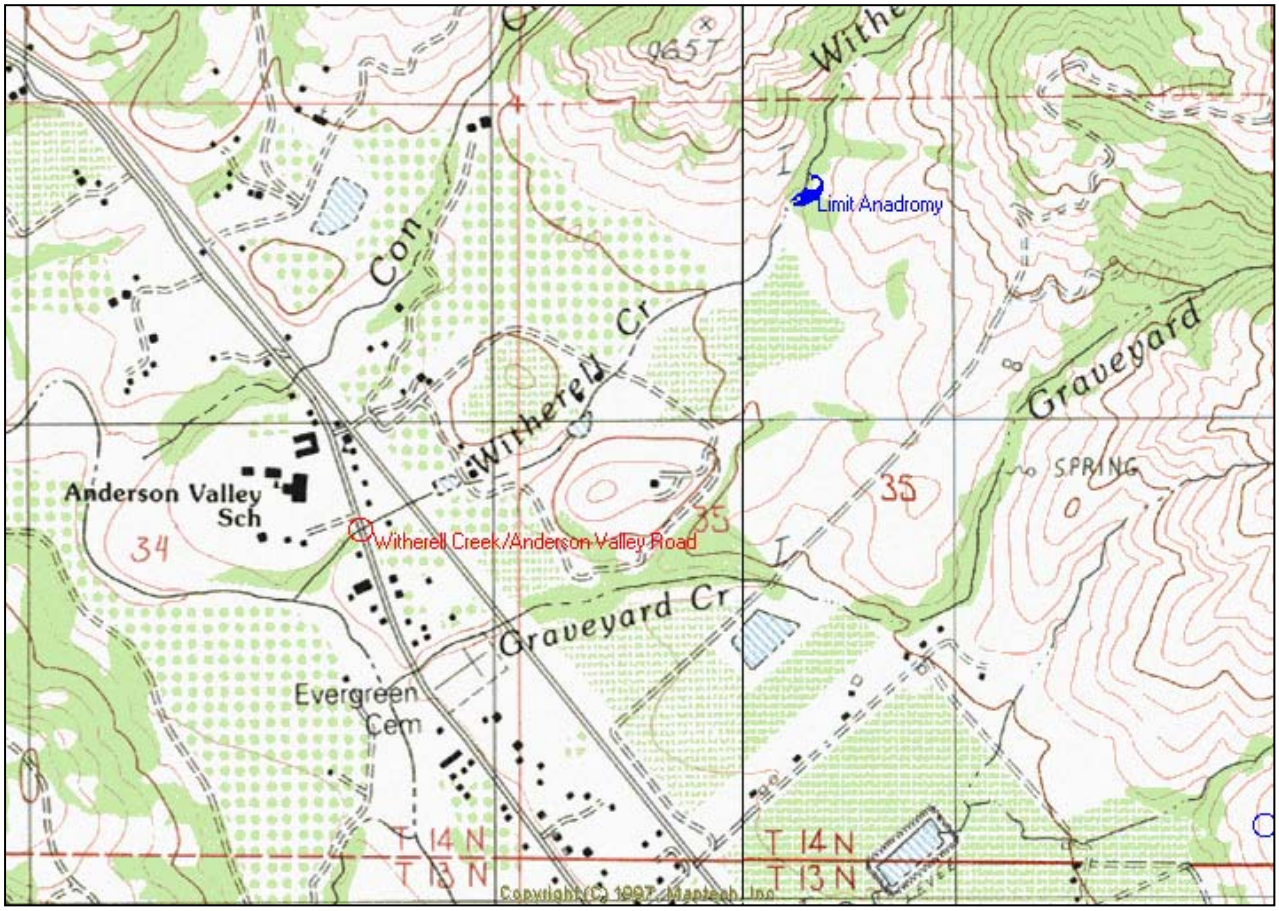
Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a three-year recurrence interval. Anderson Valley Way overtops on about a 40-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a total barrier for all species and lifestages because of either lack of depth at lower flows and excessive velocities on higher flows.

Additional Road Crossings: Downstream, none. Upstream (500') = Highway 128; then 300' more to private pond/road crossing; then 900' more to second pond; then 400' more to second private road crossing.

Habitat: CDFG files had no information on Anderson Creek tributaries. **Quantity** = approximately 4,400' of potential fish-bearing habitat **Quality** =Poor. Dry channel, narrow and confined, thick growth of Himalayan blackberries, lots of trash.

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings. Lack of fisheries benefits makes this site a low-priority to treat with restoration funds. Mendocino County DOT should conduct regular maintenance of this crossing and replace crossing when culvert wears out.



Note: No photographs available for Whiterell Creek/Anderson Valley Way

Site #21: Ornbaun Creek #1/Ornbaun Road; Anderson Ck., Navarro River **Ranking: #18 = Low Priority**

Location: County Map #3H22. T13N, R14W, Section 3. **Culvert Type:** Circular CSP's (three pipes).

