Historical Distribution and Current Status of Steelhead/Rainbow Trout *(Oncorhynchus mykiss)* in Streams of the San Francisco Estuary, California

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Center for Ecosystem Management and Restoration

SONOMA COUNTY

Petaluma River Watershed

The Petaluma River watershed lies within portions of Marin and Sonoma Counties. The river flows in a northwesterly to southeasterly direction into San Pablo Bay.

Petaluma River

In a 1962 report, Skinner indicated that the Petaluma River was an historical migration route and habitat for steelhead (Skinner 1962). At that time, the creek was said to be "lightly used" as steelhead habitat (Skinner 1962).

In July 1968, DFG surveyed portions of the Petaluma River accessible by automobile from the upstream limit of tidal influence to the headwaters. No *O. mykiss* were observed (Thomson and Michaels 1968d).

Leidy electrofished upstream from the Corona Road crossing in July 1993. No salmonids were found (Leidy 2002).

San Antonio Creek

San Antonio Creek is a tributary of Petaluma River and drains an area of approximately 12 square miles. The channel is the border between Sonoma and Marin Counties.

In a 1962 report, Skinner indicated that San Antonio Creek was an historical migration route for steelhead (Skinner 1962).
In July 1968, DFG visually surveyed San Antonio Creek from the San Antonio Slough upstream to Chileno Valley Road. Fishery value was deemed poor due to intermittent summer flows, scarce spawning gravel and suspected dairy effluent. No *O. mykiss* were observed (Michaels and Thomson 1968).

In September 1981, Leidy electrofished three sites on San Antonio Creek between Highway 101 and Chileno Valley Road. No *O. mykiss* were found (Leidy 1984).

Adobe Creek (Casa Grande Creek)

Adobe Creek originates on the southwest face of Sonoma Mountain, flowing south and west to its confluence with the Petaluma River. A 1968 DFG visual survey of Adobe Creek found juvenile *O. mykiss* (50-150 mm) at an estimated density of 150 per 30 meters of stream. This survey also found two ten-foot diversion dams that were complete barriers to fish migration. Several impoundments were noted on tributary streams as well (Thomson and Michaels 1968a).

In 1987, students of Casa Grande High School rescued approximately 2,000 steelhead planted earlier that year from isolated pools in Adobe Creek (Furrer 2003).

Juvenile *O. mykiss* were rescued from Adobe Creek in June 1993 (Emig 1993). Beginning in 1993, the students of Casa Grande High School operated a hatchery that supplemented naturally occurring *O. mykiss* populations with steelhead derived from Feather River stocks (Furrer 2003).

In November 1997, Leidy electrofished Adobe Creek approximately 100 meters upstream from the footbridge in Rancho Adobe State Park and caught 17 *O. mykiss* (74-198 mm FL) (Leidy 2002).

Lynch Creek

Lynch Creek drains the west face of Sonoma Mountain, joining the Petaluma River in the city of Petaluma. In July 1968, DFG visually surveyed Lynch Creek by car with frequent stops for closer inspection. Although no fish were seen, the survey report cites residents' reports of a small run of steelhead in the stream. The surveyors recommended that the stream be managed as a steelhead spawning and nursery area (Thomson and Michaels 1968c).

Staff from DFG reports a sighting of an adult *O. mykiss* in Lynch Creek in summer 1998 (W. Cox pers. comm.). In May 2000 DFG noted 3 YOY during an informal survey of the creek (W. Cox pers. comm.).

Washington Creek

Washington Creek originates in the lower foothills north of the city of Petaluma and runs a short distance to the Petaluma River. In July 1968, DFG visually surveyed Washington Creek from the mouth up to a four-foot fall located approximately 200 feet upstream from Adobe Road. No fish were observed, and the channel was largely dry (Michaels and Thomson 1969). Staff from DFG reports that Washington Creek does not support an *O. mykiss* population currently (W. Cox pers. comm.).

Willow Brook

In July 1968, DFG visually surveyed Willow Brook Creek from the mouth to the headwaters. The channel was primarily dry with warm, intermittent pools that appeared to be drying completely. No *O. mykiss* were observed. Because of poor summer conditions, DFG considered Willow Brook to have no fishery value (Thomson and Michaels 1968e). Staff from DFG reports that Willow Brook may support an *O. mykiss* population in some years (W. Cox pers. comm.).

Lichau Creek

Lichau Creek flows west out of the Sonoma Mountains, then south past the town of Penngrove. In July 1968, DFG visually surveyed Lichau Creek from the mouth to the headwaters. Approximately ten juvenile *O. mykiss* (50-180 mm) were found in two small headwater pools (Thomson and Michaels 1968b). Although no barriers were observed in the main channel, dams were observed in some tributary streams. Staff from DFG reports that Lichau Creek may support an *O. mykiss* population in some years (W. Cox pers. comm.).

Assessment: The Petaluma River watershed historically supported steelhead runs, although the habitat available in the system is of substantially lesser importance than the Sonoma Creek system to the east. The river has been referred to by DFG staff as

"Petaluma Dead-End Slough" for the low habitat value of tributaries to the watershed upstream of the tidal portion (W. Cox pers. comm.).

Sonoma Creek Watershed

The Sonoma Creek watershed encompasses 170 square miles including the relatively narrow north-south trending Sonoma Valley. The creek enters the San Francisco Estuary at the northernmost part of San Pablo Bay. Major tributaries to the upper reaches of the creek include Calabazas, Stuart, Graham, Asbury and Bear Creeks.

Sonoma Creek

Staff from DFG conducted a visual stream survey of Sonoma Creek in August 1946 from the mouth to a natural falls in the headwaters, a distance of about 52 miles. Staff found both sea-run steelhead and resident *O. mykiss* in the system, noting natural propagation of *O. mykiss* as evidenced by the common presence of juvenile fish (65-100 mm TL) (Shapovalov and Bruer 1946). According to the survey report, steelhead ascend Sonoma Creek to at least one mile upstream of "U station" which is located about 0.6 miles upstream of Golden Bear Lodge.

According to a DFG summary report, 3,580 fingerling steelhead were rescued from Sonoma Creek in 1954 (Pintler 1956). Rescued fish apparently were moved to other areas within the Sonoma Creek watershed that had wetted stream channel throughout the dry season.

A visual stream survey of Sonoma Creek was conducted by DFG in February 1957. The survey report declared that the creek is utilized by steelhead as a spawning and nursery grounds and noted very good spawning areas throughout the Adobe Canyon and main branches down to Boyes Hot Springs and further downstream (Elwell 1957). Both flashboard dams and water diversions were said to occur along the length of the entire stream, but no permanent barriers. The surveyors said steelhead fingerlings (50-75 mm TL) were quite common along the entire stream length and recommended management as a steelhead spawning and nursery ground (Elwell 1957).

Sonoma Creek rescue efforts by DFG in 1958 produced 910 fingerling steelhead in 1958 (Allen 1958). During 1959, DFG rescued 2,507 fingerling steelhead from Sonoma Creek (Allen 1962). According to a DFG summary report, 44,544 fingerling steelhead were rescued from Sonoma Creek in 1961 (Rowell 1961). (As this figure represents an order-of-magnitude increase from other rescue totals, we consider it less reliable than previously reported numbers.) Rescued fish apparently were moved to other areas within the Sonoma Creek watershed that had wetted stream channel throughout the dry season.

