

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

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## NAPA COUNTY

### Huichica Creek Watershed

The Huichica Creek watershed is in the southwest corner of Napa County. The creek flows in a generally southern direction into Hudeman Slough, which enters the Napa River via the Napa Slough. Huichica Creek consists of approximately eight miles of channel.

#### *Huichica Creek*

In March 1966 and in the winters of 1970 and 1971, DFG identified *O. mykiss* in Huichica Creek (Hallett and Lockbaum 1972; Jones 1966, as cited in Hallett, 1972). In December 1976, DFG visually surveyed Huichica Creek from the mouth to Route 121 and concluded that the area surveyed offered little or no value as spawning or nursery grounds for anadromous fish. However, the area was said to provide passage to more suitable areas upstream (Reed 1976).

In January 1980, DFG visually surveyed Huichica Creek from Route 121 upstream to the headwaters. *Oncorhynchus mykiss* ranging from 75–150 mm in length were numerous and were estimated at a density of 10 per 30 meters (Ellison 1980). The survey noted a six-foot falls approximately 1.75 miles upstream of Highway 121 as likely to be a complete barrier to upstream movement of steelhead (Ellison 1980).

A site on Huichica Creek at Highway 121 was sampled as part of a fish distribution study in September 1981. Two *O. mykiss* (79, 87 mm FL) were collected by dip net from a ten-meter reach (Leidy 1984).

In April 1983, DFG electrofished three stations on Huichica Creek. A site 1.5 miles upstream of Route 121 and another at Route 121 contained *O. mykiss* (42-252 mm FL) at densities estimated to be 3 per 30 meters. *Oncorhynchus mykiss* also were identified downstream of Route 121 but not collected (Jong 1983). In September 1985, DFG electrofished the same three stations on Huichica Creek. Two *O. mykiss* (-197 mm FL) were caught about 1.5 miles upstream of Route 121, while three *O. mykiss* (-214 mm) were collected at Route 121. No *O. mykiss* were found downstream of Route 121 (Gray 1985).

In July 1988, DFG electrofished Huichica Creek at Route 121 and caught 19 *O. mykiss* ranging from 60-186 mm FL (Montoya 1988a). In November 1989, DFG electrofished an established site approximately 1.5 miles upstream of Route 121 as well as a new site approximately 0.75 mile upstream of Route 121 at the confluence of an unnamed tributary. The established site yielded three *O. mykiss*, ranging in size from 95–110 mm FL. The new site yielded six *O. mykiss* (90–120 mm FL) (Gray 1989a).

Ecotrust and FONR surveyed Huichica Creek between May and September 2002. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. *Oncorhynchus mykiss* were observed in numerous Huichica Creek reaches, with five reaches having density level “3” (Ecotrust and FONR 2002).

**Assessment:** Huichica Creek appears to have hosted a steelhead run historically. In 1980, DFG categorized Huichica Creek as a moderate size drainage providing steelhead spawning and nursery habitat (Ellison 1980). Recent surveys in Huichica Creek by FONR and Ecotrust established that *O. mykiss* persists in the drainage, including areas of high relative density.

## Napa River Watershed

Mainstem Napa River consists of about 40 miles of channel and covers 426 square miles. The river enters San Pablo Bay at the city of Vallejo. Lower Napa River is tidal to approximately 0.25 mile upstream of Trancas Bridge in the city of Napa. Major tributaries include Dry Creek, Redwood Creek, Sulphur Creek, Conn Creek, Soda Creek, Milliken Creek, and Napa Creek. Kimball Canyon Dam, near the headwaters of Napa River, is a complete barrier to upstream fish migration. The channel upstream from the dam is known as Kimball Canyon Creek.

A rare, watershed-wide steelhead resource analysis was performed by DFG in 1969 for the Napa River drainage. In the final document, DFG estimated the standing crop of juvenile steelhead at 87,300 to 144,600 fish (Anderson 1969f). According to DFG, this crop would result in an adult run of 580 to 960 steelhead given a return of 0.5 percent, or 1,160 to 1,930 steelhead based on a return of 1.0 percent (Anderson 1969f). The report also found larger populations of smaller-sized juvenile steelhead in the upper reaches of tributary streams, while lower reaches of tributary streams and isolated sections of Napa River supported smaller populations of larger-sized juveniles (Anderson 1969f). Mean juvenile fork length was about 25 mm less in upper reaches of tributary streams (64 mm) than in the mainstem Napa River (89 mm).

From October 1973 to February 1979, DFG conducted large-mesh and small-mesh gill-net surveys of fish in South, Dutchman, Devil's and Hudeman sloughs in the Napa River Marsh with results provided in Table IX-1.

Table IX-1. DFG *Oncorhynchus mykiss* sampling in the Napa River Marsh, 1973-1979

	Number <i>Oncorhynchus mykiss</i> Collected						
	1973	1974	1975	1976	1977	1978	1979
South slough	--	--	3	--	--	2	4
Dutchman slough	--	4	2	--	1	1	--
Devil's slough	--	--	1	1	--	--	2
Hudeman slough	1	--	5	6	--	1	--
<b>Total</b>	<b>1</b>	<b>4</b>	<b>11</b>	<b>7</b>	<b>1</b>	<b>4</b>	<b>6</b>

(Source: Kohlhorst 1973, 1976; Kohlhorst 1979).