Dimensions: One pipe = 3.5' diameter and two pipes = 4.0' diameter (each). **Length:** 30.5' **Slope:** 5.96%

Modifications: None. **Fill Estimate:** 284 cubic yards **Overall condition:** Poor, all pipes rusted through.

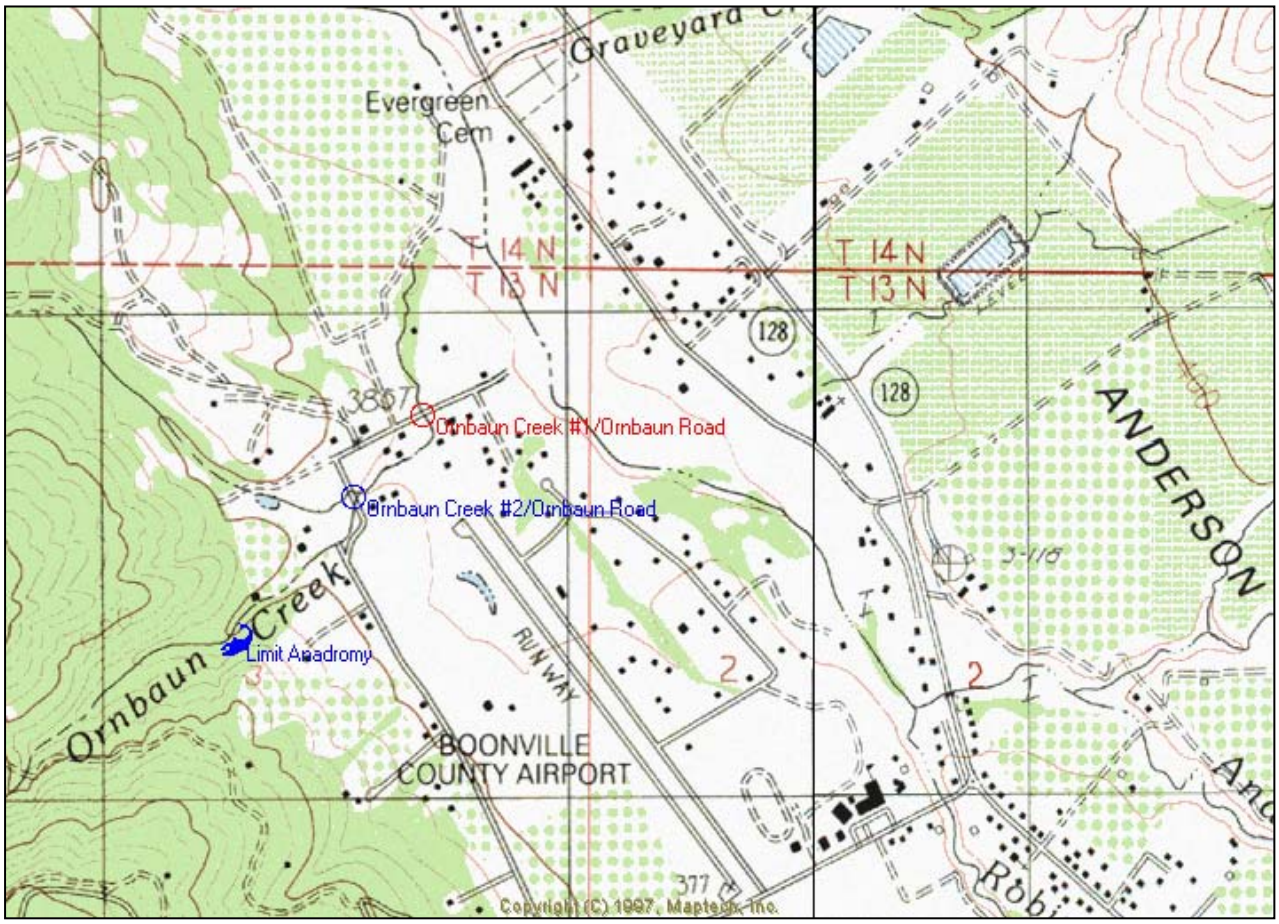
Sizing: Extremely undersized; for all three culverts combined, HW/D = 1 on a storm flow with less than a two year recurrence interval. Ornbaun Road overtops on about a 23-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a total barrier for all species and lifestages because of lack of depth at lower flows and excessive velocities on higher flows.

Additional Road Crossings: Downstream, none. Upstream (400') Ornbaun Road #2.

Habitat: CDFG files had no information on Anderson Creek tributaries. **Quantity =** approximately 2,500' of potential fish-bearing habitat **Quality =**Poor. Dry channel, no pools, narrow and confined, thick growth of Himalayan blackberries, lots of trash, flows through residential area.

Preferred Treatment: Properly-sized pipe-arch set on concrete footings. Lack of fisheries benefits makes this site a low-priority to treat with restoration funds. Mendocino County DOT should conduct regular maintenance of this crossing and replace crossing when culvert wears out.