In a 1962 report, Skinner indicated that Sonoma Creek was an historical migration route and habitat for steelhead (Skinner 1962). At that time, the creek was said to be "lightly used" as steelhead habitat (Skinner 1962).

Staff from DFG responded to a landowner inquiry regarding a fish kill at the confluence of Sonoma Creek and Calabazas Creek in May 1965. The subsequent report noted a count of 271 dead steelhead juveniles (64-196 mm TL) (Kastner 1965). A 1965 DFG letter report stated that Sonoma Creek is inaccessible to steelhead about 1.5 miles upstream of the confluence with Bear Creek due to a 12+ meter fall, and described resident *O. mykiss* existing upstream of the falls (Meyer 1965). In two 1965 letters, DFG

staff state that Sonoma Creek and all of its tributaries support a "fair" run of steelhead trout, estimated at 500 individuals or more (Greenwald 1965). The letters also cite a limited summer fishery for young steelhead throughout the upper reaches of the stream.

A 1966 DFG report summarized steelhead resources in the Sonoma Creek watershed, citing the upper reaches of the watershed as having a substantial summer trout fishery for juvenile steelhead and resident trout (Rockwood 1966). The report describes good to excellent spawning gravels and some adequate nursery areas in the drainage. According to the report, the prime spawning areas for steelhead are upstream from Boyes Hot Springs, while the prime nursery areas are upstream from Glen Ellen (Rockwood 1966). The report estimated the size of the steelhead run in Sonoma Creek to be about 500 individuals annually with great variation (Rockwood 1966).

Surveys performed in July 1966 by DFG staff indicated that mainstem Sonoma Creek contained about 15 miles of cold water stream accessible to steelhead trout upstream of Glen Ellen and downstream of the natural falls (Rockwood 1966). *Oncorhynchus mykiss* densities within this reach were estimated to be 15-60 per 30 meters. The survey report recommends establishing minimum flows in Sonoma Creek of five cubic feet per second to enhance *O. mykiss* habitat.

In 1977, DFG published a natural resources assessment of the Napa Marsh in which they estimated an annual steelhead run of approximately 1,200 adult fish in Sonoma Creek (Michaels 1977). Mainstem Sonoma Creek was sampled for fish with seines and dip nets at two locations in September 1981. *Oncorhynchus mykiss* were collected at a site immediately downstream of the junction of Warm Springs Road and Highway 12 (17: 71-143 mm FL) and at a location just downstream of the entrance to Sugerloaf Ridge State Park (17: 40-85 mm FL) (Leidy 1984).

Leidy sampled Sonoma Creek at numerous locations in June, July and August of 1993. *Oncorhynchus mykiss* collection results during this effort are in Table VIII-1 below.

Table VIII-1. Sampling results, Sonoma Creek, June-August 1993

Location	*Oncorhynchus mykiss*		
	No.	**Size Range (mm)**	**Estimate Density (per 30 m)**
Near Madrone Rd. bridge	2	80-107	5
Near Agua Caliente Rd. bridge	3	115-130	5
Stable in Sugarloaf Ridge State Park	15	90-235	25
Upstream of falls, Sugarloaf State Park	12	51-230	--
Downstream of falls, Sugarloaf State Park	7	69-237	10
Hwy. 12 ~ 0.5 mi. downstream Watmaugh Rd. bridge	0	--	--
Riverfront Rd. at Walnut Ave.	1	180	--
Mouth of Second Napa Slough	0	--	--
Boyes Rd. crossing	1	70	5
Leveroni Blvd, bridge	2	92, 132	5
Sonoma St. Hospital	17	--	30
Hwy. 126 crossing	2	200, 226	5

(Source: Leidy 2002)

Leidy's sampling produced records of both anadromous and resident *O. mykiss* occurring in mainstem Sonoma Creek with multiple age classes represented. The Sugarloaf Ridge State Park was found to contain excellent rearing habitat and fish in good condition. The Sonoma State Hospital site also had excellent spawning and rearing habitat for *O. mykiss* (Leidy 2002).

The Southern Sonoma County Resource Conservation District published the Sonoma Creek Habitat Inventory in December 1996. The report included the results of electofishing surveys performed in 1995 and 1996 on upper Sonoma Creek. The fish sampling found steelhead at five sites on mainstem Sonoma Creek as presented in Table VIII-2.

Table VIII-2. Electrofishing results, Sonoma Creek, 1995-96

Location	*Oncorhynchus mykiss*	
	Age Class (years)	**No.**
Arnold Dr. bridge, Glen Ellen	--	6
Graham Creek confluence	YOY	4
	1+	7
1 mi. upstream Warm Springs/Bennet Valley Rds.	--	10
0.25 mi. upstream Lawndale Ave. bridge	YOY	22
	1+	2
	2+	1
Bear Creek confluence	YOY	71
	1+	4
	2+	1

(Source: SSCRCD 1996)

A summary statement issued with the report of electrofishing results characterized Sonoma Creek at the entrance to Sugerloaf Ridge State Park as being in the "trout zone" (after Moyle 1976), with conditions transitioning to warmer water and lower gradient downstream (SSCRCD 1996). The report further recommended management of Sonoma Creek as an anadromous, natural production stream.

Electrofishing was performed in October 2002 in various Sonoma Creek reaches. Data from sampling in four reaches indicate that multiple *O. mykiss* age classes are present in the creek (52-152 mm FL) (SEC 2002).

Fowler Creek

Fowler Creek is formed by the joining of Carriger and Felder Creeks. From this confluence, the creek runs in a southeasterly direction about two miles to Sonoma Creek. Some investigators appear to have referred to Carriger Creek as Fowler Creek and to Fowler Creek as Carriger Creek.

During the summer of 1986 approximately 275 *O. mykiss* fry and 5 1+ and 2+ fish were transferred by citizens from a desiccating pool on lower Fowler Creek off Fowler Creek Road to an unknown location on Fowler Creek near the lowermost crossing of Grover Street in the George Ranch area (Friends of Sonoma Creek 1987).

Rodgers Creek

The headwaters of Rodgers Creek begin on the southwest slopes of the Sonoma Mountains and drain in a southeasterly direction for a distance of 6.5 miles before joining Fowler Creek approximately 0.75 miles its confluence with Sonoma Creek. Together, Rodgers and Fowler Creeks form the longest tributary to Sonoma Creek. The drainage basin is approximately 6.2 square miles.

In 1958, DFG visually surveyed Rodgers Creek at the intersection of Arnold Road and Stage Gulch Road. No salmonids were observed (CDFG 1958). A visual stream survey of several reaches of Rodgers Creek in 1965 noted large numbers of juvenile *O. mykiss* present upstream of the "dairy" upstream from the Temelec, Inc. development (Meyer 1965). In a 1965 letter, the DFG noted that Rodgers Creek contained a small population of YOY steelhead limited by low summer flows (Greenwald 1965).

A visual stream survey of the Rodgers Creek watershed conducted by DFG in 1966 estimated YOY *O. mykiss* density at 10-20 fish per 30 meters in a reach downstream of a flashboard dam located approximately three miles upstream from the Sonoma Creek confluence (Rockwood 1966). Apparently the flashboard dam acted as an almost complete barrier to the upstream movement of fish. In the area 1-2.5 miles upstream from the Fowler Creek confluence, no salmonids were observed. Upstream of the flashboard dam, *O. mykiss* (100-250 mm) density was estimated at 1-2 fish per pool. Some "fair" spawning habitat was identified, while nursery habitat was "adequate" upstream of the lowermost 3.5 miles of stream. Overall, the survey noted that removal of the flash board dam could provide good spawning and nursery areas to anadromous fish (Rockwood 1966).