### *Napa River*

A 1959 DFG survey of the Napa River included mention of a creel survey during the winter of 1954-55. The creel survey found that almost 400 steelhead were harvested from the mouth upstream to Lincoln Bridge in the city of Calistoga (Fisher 1959c).

In June 1961, DFG visually surveyed the Napa River from one mile north of Calistoga downstream to Zinfandel Lane. In this 11.5-mile reach, 26 YOY *O. mykiss* were observed up to about 75 mm in length (Day 1961b). Staff from DFG considered this reach of the Napa River to be the most important spawning and nursery area of the mainstem, but it was said to act primarily as a migration route for adult steelhead returning to spawn in the tributaries (Day 1961a).

In July 1965, DFG visually surveyed the Napa River and found it almost completely dry downstream of the Kimball Canyon Dam. No *O. mykiss* were observed in the few warm, isolated pools (Culley and Fox 1965). In February 1966, DFG surveyed two miles of the Napa River downstream of Kimball Canyon Dam and observed no fish (Brackett 1966a).

In July and August 1969, DFG electrofished seven stations on mainstem Napa River between the Blossom and Dry creek confluences. *Oncorhynchus mykiss* were collected at three stations near the Sulphur Creek confluence, with a total of 37 juvenile steelhead recorded (Anderson 1969a). Most of the steelhead were caught at Zinfandel Lane, including 30 fish ranging from 69-122 mm FL. Steelhead densities were estimated at 39 per 30 meters at Zinfandel Lane and four per 30 meters at both Pratt Avenue and Pope Street. The report included an estimate of 3,000 juvenile steelhead in the standing crop of 1969 between Calistoga and Yountville (Anderson 1969a).

In August 1969, DFG electrofished the upper Napa River about 0.25 miles downstream of Kimball Canyon Dam. Steelhead ranged in size from 69-104 mm FL, and had an estimated population density of 24 per 30 meters (Anderson 1969b). At this time, the standing crop of juvenile steelhead in the Napa River upstream of Blossom Creek was estimated to be between 600 and 2,500 fish (Anderson 1969f). In 1977 DFG published a natural resources assessment of the Napa Marsh in which the agency estimated the standing crop of juvenile steelhead from the Napa River drainage to be approximately 116,000 to 193,000 fish (Michaels 1977).

An employee of the Napa Water Department reported that he observed steelhead runs up to the base of Kimball Canyon Dam until the 1976 drought. After 1976, he observed only small trout in pools downstream of the dam (D. Anderson, pers. comm., cited in Leidy 2002).

In October 1988, DFG electrofished the Napa River from the confluence with Bell Canyon Creek downstream to Lodi Lane. No *O. mykiss* were caught (Montoya 1988c). In early October 1989, DFG set gill-nets in the Napa River downstream of the city of Napa and caught one steelhead (398 mm FL) (Gray 1989b).

Leidy found no *O. mykiss* when he electrofished four locations between Yountville and Calistoga in August and September 1993, nor when he conducted otter-trawls at four locations in the Napa sloughs in July 1994 (Leidy 2002). In July 1997, Leidy electrofished a pool on the upper Napa River, immediately downstream of an arizona crossing at the Calistoga water treatment plant. He caught two *O. mykiss* (255, 210 mm FL) with a silvery appearance suggesting anadromy (Leidy 2002).

Leidy electrofished a Napa River site in Calistoga in August 1997 and did not encounter *O. mykiss*. Another site immediately upstream of the lower spillway at Pioneer Park did not produce *O. mykiss* (Leidy 2002).

In September 1998, the Corps and USFWS sampled 12 locations with 50-foot beach seines within the area of tidal influence on the Napa River in a reach from Lincoln Avenue in the city of Napa (RM 17.3) downstream to the Rocktram Steel Pipe Factory (RM 11.6). No salmonids were caught, but the report of the seining effort cited the typical steelhead run size (as of 1999) as being between about six thousand to a few hundred fish (Wilkinson 1999).

### *Carneros Creek*

Carneros Creek drains an area of about nine square miles including a headwaters area consisting of the hills west of the city of Napa. It enters the Napa River at Cutting's Wharf, south of the city of Napa (DCE 1999).

In November 1958, DFG visually surveyed areas accessible by car on Carneros Creek between Cuttings Wharf and a point 6.5 miles upstream. No fish were observed, but the local game warden and residents reported small runs of steelhead and a small resident trout fishery in the uppermost headwaters (Elwell 1958g).

In December 1976, DFG visually surveyed Carneros Creek from Cuttings Wharf to a point 3.0 miles upstream. This reach was reported as poor nursery habitat for steelhead, serving only as a migration route (Gillespie and Reed 1976).