Site #21: Ornbaun Creek #1/Ornbaun Road; Anderson Ck., Navarro River

Site #22: Ornbaun Creek #2/Ornbaun Road; Anderson Ck., Navarro River **Ranking: #19 = Low Priority**

Location: County Map #3H22. T13N, R14W, Section 3. **Culvert Type:** Circular CSP's (three pipes).

Dimensions: Each pipe = 4.0' diameter. **Length:** 41.3' **Slope:** 3.37%

Modifications: None. **Fill Estimate:** 400 cubic yards **Overall condition:** Poor, all pipes have rusted through and been lined with concrete.

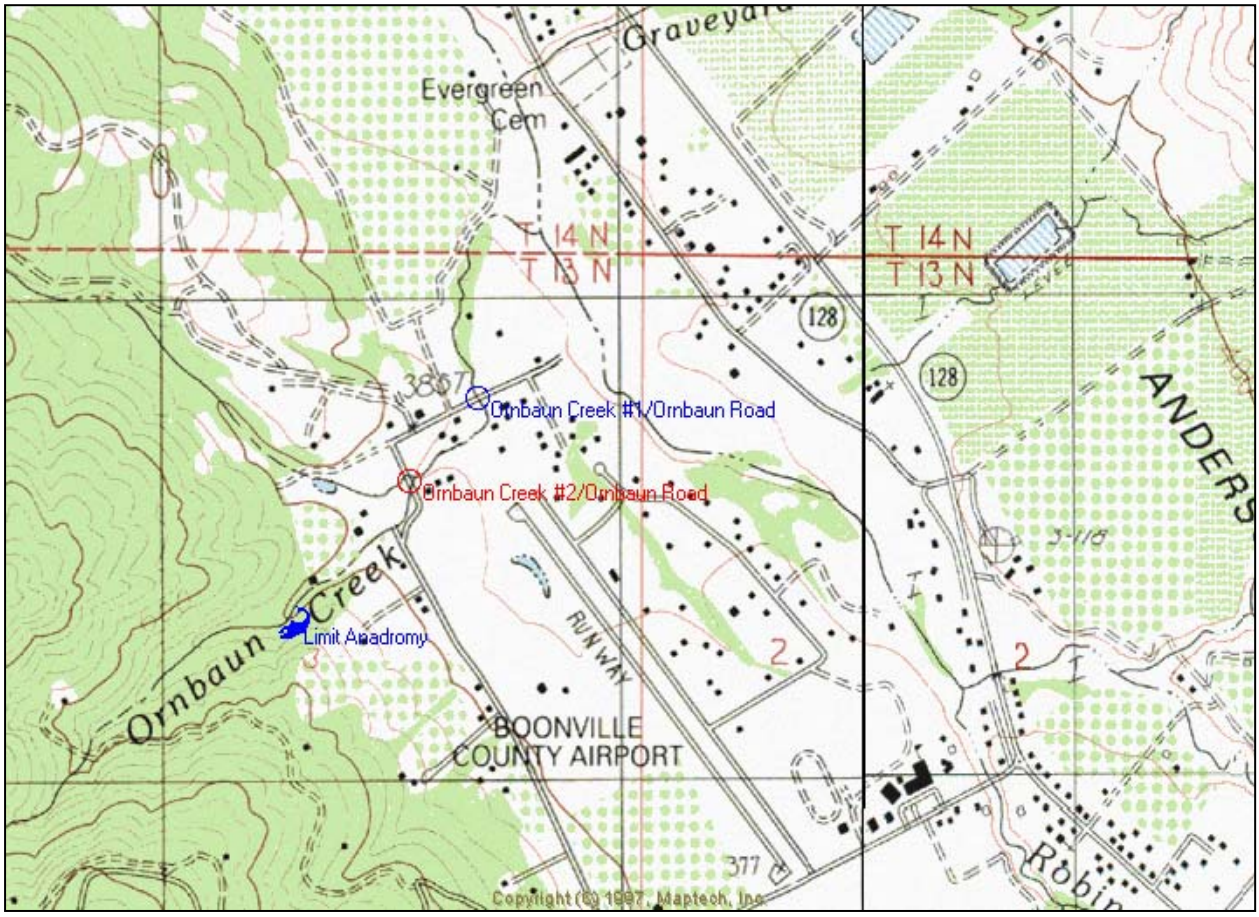
Sizing: Adequately sized; for all three culverts combined, HW/D = 1 on a storm flow with approximately a 96-year recurrence interval. Ornbaun Road overtops on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} – Q_{hp}$), FishXing determined culvert is a total barrier for all species and lifestages because of either lack of depth at lower flows and excessive velocities on higher flows.