A 1966 DFG memorandum rated Rodgers Creek as a "fair" steelhead stream, with "good" to "excellent" nursery habitat from a point 1.6 miles upstream from the mouth to the headwaters (Evans 1966). The memorandum states that at a point approximately 1.9 miles upstream from where Rodgers Creek joins Fowler Creek, there is "excellent" nursery habitat with *O. mykiss* YOY estimated at a density of 10-20 per 30 meters (Evans 1966).

In 1975, DFG conducted a visual stream survey along a four-mile reach of Rodgers Creek from approximately 2.2 miles downstream from the headwaters to just upstream of the confluence with Fowler Creek. The upstream reach contained *O. mykiss* (51-178 mm TL) at an estimated density of 25-50 per 30 meters (Coleman and Van Zandt 1975). Fifty percent of this reach was said to be suitable for spawning *O. mykiss*, while the lower portion of the creek contained very little spawning habitat (Coleman and Van Zandt 1975). The survey report recommended management as a spawning and nursery area for steelhead.

As part of a fish distribution survey, a 20-meter reach of Rodgers Creek at the West Watmaugh Road crossing was sampled in September 1981. No fish were recorded (Leidy 1984). The stream channel was noted as extensively trampled by cattle and upstream diversions appeared to have caused dewatering of portions of the stream. Staff from the Sonoma Ecology Center noted juvenile *O. mykiss* in Rodgers Creek in spring 2004 (W. Pier pers. comm.).

Felder Creek

Felder Creek and Carriger Creek join to form Fowler Creek. Interviews with local landowners have established the historical use of Felder Creek by *O. mykiss* (W. Pier pers. comm.).

As part of a fish distribution survey, a 20-meter reach of Felder Creek approximately 0.2 miles downstream from the paved end of Felder Road was sampled in September 1981. No salmonids were recorded (Leidy 1984). Staff from the Sonoma Ecology Center noted juvenile *O. mykiss* in Felder Creek in spring 2004 (W. Pier pers. comm.).

Carriger Creek

The headwaters of Carriger Creek consist of three intermittent streams draining the Sonoma Mountains. The creek flows in a southeasterly direction for a distance of eight miles before joining Felder Creek. The junction of Carriger and Felder Creeks forms

Fowler Creek, which runs another two miles to its confluence with Sonoma Creek. The drainage basin is approximately 10.5 square miles.

In a 1953 DFG fish rescue, 4,679 fingerling steelhead were moved from Carriger Creek (Pintler 1954). According to a DFG summary report, 7,060 fingerling steelhead were rescued from Carriger Creek in 1954 (Pintler 1956). Rescued fish apparently were moved to other areas within the Sonoma Creek watershed that had wetted stream channel throughout the dry season. Fish rescues conducted by DFG in1958 included 1,131 juvenile steelhead (Allen 1958). In 1961, 4,641 fingerlings were rescued (Rowell 1961).

In a 1962 report, Skinner indicated that Carriger Creek was an historical migration route and habitat for steelhead (Skinner 1962). At that time, the creek was said to be "lightly used" as steelhead habitat (Skinner 1962).

A visual stream survey of several reaches of Carriger Creek in 1965 noted juvenile *O. mykiss* under the first downstream Grove Street crossing, as well an abundant juvenile population within a small, unnamed tributary entering Carriger Creek from a southwesterly direction just downstream of the bridge (Meyer 1965). In a 1965 letter, DFG called YOY steelhead in the creek "abundant" (Greenwald 1965).

A visual stream survey of the Carriger Creek watershed conducted by DFG in July 1966 estimated YOY *O. mykiss* at a density of 20-40 per 30 meters within a reach approximately 5.5-8.5 miles upstream from Sonoma Creek (Rockwood 1966). Unpublished files from DFG indicate that a barrier was constructed on Carriger Creek in the spring of 1966 that prevented fish migration upstream. Staff from DFG recommended addition of a fishway to allow passage. During a site visit in April 1966, DFG noted numerous young steelhead upstream of and downstream of the dam located just upstream of the lowermost Grove Street crossing (Jones 1966). Two dead *O. mykiss* estimated at 150-200 mm TL had been reported between rocks on the lower side of the dam.

Carriger Creek was visually surveyed by DFG from its headwaters to the confluence with Felder Creek in March 1976. *Oncorhynchus mykiss* (25-127 mm TL) were observed in the headwaters section at a density of 10-15 fish per 30 meters, and some spawning and nursery habitat were rated "excellent" (Steitz and Johnson 1976). The middle section also had "excellent" spawning and rearing habitat, with *O. mykiss* (51-178 mm TL) at 15-40 fish per 30 meters (Steitz and Johnson 1976). A dead adult steelhead (559 mm FL) was found at the downstream terminus of the channel culvert at the Grover Road crossing (Steitz and Johnson 1976). At the confluence of Felder Creek, 5-15 *O. mykiss* (51-203 mm) were seen per 30 meters, and spawning and nursery habitat were "limited" (Steitz and Johnson 1976). The Carriger Creek survey report recommended management as a steelhead spawning and nursery area (Steitz and Johnson 1976).

A fish distribution survey was conducted in September 1981 along a 10-meter reach of Carriger Creek, approximately 0.5 miles south from the Canyon Road crossing. Three *O. mykiss* (58-149 mm FL) were collected, and *O. mykiss* juvenile density was estimated at 10 per 30 meters (Leidy 1984).

Leidy sampled a 30-meter reach of Carriger Creek in December 1997 upstream from the O'Brien Road Bridge. He collected four steelhead between 46-238 mm FL, all in excellent condition (Leidy 2002). Leidy noted that Carriger Creek at this location contained good spawning and excellent rearing habitat for steelhead. A minimum of three steelhead year classes were seen during the sampling event (Leidy 2002).

Dowdall Creek

Dowdall Creek is an intermittent stream that flows in a southeasterly direction from the Sonoma Mountains for a distance approximately four miles to where it joins Sonoma Creek. The drainage basin is approximately 1.5 square miles.

During a stream survey conducted in 1977, DFG did not observe any fish (Rowser and Fong 1977). However, the survey report noted that a local resident observed an unknown number of steelhead in the creek under Riverside Road prior to the construction of a diversion to Dowdall Creek. Apparently, the diversion acts to bypass stream flows away from the lower mile of Dowdall Creek. The report rated Dowdall Creek as having little value as nursery or spawning habitat for fish due to the poor condition of potential spawning areas and barriers to upstream fish migration from vegetation growth in the lower two miles of streambed (Rowser and Fong 1977).

Agua Caliente Creek

The headwaters of Agua Caliente Creek begin as several tributaries on the southwest slopes of Bismark Knob and Hogback Mountain, and combine to flow in a west to southwest direction approximately 5.6 miles to the confluence with Sonoma Creek. The creek drains approximately ten square miles.

Between 1953 and 1961, DFG, State Hatchery and Wildlife Protection personnel rescued fish in drying portions of Agua Caliente Creek. The rescue data is summarized in Table VIII-3.

Table VIII-3. Fish rescued from Agua Caliente Creek, 1953-1961

Year	Total fish rescued	Size range
1953	3,206	1-2.5
1954	16,835	1.5
1961	4,600	-

(Source: Pintler 1954; Pintler 1956; Rowell 1961)

A visual survey of several reaches of Agua Caliente Creek in July 1965 noted steelhead in scattered pools at the end of Lomita Avenue off Arnold Drive (Meyer 1965). A visual survey also was conducted in August 1965 covering 7.5 miles from the Sonoma Creek confluence to the headwaters (Fox 1965). The survey report described juvenile steelhead (20-80 mm TL) density of about 25 per 30 meters, with individuals in "good condition." The survey report called Agua Caliente Creek a good spawning and rearing stream and recommended management to support steelhead habitat (Fox 1965).

In a 1965 letter, DFG noted that Agua Caliente Creek contained salmonid nursery habitat and supported a small population of YOY steelhead (Greenwald 1965). A visual stream survey of the Agua Caliente Creek watershed conducted by DFG in 1966 estimated YOY *O. mykiss* at densities of greater than 50 fish per 30 meters along 1.5 miles (Rockwood 1966). Other reaches had densities ranging from 1 per 30 meters to 1 fish per 90 meters (Rockwood 1966). Overall, the survey concluded that Agua Caliente Creek was of little importance to anadromous fishes due mainly to poor spawning and rearing habitat availability (Rockwood 1966).

According to data complied by the Sonoma Ecology Center, *O. mykiss* were observed in Agua Caliente Creek in August and September 2001 (SEC 2003). Both YOY and age 1+ fish were noted.

Hooker Creek

The headwaters of Hooker Creek consist of two small perennial to intermittent, south to southwest flowing tributaries that join to flow west to the confluence with Sonoma Creek. Hooker Creek is over five miles in length and drains approximately 4.6 square miles, including the Wilson Creek watershed.

About two miles of Hooker Creek was visually surveyed by DFG in June 1966. No fish were observed, and the survey report stated that the creek lacked importance as a nursery area for anadromous fish (Rockwood 1966).

In 1977, DFG conducted a visual stream survey of Hooker Creek from its confluence with Sonoma Creek upstream a distance of five miles. According to the survey report, residents adjacent to Hooker Creek reported that trout had existed in the creek in the past but had not been seen within the previous two years. The report noted that the creek was probably a "fair" steelhead stream at one time (Spingla and Webb 1977a).

According to data complied by the Sonoma Ecology Center, *O. mykiss* were observed in Hooker Creek in May, June and July 2002 (SEC 2003). Both YOY and age 1+ fish were noted.

Wilson Creek

Wilson Creek is a tributary to Hooker Creek draining primarily grape fields and numerous smaller tributaries, including Butler and Withman Creeks, originating in local canyons.

In April 1977, DFG visually surveyed Wilson creek from the mouth to the headwaters. Because of unusually low rainfall, flow was isolated to the headwaters with intermittent pools between the mouth and Madrone Road. No fish were found, but DFG staff speculated that Wilson Creek might have served as steelhead rearing habitat in years with normal flows (Spingla and Webb 1977b). Staff from the Sonoma Ecology Center also expect that Wilson Creek supported *O. mykiss* historically (W. Pier pers. comm.).

Mill Creek

Mill Creek flows east out of the Sonoma Mountains from west of the town of Elridge. It joins Sonoma Creek in the vicinity of the Sonoma State Hospital.

Leidy sampled Mill Creek in December 1997. A 30-meter reach approximately 100 feet downstream of the road crossing at Sonoma State Hospital had seven *O. mykiss* (55-145 mm FL) (Leidy 2002).

According to data complied by the Sonoma Ecology Center, *O. mykiss* were observed in Mill Creek in June 2001 (SEC 2003). Both YOY and age 1+ fish were noted.

Asbury Creek

Asbury Creek is a perennial stream that begins on the north slopes of Sonoma Mountain and flows northeasterly for a distance of approximately 2.5 miles to its confluence with Sonoma Creek. The drainage basin of Asbury Creek and its tributaries is approximately five square miles.

A visual stream survey by DFG in July 1966 estimated YOY steelhead density at 1-5 fish per 30 meters in the lower 1.5 miles of stream and noted that local residents had observed small numbers of steelhead migrating to spawn during the two to three years prior to 1966 (Rockwood 1966). However, the report rated Asbury Creek of minor importance to steelhead due to relatively poor spawning and rearing habitat quality (Rockwood 1966).

A 1996 survey noted a 25 meter concrete flume located immediately upstream of the Sonoma Creek confluence as a potential barrier to fish passage during high stream flows (SSCRCD 1996). Researchers cited long-time residents who indicated that Asbury Creek was a productive steelhead stream at one time and associated steelhead population declines with installation of the culvert. A diversion pipe about two miles upstream also was termed a barrier to anadromous fish. Between the confluence and the diversion pipe, six steelhead (1 age 0+; 5 age 1+) were seen by the survey team (SSCRCD 1996). Surveyors characterized rearing habitat in the lower reaches of Asbury Creek as "limited," with spawning habitat "impacted by fine sediment." Upper reaches were said to comprise good spawning habitat, with spring-fed flows in the headwaters providing cool summer water temperatures (SSCRCD 1996).

Calabazas Creek

The headwaters of Calabazas Creek begin as several perennial drainages that join and run in a west-southwest direction through Nunns Canyon 5.2 miles to the confluence with Sonoma Creek. A natural barrier to anadromous fish passage exists approximately 1.5 miles upstream of the confluence. The drainage basin is approximately 7.7 square miles.

Calabazas Creek was surveyed by DFG from the mouth upstream approximately three miles to the headwaters in January 1961. Staff from DFG seined nine *O. mykiss* (76-178 mm TL)(Day 1961). Spawning areas for *O. mykiss* were observed to be suitable throughout the entire stream, with the most suitable spawning habitat located from Dunbar Road upstream for a distance of 1.5 miles. The survey concluded that Calabazas Creek is a "fairly good" spawning stream for steelhead in the lower and middle reaches and recommended that Calabazas Creek continue to be managed as a steelhead spawning and nursery area (Day 1961).

In a 1962 report, Skinner indicated that Calabazas Creek was an historical migration route for steelhead (Skinner 1962). A visual stream survey of the Calabazas Creek watershed was conducted by DFG in 1966. Staff estimated YOY *O. mykiss* at a density of 5-40 fish per 30 meters within a 3.5-mile reach upstream from the mouth to a series of impassable falls (Rockwood 1966). Some "excellent" spawning habitat was found, and the creek was called one of the better steelhead spawning and nursery tributaries to Sonoma Creek (Rockwood 1966).

Staff from DFG conducted a visual survey of Calabazas Creek in June 1974. While sampling locations are not provided in the survey record, the report concludes that Calabazas Creek is one of the more important steelhead spawning and rearing areas within the Sonoma Creek watershed (Jones 1974). The report noted that a "good" population of juvenile steelhead was present.

In September 1975, DFG performed visual surveys of Calabazas Creek along a five-mile reach from the mouth to the headwaters. Density of *O. mykiss* in the middle section was estimated to be 100 fish per 30 meters (Tyler and Coleman 1975). The survey report noted that Calabazas Creek provided good steelhead spawning and nursery area, but that steelhead were limited to the lower and middle areas by barriers and warm stream temperatures. The report recommended that Calabazas Creek be maintained as a steelhead spawning and nursery stream (Tyler and Coleman 1975).