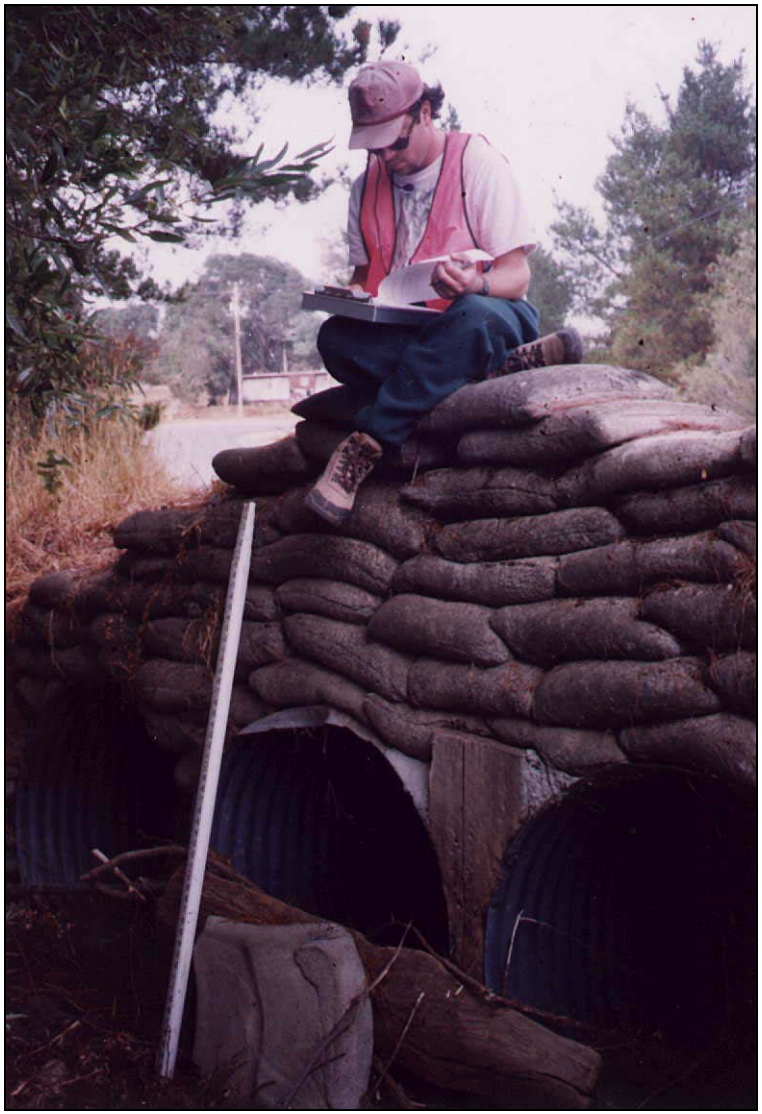
Additional Road Crossings: Downstream, (400') Ornbaun Road #1. Upstream, none.

Habitat: CDFG files had no information on Anderson Creek tributaries. **Quantity =** approximately 1,500' of potential fish-bearing habitat **Quality =** Poor. Dry channel, no pools, narrow and confined, thick growth of Himalayan blackberries, lots of trash, flows through residential area.

Preferred Treatment: Properly-sized pipe-arch set on concrete footings. Lack of fisheries benefits makes this site a low-priority to treat with restoration funds. Mendocino County DOT should conduct regular maintenance of this crossing and replace crossing when culvert wears out.



Site #22: Ornbaun Creek #2/Ornbaun Road; Anderson Ck., Navarro River



Site #23: Spanish Creek/Crispen Lane; Brush Creek, Coastal **Ranking: #11 = Moderate Priority**

Location: County Map #2H34. T13N, R16W, Section 19. **Culvert Type:** Circular CSP. **Dimensions:** Diameter = 4.0' **Length:** 80.0' **Slope:** 2.16% **Modifications:** None.

Fill Estimate: 2,353 cubic yards **Overall condition:** Good, relatively new installation.