Leidy sampled Calabazas Creek in June 1993. The sampling occurred at two reaches, one upstream and one downstream from the Atwood Ranch pump house. He collected 32 *O. mykiss* between 34-155 mm FL, all in excellent condition. Leidy visually estimated juvenile *O. mykiss* density to be 20 fish per 30 meters in a 200-meter reach upstream from the pump house (Leidy 2002). This reach of Calabazas Creek was said to contain high quality spawning and rearing habitat. At a 30-meter reach upstream from the Highway 129 bridge, four *O. mykiss* (54-72 mm FL) were collected (Leidy 2002).

In September1993Leidy sampled three additional reaches in the headwater and middle sections of the Calabazas Creek watershed. The uppermost sampling site was located approximately 1.5 miles upstream from an impassable bedrock falls. No fish were collected at this site (Leidy 2002). The second site was a large pool at the base of the falls approximately 1.5 miles upstream from the mouth, where Leidy collected juvenile and adult *O. mykiss* (17: 68-217 mm FL). At a site approximately 0.4 miles downstream from the bedrock falls, Leidy found *O. mykiss* (25: 39-185 mm FL) and estimated density of juveniles at 15 fish per 30 meters (Leidy 2002). Overall, Calabazas Creek was found to contain good spawning and excellent rearing habitat for *O. mykiss*, and at least four-year classes were noted (Leidy 2002).

Calabazas Creek was electrofished between the confluence with Sonoma Creek and a point 3.5 miles upstream in July of 1996. The survey team found five juvenile steelhead (3 age 0+; 1 age 1+; 1 age 2+) in a 183-meter reach downstream from the confluence of Stuart Creek. A second reach was electrofished downstream from Dunbar Road, resulting in a sample of 30 juvenile steelhead (27 age 0+; 3 age 1+). The survey report also notes visual observations of several steelhead trout on the Atwood Ranch in April 1996 and sightings of three age classes consistently throughout the creek (SSCRCD 1996).

Upstream portions of Calabazas Creek were characterized as being likely trout habitat and portions nearer the Sonoma Creek confluence as more characteristic of the "roach zone" (after Moyle 1976). A series of bedrock falls 3.5 miles from the confluence with Sonoma Creek were deemed barriers to migrating fish, and no fish were observed at locations upstream. The survey report concluded that Calabazas Creek contained "fair to good" salmonid habitat and recommended management as a steelhead stream (SSCRCD 1996).

Leidy again surveyed Calabazas Creek in July 1997. He collected seven *O. mykiss* (62-216 mm FL) in a 30-meter reach near Atwood Ranch (Leidy 2002). Electrofishing was performed in October 2002 in various Calabazas Creek. Juvenile *O. mykiss* (52-75 mm FL) were noted in the creek, indicating reproduction (SEC 2002).

Stuart Creek

Stuart Creek originates as several small drainages near the northwest slopes of Mt. Veeder and flows in a southwest to westerly direction approximately five miles to its confluence with Calabazas Creek. The Stuart Creek watershed is approximately five square miles.

A visual stream survey of the Stuart Creek watershed conducted by DFG in June 1966 estimated YOY *O. mykiss* density at 10-30 per 30 meters within a 2.2-mile reach from the mouth upstream to a series of impassable falls (Rockwood 1966). A pool downstream of a flashboard dam 1.2 miles from the confluence with Calabazas Creek had at least two-year classes of *O. mykiss* (20-30 YOY; 15: 100-150 mm TL).

A visual stream survey of Stuart Creek was conducted by DFG in October 1975 from its confluence with Calabazas Creek upstream a distance of 3.1 miles. A natural falls was noted about 1.9 miles upstream of the confluence, apparently serving as a passage barrier for anadromous fish. *Oncorhynchus mykiss* (50-254 mm TL) were observed upstream of the falls at a density of approximately 10 per 30 meters of stream. These fish were believed to be resident *O. mykiss* derived from 1930s stocking efforts (Holstine et al. 1975). Downstream of the falls, *O. mykiss* (102-152 mm TL) were observed at a density of 1 per 30 meters of stream (Holstine et al. 1975). The report concluded that Stuart Creek was a poor steelhead spawning stream, but contained "fair" nursery habitat (Holstine et al. 1975).

According to data complied by the Sonoma Ecology Center, *O. mykiss* were observed in Stuart Creek in June 1995 (SEC 2003). Both YOY and age 1+ fish were noted.

Visual surveys were conducted on Stuart Creek in July 1996, and the condition of anadromous fish habitat was assessed. The surveys were conducted between the confluence with Sonoma Creek and the waterfall 1.9 miles upstream. The lower portions of the creek from the confluence with Calabazas Creek to approximately 1.5 miles upstream contained salmonids (age 0+ and 1+) in low numbers, while upstream reaches were observed to have "good" numbers in each of three age classes (0+, 1+, 2+) (SSCRCD 1996). In general, lower portions of Stuart Creek were considered to have "poor" or "marginal" salmonid habitat due to channel dewatering, with upper reaches in good condition and containing some of the best habitat in the Sonoma Creek watershed (SSCRCD 1996).

Trinity Creek

Trinity Creek enters Calabazas Creek from the east upstream of Stuart Creek. Staff from the Sonoma Ecology Center believe that Trinity Creek likely supported *O. mykiss* historically. In a 2004 fish passage survey, staff noted *O. mykiss* in this creek (W. Pier pers. comm.).

Redwood Creek

Redwood Creek enters Calabazas Creek from the east upstream of Trinity Creek. Staff from the Sonoma Ecology Center have evidence that Trinity Creek supported *O. mykiss* historically. In a 2002 survey, staff noted *O. mykiss* in this creek (W. Pier pers. comm.).

Graham Creek

The headwaters of this perennial stream consist of three small drainages that originate on the northern slopes of Sonoma Mountain in Jack London State Park. These tributaries join to flow northeast approximately 1.9 miles to the confluence with Sonoma Creek near the intersection of Warm Springs Road and Sonoma Mountain Road. The drainage basin is approximately two square miles.

A 1946 visual stream survey by DFG noted that steelhead migrated upstream to a concrete diversion dam approximately 0.7 miles upstream from the confluence with Sonoma Creek (Curtis 1946). The DFG report characterized the portion of Graham Creek immediately upstream from Sonoma Creek as having "a few" salmonid spawning areas.

A visual stream survey by DFG in December 1959 reported only the lower 0.2 miles of Graham Creek as available to spawning steelhead due to complete barriers formed on the stream by water users (Day 1959). The biologist's assessment of the stream was that it would contribute considerably to the steelhead runs of Sonoma Creek if migration barriers were removed (Day 1959). At the time of the survey, only small numbers of resident *O. mykiss* (50-200 mm TL) were seen in the creek. Staff from DFG estimated that steelhead would be able to use 2.5 miles of Graham Creek upstream of the mouth with barrier removal.

During another visual stream survey by DFG in February 1960, staff observed a spawning pair of steelhead in a riffle approximately 100 feet downstream from the Glen Ellen Water Company Dam (Day 1960). In April of 1960, DFG observed juvenile steelhead in "fair" numbers (38-50 mm TL) at various points from Warm Springs Creek Road upstream to the Glen Ellen Water Company dam (Day 1960).

A visual stream survey of the Graham Creek watershed conducted by DFG in July 1966 estimated YOY *O. mykiss* density to be 5-10 per 30 meters (Rockwood 1966). Habitat was deemed only "fair" for spawning and "adequate" for rearing. However, the survey noted that Graham Creek had the potential to be a good spawning and nursery area for anadromous fish with the removal of two barriers that blocked access to an additional one mile of stream. Resident trout were observed upstream of the barriers (100-200 mm TL) (Rockwood 1966).

In 1976, DFG conducted a visual stream survey of Graham Creek from the confluence with Sonoma Creek upstream a distance of approximately 2.5 miles. Juvenile steelhead (to 127 mm TL) were recorded at a density of 50 per 30 meters between the mouth and a 2.5-meter concrete dam (Pinkham 1976b). Upstream of the dam, few fish were observed, mostly YOY and some larger *O. mykiss* (to 200 mm TL). *Oncorhynchus mykiss* were present from this lowermost dam upstream to a 12-foot bedrock fall located about 2.5 miles upstream from Sonoma Creek. Spawning habitat for salmonids was rated as "fair" to "good" throughout the middle stream reaches and nursery habitat as "excellent" (Pinkham 1976b). The survey report recommended management as a steelhead spawning and nursery stream.

A 15-meter reach of Graham Creek approximately 0.5 miles upstream from the Warm Springs Road crossing was sampled as part of a fish distribution study in September 1981. Three *O. mykiss* were collected (59-132 mm FL), and the density of *O. mykiss* juveniles was visually estimated at 10 per 30 meters (Leidy 1984).

Leidy surveyed a 60-meter reach of Graham Creek upstream of Jack London State Park in October 1994. He collected 17 resident *O. mykiss* (47-190 mm FL).

Staff from DFG electrofished Graham Creek in the summer of 1996, finding steelhead at two locations: one just upstream from the confluence with Sonoma Creek and one in Jack London State Park. The first site yielded 30 juveniles (26 age 0+; 2 age 1+; 2 age 2+) in a 30-meter reach, while the second had 36 juveniles (18 age 0+; 15 age 1+; 3 age 2+) in a 60-meter reach. No salmonids were observed upstream of where a 14-foot log and debris/rock falls appeared to impede further passage. The report characterized Graham Creek as completely within the "trout" zone (after Moyle 1976) but found mostly "fair to poor" salmonid habitat due to

a lack of suitable pools, shelter and depth needed for rearing, as well as spawning habitat impacted by fine sediment. However, the report recommended management as an anadromous, natural production stream (SSCRCD 1996).

Electrofishing was performed in October 2002 in Graham Creek. Data from sampling indicate that multiple *O. mykiss* age classes (46-165 mm FL) are present in the creek (SEC 2002).

Yulupa Creek

Yulupa Creek is a small, perennial stream that runs from the Sonoma Mountains in an easterly direction to its confluence with Sonoma Creek about 2.5 miles south of Kenwood. The Yulupa Creek watershed is approximately five square miles. The creek has two principal forks, with the south fork consisting of about 2.8 miles of channel and the north fork and its intermittent tributaries accounting for another 4.3 miles of stream.

A visual stream survey of the Yulupa Creek watershed was conducted by DFG in 1966. The density of YOY *O. mykiss* was estimated at 5-10 per 30 meters (Rockwood 1966). Some spawning habitat was called "fair," while nursery habitat was mostly "unsuitable" or "adequate." The survey report noted that each year local residents observed very few adult steelhead and that a flash board dam on the south fork was a barrier to upstream migration except during high stream flows.

Another visual stream survey of the Yulupa Creek watershed conducted by DFG in 1976 noted steelhead ranging in length from 10-28 mm TL. Fish were seen on the south fork downstream of a flash board near the confluence of the two forks as well as on the north fork about 650 feet upstream from this confluence (Pinkham 1976d). Steelhead density was visually estimated to be 10 per 30 meters. The survey report also indicated that resident *O. mykiss* were observed upstream of an earthen road crossing on the north fork. The report noted that the south fork of Yulupa Creek contained potentially "good" steelhead spawning and rearing habitat, but that barriers such as dams and low stream flows limited utilization of these habitats (Pinkham 1976d).
A 20 meter reach of Yulupa Creek approximately 400 meters upstream from the Warm Springs Road crossing was sampled as part of a fish distribution survey in September 1981. Three *O. mykiss* (72-173 mm FL) were collected (Leidy 1984). During the summer of 1986, approximately 125 *O. mykiss* fry were transferred by local citizens from a desiccating pool on the upper south fork of Yulupa Creek near Kieser Ranch Road to two unknown downstream locations with perennial flow (Coleman and Sanchietti 1987).

Kunde Creek

Kunde Creek enters Sonoma Creek from the east upstream of Yulupa Creek. Staff from the Sonoma Ecology Center believe that Kunde Creek likely supported *O. mykiss* historically. In a 2004 survey, staff noted *O. mykiss* in this creek (W. Pier pers. comm.).

Fisher Creek

Fisher Creek enters Sonoma Creek from the east upstream of Kunde Creek. Staff from the Sonoma Ecology Center believe that Fisher Creek likely supported *O. mykiss* historically. In a 2004 survey, staff noted *O. mykiss* in this creek (W. Pier pers. comm.).

Unnamed Tributary to Sonoma Creek near Kenwood

This small, intermittent stream drains about two square miles of the southwest slopes of Mt. Hood in Sonoma County. The tributary intersects Lawndale Road, Highway 12 and Pythian Road near Kenwood. A smaller tributary running easterly from the Sonoma Mountains joins the creek approximately 0.6 miles upstream from its confluence with Sonoma Creek. The headwater reach consists of two forks constituting approximately 1.5 miles of channel length.

Staff from DFG did not observe any fish during a stream survey conducted in May 1977 (Webb and Boccone 1977). However, the survey noted that local residents had observed over a 30-year period adult steelhead migrating through, and spawning within, a two-mile stream reach beginning at the confluence of Sonoma Creek and continuing a distance of about one mile upstream from the Highway 12 crossing. Upstream from this point, a series of cascades and waterfalls apparently served as barriers to further upstream migration (Webb and Boccone 1977). The one-mile reach between Highway 12 and Sonoma Creek was rated as "good" steelhead spawning habitat. According to local residents, stream flows ceased in most years by June and water diversions sometimes completely dried the stream as early as late spring, stranding adult resident *O. mykiss* (Webb and Boccone 1977).

Bear Creek

The headwaters of Bear Creek consist of three small perennial streams originating on the northeast slopes of Mt. Hood and the north and west slopes of Bald Mountain that join to flow south approximately two miles to the confluence with Sonoma Creek. The drainage basin is approximately 1.6 square miles. A series of six bedrock falls five to ten feet high occur on the creek. The first falls, located approximately 0.5 miles upstream from the confluence of Sonoma Creek, is a barrier to the upstream movement of anadromous fish.

A visual stream survey of the Sonoma Creek watershed conducted by DFG in August 1946 noted that "sea-run" steelhead spawn in Bear Creek (Shapovalov and Bruer 1946). In 1965, DFG stated that upper Sonoma Creek including Bear Creek contained *O. mykiss* nursery habitat, and that YOY were abundant (Greenwald 1965). Stream survey notes for the Sonoma Creek watershed compiled by DFG during the summer of 1966 note that Bear Creek contains "good" spawning and rearing habitat and a "good" *O. mykiss* population estimated at between 10-20 per 30 meters (Greenwald 1965).