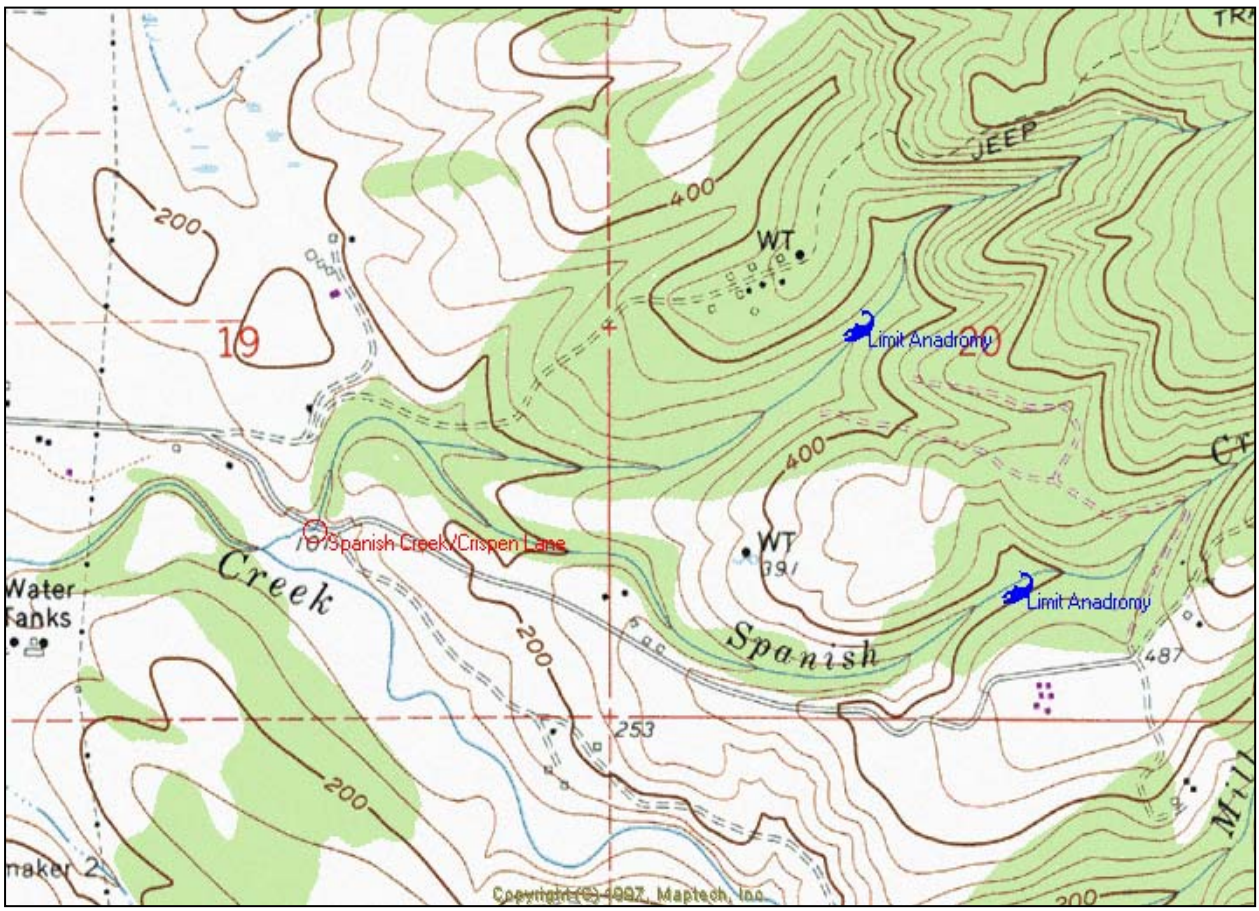
Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a one-year recurrence interval. Crispen Lane overtops on about a six-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is a total barrier adult coho salmon and steelhead, but a temporal/partial juvenile barrier: 64% passable for 2+ year-olds, 24% passable for 1+ year-olds, and 6% passable for young-of-year. On 2/24/00, measured an average surface velocity = 5.6 feet/second, with 4" depth in culvert near inlet. Velocities appeared faster at channel drop just above culvert inlet and within the lower 20' of the culvert.

Additional Road Crossings: Downstream, none. Upstream, none.

Habitat: Jones (2001) summarized the following information. Johnson and Miller (9/8/67) observed numerous steelhead up to 5" in length, noted that both pools and spawning gravels were limited, no mention of any migration barriers. CDFG (1968) recorded juvenile coho 1.2 miles up Spanish Creek. Jones (1983) electrofished only juvenile steelhead. **Quantity =** approximately 10,200' of channel above county road. **Quality =** Fair/poor. Private property with no access. Downstream of Crispen Lane creek is impacted by unfenced grazing, upstream grazing and timber harvest is evident. On initial site visit, observed evidence that private landowner had driven heavy equipment up channel and cut down riparian hardwoods. Some of this wood then plugged culvert inlet, which was cleared on our 2/24/00 site visit.

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings.



Site #23: Spanish Creek/Crispen Lane; Brush Creek, Coastal

Site #24: Hathaway Creek/Windy Hollow Road; Garcia River **Ranking: #22 = Priority**

Location: County Map #2H34. T12N, R17W, Section 1. **Culvert Type:** Circular CSP.

Dimensions: Diameter = 5.8.0' **Length:** 61.0' **Slope:** 0.31% **Modifications:** None.

Fill Estimate: 2,353 cubic yards **Overall condition:** Poor, culvert floor is rusted through.