A visual stream survey of Bear Creek was performed in June 1976 from the confluence upstream a distance of 1.2 miles. Steelhead YOY (100-130 mm TL) were reported in pools about 0.2 miles upstream of the Sonoma Creek confluence (Pinkham 1976a). The average density of fish was estimated to be 20 per 30 meters. The survey report called Bear Creek one of the few tributaries in the Sonoma Creek watershed providing good steelhead spawning and rearing habitat, and recommended management as one of the most important spawning and nursery streams in the watershed (Pinkham 1976a).

Leidy sampled various portions of Bear Creek in July and September 1993. In a 40-meter reach near the Sonoma Creek confluence, he collected 12 *O. mykiss* (38-208 mm FL) and visually estimated juvenile density at 30 per 30 meters (Leidy 2002). During the September survey, Leidy collected juvenile and adult *O. mykiss* (25: 35-164 mm FL) in a 24 meter reach approximately 0.2 miles upstream from the confluence with Sonoma Creek, and estimated juvenile density at 40 per 30 meters (Leidy 2002). Leidy found at least three *O. mykiss* year classes in Bear Creek during these sampling events. Bear Creek was found to contain good spawning and excellent rearing habitat for *O. mykiss* although the aerial extent was said to be limited by the small

size of the stream. Cool water temperatures and constant stream flow during the summer months are typical due to the presence of seeps in the lower reach of the stream, and create good habitat conditions.

In 1996, DFG electrofished a Bear Creek site upstream from the Sonoma Creek confluence. One hundred ten juvenile steelhead (92 age 0+; 13 age 1+; 5 age 2+) were counted in a 90-meter reach (SSCRCD 1996). No steelhead YOY were seen upstream of an eight-foot bedrock fall located about 0.3 miles upstream of the Sonoma Creek confluence, and the researcher speculated that the fall was a barrier to upstream migration. *Oncorhynchus mykiss* assumed to be resident were observed upstream of the barrier (SSCRCD 1996).

Staff from DFG noted that Bear Creek offered the highest steelhead production capacity for its length (approximately 0.3 miles) of any Sonoma Creek watershed tributary. Favorable water temperature and canopy conditions were cited as contributing to the quality of salmonid habitat (SSCRCD 1996). The survey report concluded that Bear Creek should be managed as a steelhead stream.

Electrofishing was performed in October 2002 in Bear Creek. Data from sampling indicate that multiple *O. mykiss* age classes (38-138 mm FL) are present in the creek (SEC 2002).

Assessment: Sonoma Creek appears to have been an important contributor to regional steelhead resources based on the presence of runs of 500 individuals as late as 1965. Rescue data from 1954 also provide insight into the potential production of the system. Combined, Sonoma Creek, Agua Caliente Creek, and Carriger Creek produced a minimum of 27,475 juvenile *O. mykiss* in that year (Pintler 1956). These fish were derived from both anadromous stocks and fish rescued in previous years.

Populations of *O. mykiss* are consistently found in surveys of mainstem Sonoma Creek and its tributaries in the last ten years, and the presence of multiple year classes indicates natural propagation. A Sonoma Ecology Center sponsored assessment of salmonid habitat conditions, conducted in the Sonoma Creek watershed between June and December 1998, found that neither water temperature nor spawning gravel were factors limiting steelhead production based on sampling at several locations throughout the mainstem and at locations on Carriger, Calabazas, Graham and Bear Creeks (Katzel and McKnight 2001; McKnight and Katzel 2000). Sonoma Creek tributaries known to offer steelhead habitat include Agua Caliente Creek, Calabazas Creek and Stuart Creek. Bear Creek and the Sugarloaf Ridge State Park area provide additional important habitat resources.

Declines in the abundance of *O. mykiss* populations of the Sonoma Creek watershed and restriction of the species' distribution have been noted in various survey reports and in interviews with long-time Sonoma County residents. Causative factors most likely include dam construction, effects of deforestation, water withdrawals, and past over-fishing. Additional studies related to fisheries enhancement are currently being conducted under the auspices of the Sonoma Ecology Center that will improve the understanding of the distribution of *O. mykiss* in the watershed.

Schell Creek Watershed

The watershed areas of two tributaries, Arroyo Seco and Nathanson Creek, which originate on the Sonoma/Napa divide north and east of the city of Sonoma, constitute the majority of the Schell Creek drainage. Schell Creek is a 3.4-mile channel that begins on the floor of Sonoma Valley south of the city of Sonoma and flows in a south-southeast direction through agricultural fields

until it issues into the tidally influenced Schell and Steamboat Sloughs within the Sonoma Creek/Napa River wetland complex. Schell Creek, Nathanson Creek and Arroyo Seco combine to form a drainage basin of 21.2 square miles.

Schell Creek

In June 1976, DFG conducted a visual stream survey of Schell Creek from the confluence with Schell Slough to the headwaters. The survey report cited Schell Creek as only a migratory corridor for *O. mykiss* known to spawn in the upstream reaches of Arroyo Seco and Nathanson Creek (Pinkham 1976c). Urbanization and agricultural development were cited as causing adverse impacts to the habitat value of the creek.

As part of a fish distribution study, a site on Schell Creek was sampled by pole-seine in September 1981. No *O. mykiss* were found (Leidy 1984). Based on the results of a 2004 survey by the Sonoma Ecology Center, *O. mykiss* are known to use Schell Creek currently (W. Pier pers. comm.).

Arroyo Seco

Arroyo Seco is one of two main tributaries (with Nathanson Creek) of Schell Creek. A 1966 DFG report cited *O. mykiss* YOY observed in the upper sections of Arroyo Seco (Rockwood 1966). Fishermen sighted spawning *O. mykiss* in Arroyo Seco in winter 2004 (W. Pier pers. comm.).

Haraszthy Creek

Haraszthy Creek is an intermittent tributary to Arroyo Seco that flows for a distance of 2.9 miles before joining Arroyo Seco. The Haraszthy Creek watershed is approximately 2.5 square miles.

Staff from DFG conducted a visual survey of Haraszthy Creek in June 1977 from the mouth to just upstream of Thornsberry Road, a distance of approximately three miles. No fish were observed during the survey, but the report noted "potentially good" spawning habitat approximately 0.5 miles upstream from its confluence with Arroyo Seco (Webb 1977). The DFG report recommended that Haraszthy Creek downstream of Haraszthy Falls be managed as steelhead spawning habitat.

We did not find evidence of recent use by *O. mykiss*. However, the creek may be accessed currently by spawning *O. mykiss* and is proximate to other streams known to be used (W. Pier pers. comm.).

Nathanson Creek

Nathanson Creek drains primarily south from Hogback Mountain for a distance of 7.5 miles before joining Schell Creek. The Nathanson Creek watershed is 15 square miles.

A visual survey of several reaches of Nathanson Creek in July 1965 noted the presence of "small" *mykiss* in the upper reaches upstream from the city of Sonoma (Meyer 1965). In a 1965 letter, DFG noted that Nathanson Creek contained a small population of young steelhead within the three miles of permanent stream (Greenwald 1965). A DFG survey in June 1966 found YOY *O. mykiss* in the upper section of Nathanson Creek but did not report size or density information (Rockwood 1966).

In 1974, DFG conducted a visual survey of Nathanson Creek from the mouth upstream about 7.5 miles. Juvenile *O. mykiss* (51-178 mm TL) were visually estimated at a density of 20 per pool in the reach downstream of a 60-foot natural falls. The falls are located about 2.5 miles upstream from the Lovall Valley Road crossing (Lincoln 1974). *Oncorhynchus mykiss* also were observed upstream of the falls, but no estimate of the number or size range of these fish is given. The survey report recommended management of the reach downstream of the falls as spawning and rearing habitat for steelhead (Lincoln 1974).

Nathanson Creek was sampled at East Napa Street in September 1981 as part of a fish distribution study. No *O. mykiss* were found (Leidy 1984). In spring 2002, *O. mykiss* fry were seen in Nathanson Creek, and several year classes were seen in spring 2005 (W. Pier pers. comm.).

Assessment: Natural propagation of anadromous salmonids occurred in the Schell Creek watershed, particularly in Nathanson Creek, until at least 1976 and still occurs. However, insufficient recent information exists to assess the current contribution of this drainage to regional steelhead resources.

Table VIII-4. Distribution status of O. mykiss in San Francisco Estuary streams of Sonoma County, California[a]

Watershed	Stream/ Tributary	Yrs. Surveyed/ Quant. Data	Max. Period of Record	Data Type	Life Hist. Stage/ No.Yrs. Data	Anad. Life-Cycle Possible	O. mykiss		Evidence of Pop. Decline	Current Pop. Status	References (Pers. Comm.)
							Hist.	Current			
Petaluma River	Petaluma	2/0	1962-**1993**	1, 2	-	Y	DF	DF	Y	1	23, 42, 50
	San Antonio	2/0	0 **1981**	1, 2	-	N	DF	PS	Y	0	22, 28, 42
	Adobe (Casa Grande)	3/2	1968-97	1, 2, 3	J/3; R/1	Y	DF	DF	-	1, 2, 3	11, 15, 23, 47,
	Lynch	2/1	1968-2000	0, 1	J/1	UNK	DF	DF	Y	1, 2, 3	49 (1)
	Washington	1/0	0 **1968**	1	-	N	UNK	NP	-	0	29 (1)
	Willow Brook	1/0	0 **1968**	1	-	UNK	UNK	PS	-	0	51 (1)
	Lichau	1/1	1968	1	J/1; R/1	UNK	DF	PS	Y	0	48 (1)
Sonoma Creek	Sonoma	8/6	1946-2002	0, 1, 2, 3	J/7; R/4; M/1	Y	DF	DF	Y	1, 2, 3	1, 2, 16, 20, 22, 23, 26, 27, 35-37, 39, 41, 42, 45, 57
	Fowler	1/1	1986	3	J/1; R/1	UNK	DF	PB	Y	0	14
	Rodgers	6/2	1958-2004	0, 1, 2	J/4; R/2	Y	DF	DF	Y	1,2,3	1, 3, 5, 12, 16, 22, 26, 36 (2)
	Felder	2/0	1970s-2004	0,1,3	J/1	Y	DF	DF	-	1,2,3	22 (2)
	Carriger	5/3	1962-97	1, 2, 3	J/5; R/2; M/1	Y	DF	DF	Y	1, 2, 3	1, 16, 18, 22, 23, 26, 34-37, 42, 46

Watershed	Stream/ Tributary	Yrs. Surveyed/ Quant. Data	Max. Period of Record	Data Type	Life Hist. Stage/ No.Yrs. Data	Anad. Life-Cycle Possible	O. mykiss		Evidence of Pop. Decline	Current Pop. Status	References (Pers. Comm.)
							Hist.	Current			
	Dowdall	1/0	pre-diversion **1977**	0, 1	-	UNK	PB	NP	Y	0	38 (2)
	Agua Caliente	3/3	1965-2002	0, 1	J/3	UNK	DF	DF	Y	1, 2, 3	13, 16, 26, 34-37, 40
	Hooker	3/1	pre-1975 2002	0, 1	J/1	UNK	DF	DF	Y	1, 2, 3	36, 40, 43
	Wilson	1/0	0 **1977**	1	-	UNK	PB	UNK	-	0	44 (2)
	Mill	2/2	1997-2002	1, 2	J/2	Y	DF	DF	Y	1, 2, 3	23, 40
	Asbury	2/2	1966-96	0, 1	J/2; M/1	Y	DF	DF	Y	1, 2, 3	36, 45
	Calabazas	7/7	1961-2002	1, 2, 3	J/7; R/4	Y	DF	DF	-	1, 2, 3	9, 19, 23, 36, 39, 42, 45, 52
	Trinity	1/0	2004	1	J/1	Y	PB	DF	-	1, 2	(2)
	Redwood	2/0	1980s-2002	1	J/2	Y	DF	DF	-	1, 2	(2)
	Stuart	4/3	1966-96	1, 2	J/4; R/3	Y	DF	DF	-	1, 2, 3	17, 36, 40, 45
	Graham	9/8	1946-2002	0, 1, 2	J/8; R/5; M/2	Y	DF	DF	-	1, 2, 3	6-8, 22, 31, 36, 39, 45
	Yulupa	4/3	1966-86	0, 1, 2	J/3; R/2; M/1	UNK	DF	PB	Y	1	4, 22, 33, 36

Watershed	Stream/ Tributary	Yrs. Surveyed/ Quant. Data	Max. Period of Record	Data Type	Life Hist. Stage/ No.Yrs. Data	Anad. Life-Cycle Possible	O. mykiss		Evidence of Pop. Decline	Current Pop. Status	References (Pers. Comm.)
							Hist.	Current			
	Kunde	1/0	2004	1	M/1	Y	PB	DF	-	1	(2)
	Fisher	2/0	2002-2004	1	M/1	Y	PB	DF	-	1	(2)
	Unnamed Trib. near Kenwood	1/0	1947-77	0, 1	-	UNK	DF	UNK	-	0	54
	Bear	7/6	1946-2002	0, 1, 2	J/5; R/3; M/1	Y	DF	DF	-	1, 2, 3	16, 21, 23, 25, 30, 35, 39, 41, 45
Schell Creek	Schell	3/0	2004	1,3	M/1	Y	DF	DF	Y	1	22, 32 (2)
	Arroyo Seco	2/0	1966-2004	1	J/1; M/1	Y	DF	DF	-	1	36 (2)
	Haraszthy	1/0	0 **1977**	1	-	UNK	PS	PS	-	0	53 (2)
	Nathanson	6/3	1965-2005	1, 3	J/5; R/1	Y	DF	DF	-	1, 2, 3	16, 22, 24, 26, 36 (2)

[a] Table headings and codes are defined in the Methods section of this report.

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Personal Communications

1. W. Cox, Department of Fish & Game, telephone conversations with G. Becker, CEMAR, on June 27, 2005, regarding *O. Mykiss* distribution in Sonoma County streams.
2. W. Pier, Sonoma Ecology Center, interview with G. Becker, CEMAR, on May 25, 2005 in Sonoma, California regarding *O. mykiss* distribution in Sonoma County streams.

SONOMA COUNTY MAPS

Historical status of *Oncorhynchus mykiss* in streams of Sonoma County, Caliornia.

Current status of *Oncorhynchus mykiss* in streams of Sonoma County, Caliornia.