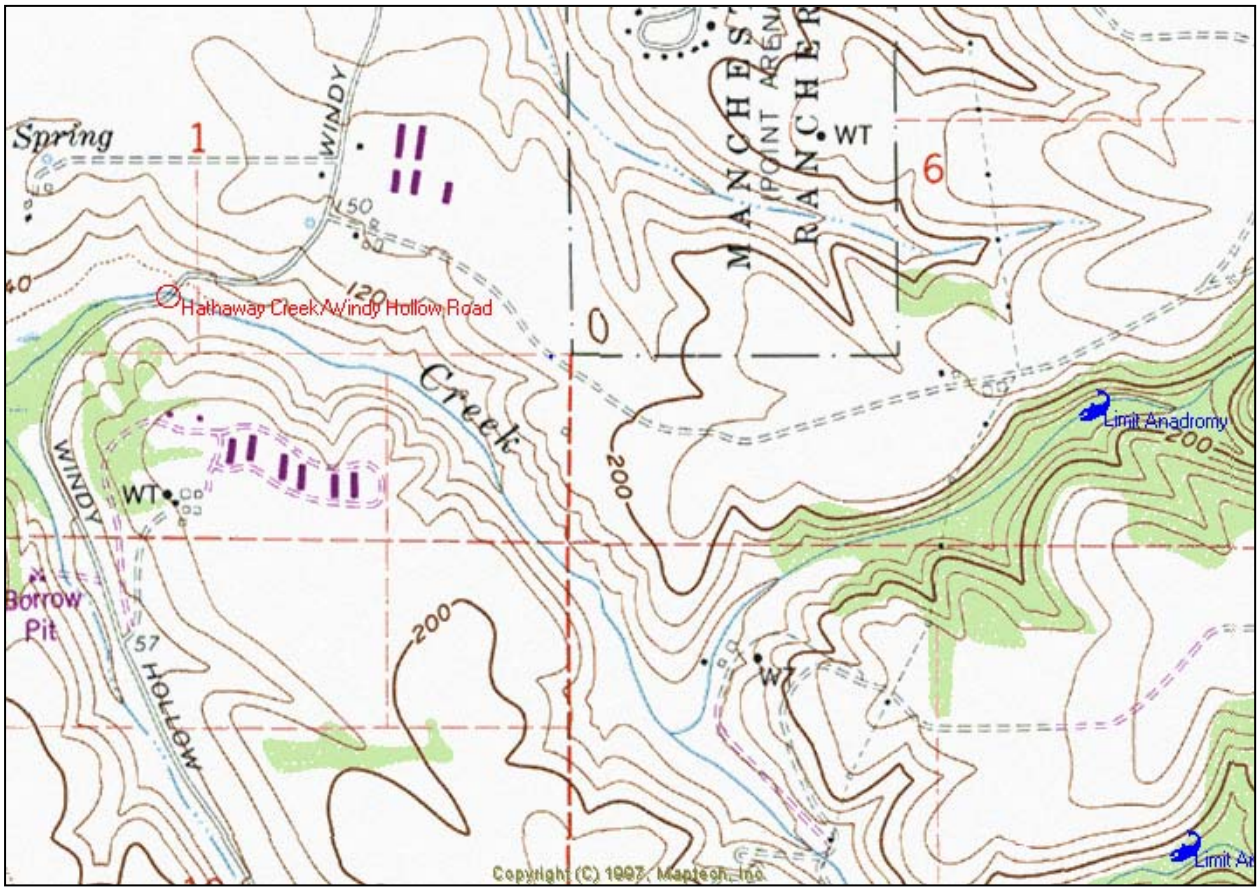
Sizing: Extremely undersized; HW/D = 1 on a storm flow with approximately a 1.5-year recurrence interval. Windy Hollow Road overtops on about a four-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is 100% passable for all species and lifestages presumed present (coho salmon and steelhead). Culvert is submerged about three feet deep at low flow.

Additional Road Crossings: Downstream, (1.0 miles) is a bridge at Highway 1. Upstream, (1.3 miles) USGS topographic map indicates a private road crossing on southern fork of creek.

Habitat: No information available in CDFG files or Jones (2001). **Quantity =** approximately 10,200' of channel above county road. **Quality =** Fair/poor. Private property with no access. Downstream of Windy Hollow Road creek is impacted by unfenced grazing, upstream some grazing and timber harvest is evident. No fish observed during initial site visit, however heard verbal accounts of historic steelhead and coho salmon spawning in upper watershed (Bell, pers. comm.).

Preferred Treatment: Properly-sized bridge or pipe-arch set on concrete footings. Because current culvert provides fish passage this site is not a restoration priority; however poor condition of culvert means replacement should occur relatively soon.



Site #24: Hathaway Creek/Windy Hollow Road; Garcia River

Site #25: Mill Creek #1/Fish Rock Road; Garcia River **Ranking: #21 = Low Priority**

Location: County Map #2H34. T12N, R13W, Section 8. **Culvert Type:** SSP pipe-arch.

Dimensions: 16.5' W x 10.0'H **Length:** 71.0' **Slope:** -0.06% **Modifications:** None.

Fill Estimate: 920 cubic yards **Overall condition:** Good.

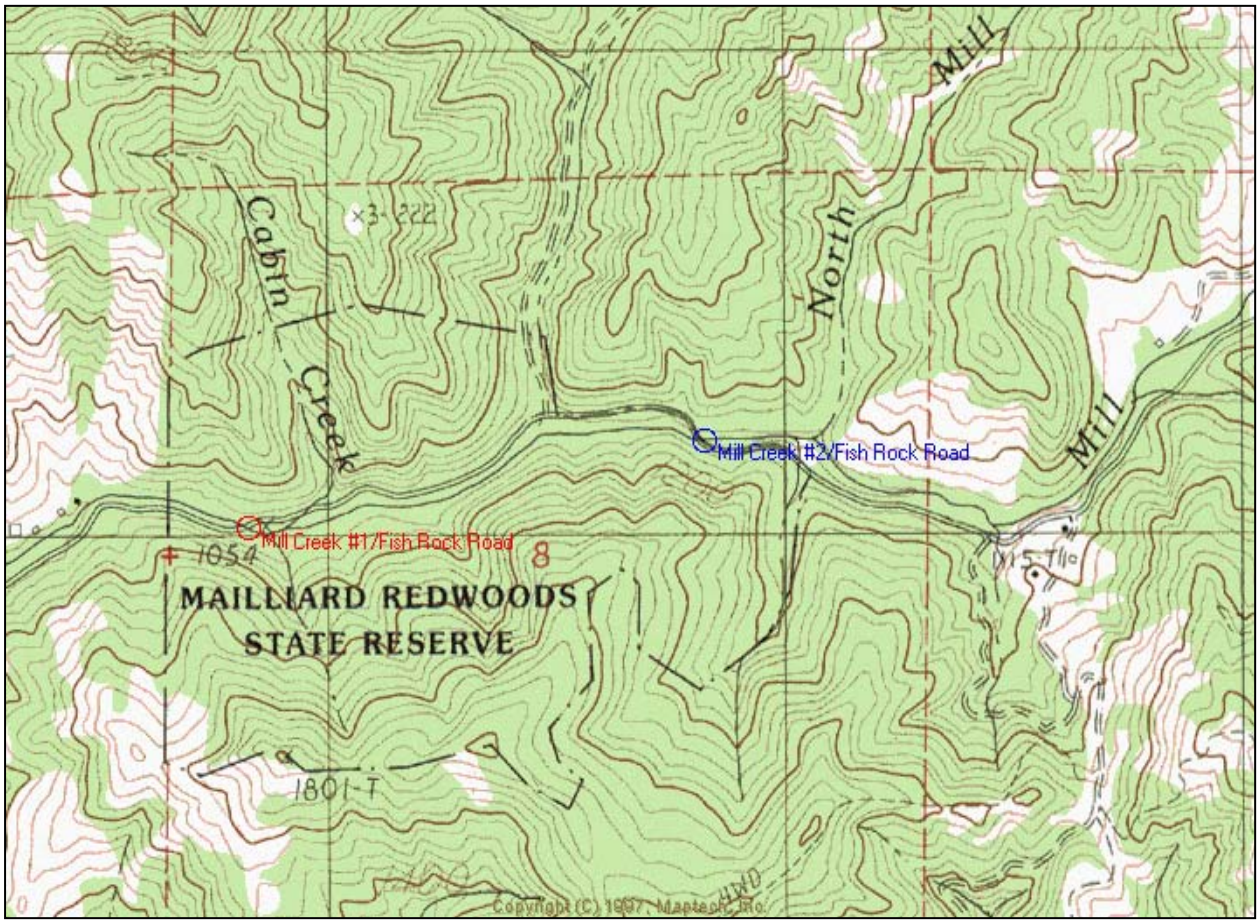
Sizing: Adequately sized; HW/D = 1 on a storm flow with approximately a 134-year recurrence interval. Fish Rock Road overtops on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is at least 90% passable for all species and lifestages presumed present (coho salmon and steelhead). Culvert is submerged about 10" deep at low flow.

Additional Road Crossings: Downstream, none. Upstream, (3,600') county crossing at Mill Creek #2/Fish Rock Road.

Habitat: No recent CDFG habitat surveys for Mill Creek. Jones (2001) provided these summaries: Holman (1968) sampled juvenile steelhead 5.5 miles up Mill Creek. Maahs (1996) carcass survey, observed two steelhead spawning. Mailliard (1999) observed steelhead 5.5 miles upstream. **Quantity =** approximately 13,400' of channel above crossing. **Quality =** Good, especially through State Park, dense riparian of predominantly mature, second-growth redwoods, abundant pools with LWD, and numerous pooltails spawning gravels. Observed numerous young-of-year and 1+ year-old steelhead above and below culvert. No redds or adults seen during two winter visits (2/25/00 and 3/31/00) over a 1.3 mile reach of Mill Creek (walked about 3,000' and spot-checked other areas from Fish Rock Road).

Preferred Treatment: None required, current crossing provides passage and is properly-sized.



Site #25: Mill Creek #1/Fish Rock Road; Garcia River

Site #26: Mill Creek #2/Fish Rock Road; Garcia River **Ranking: #9 = Low Priority**

Location: County Map #2H34. T12N, R13W, Section 8. **Culvert Type:** SSP pipe-arch.

Dimensions: 12.0' W x 8.0'H **Length:** 60.5' **Slope:** 0.64% **Modifications:** None.

Fill Estimate: 690 cubic yards **Overall condition:** Good.

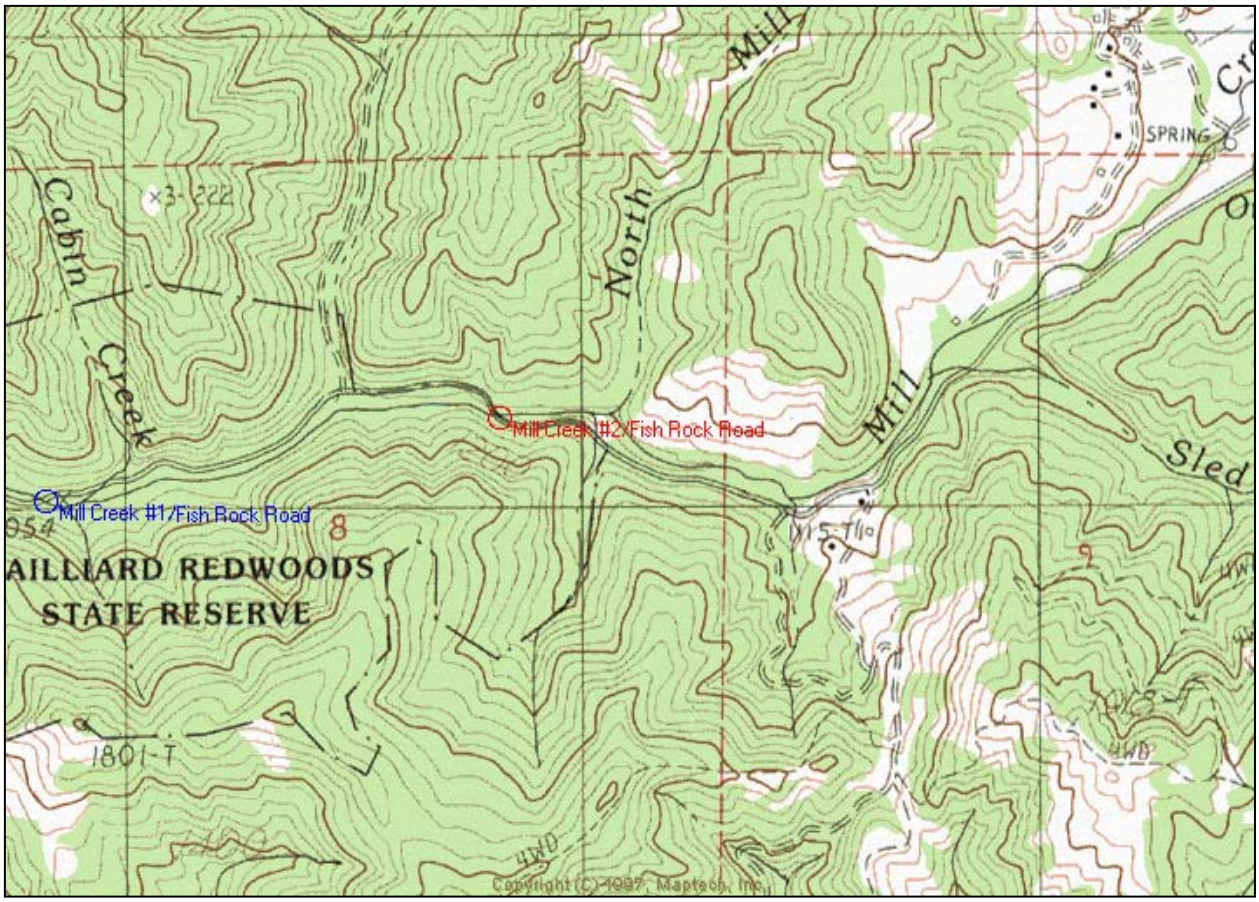
Sizing: Undersized; HW/D = 1 on a storm flow with approximately a 37-year recurrence interval. Fish Rock Road overtops on greater than a 250-year storm discharge.

Barrier Status: For the range of migration flows ($Q_{lp} - Q_{hp}$), FishXing determined culvert is 72% passable for adult coho salmon and steelhead; but is a total barrier for all age classes of juveniles due to the leap required to enter culvert (1.3') and excessive velocities on higher winter migration flows.

Additional Road Crossings: Downstream (3,600'), county crossing at Mill Creek #1/Fish Rock Road.

Habitat: No recent CDFG habitat surveys for Mill Creek. Jones (2001) summary: Holman (1968) sampled juvenile steelhead 5.5 miles up Mill Creek. Maahs (1996) carcass survey, observed two steelhead spawning. Mailliard (1999) observed steelhead 5.5 miles upstream. **Quantity =** approximately 13,400' of channel above crossing. **Quality =** Good, especially through State Park, dense riparian of predominantly mature, second-growth redwoods, abundant pools with LWD, and numerous pooltails spawning gravels. Observed numerous young-of-year and 1+ year-old steelhead above and below culvert. No redds or adults seen during two winter visits (2/25/00 and 3/31/00) over a 1.3 mile reach of Mill Creek (walked about 3,000' and spot-checked other areas from Fish Rock Road).

Preferred Treatment: Least expensive option is to modify current crossing with an outlet beam, baffles, and/or outlet pool weirs to increase depth and reduce velocities. A series of weirs may backwater crossing. However, current pipe-arch is undersized by NMFS guidelines and agencies may not grant necessary permits.



Site #26: Mill Creek #2/Fish Rock Road; Garcia River