In June 1981, DFG surveyed the lower 4.1 miles of Carneros Creek to locate stranded steelhead. Intermittent water was present throughout the surveyed reach, but no fish were observed. Three dams were found, two at ten feet high and another six feet high. All were considered complete barriers to migration (Harris and Ambrosins 1981b).

Ecotrust and FONR surveyed Carneros Creek between May and September 2002. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. *Oncorhynchus mykiss* were observed in numerous Carneros Creek reaches, with six reaches having density level "3" (Ecotrust and FONR 2002).

### *Suscol Creek*

Suscol Creek consists of about eight miles of channel that drains the hills southeast of the city of Napa. It enters the lower Napa River about five miles south of the city of Napa.

In a 1949 letter, a landowner along Suscol Creek reported observing spawning steelhead in the winter and juveniles throughout the year (Berry 1949). The author noted perennial flows in the creek. In January 1955, DFG visually surveyed Suscol Creek in response to a proposed diversion for pasture irrigation. *Oncorhynchus mykiss* were observed and natural propagation was rated as "fair" (CDFG 1955).

In May 1973, DFG visually surveyed Suscol Creek from the mouth to the headwaters. Steelhead were observed throughout the stream, ranging in length from 25-205 mm, at estimated densities of 25-200 per 30 meters of stream (Reynolds 1973).

In January 1997, Leidy electrofished 30 meters of Suscol Creek between Devlin Road and highways 29/37. He caught eight *O. mykiss* ranging from 86-255 mm FL (Leidy 2002). The largest fish (178-255 mm) displayed smolt characteristics.

Ecotrust and FONR surveyed Huichica Creek between May and September 2002. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. *Oncorhynchus mykiss* were observed in six Suscol Creek reaches, with two reaches having density level "2" (Ecotrust and FONR 2002).

### *Tulucay Creek*

Tulucay Creek consists of approximately eight miles of channel draining an area of 13 square miles. The creek enters the Napa River about 1.5 miles south of Imola Avenue (DCE 1999).

In November 1958, DFG surveyed points accessible by car on Tulucay Creek from the mouth to its headwaters. *Oncorhynchus mykiss* averaging 75-100 mm in length were noted but generally were scarce (Elwell 1958o). The report noted that Tulucay Creek supported nursery areas in the mid-section of the drainage adequate to sustain a population of trout (Elwell 1958f).

In June 1981, DFG visually surveyed Tulucay Creek from the mouth to the Green Valley Road crossing for the purpose of rescuing fish stranded by low flows. Several *O. mykiss* 75-200 mm were observed in perennial pools of the upper reach (Harris and Ambrosins 1981f). The Green Valley Road crossing was identified as a passage barrier.

In July 1992, DFG electrofished four Tulucay Creek sites downstream of the confluence with Murphy Creek. A pool at the Fourth Avenue Bridge contained one *O. mykiss* (240 mm FL) (Emig 1992a). The survey report noted that the population probably had been reduced because of low flows resulting from the lack of bypass requirements for upstream diversions (Emig 1992a).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. One reach of Tulucay Creek was found to have *O. mykiss* at density level "1" (Ecotrust and FONR 2001).

### *Murphy Creek*

Murphy Creek drains about one square mile directly east of the city of Napa. It is a perennial creek that joins Spencer Creek to form Tulucay Creek.

In June 1968, DFG investigated reports of a fish kill involving large numbers of Murphy Creek steelhead. During a subsequent survey, juvenile *O. mykiss* were observed between 38-100 mm in length at an estimated density of 20 per 30 meters of stream throughout the surveyed area (Jones 1968).

In August 1990, DFG electrofished pool sites upstream of the crossing at Shady Brook Lane. Five *O. mykiss* were caught ranging in size from 103-210 mm. An additional three to four *O. mykiss* (50-150 mm) were observed but not caught (Gray 1990d). The survey report noted a local resident's statement that, until about 1970, many adult steelhead, typically 610-660 mm long, migrated up Murphy Creek.

In July 1992, DFG electrofished pools at two Murphy Creek sites. *Oncorhynchus mykiss* were found at both sites and ranged from 126-249 mm (Emig 1992a).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Two reaches of Murphy Creek were found to have *O. mykiss* at density level "1" and one headwaters reach had level "2" (Ecotrust and FONR 2001).

### *Spencer Creek*

Spencer Creek is tributary to Tulacay Creek and drains the area directly east of the city of Napa. Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. One headwater reach of Spencer Creek was found to have *O. mykiss* at density level “2” (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in one Spencer Creek reach (Ecotrust and FONR 2002).

### *Napa Creek*

Napa Creek is formed by the confluence of Browns Valley Creek and Redwood Creek in Browns Valley west of the city of Napa. Napa Creek is contained almost wholly within the city of Napa. The combined drainage area of Napa Creek and its tributaries is 15 square miles (DCE 1999).

In November 1958, DFG visually surveyed easily accessible reaches of Napa Creek from the confluence with the Napa River to the headwaters. No *O. mykiss* were found in the reach below the confluence of Redwood Creek and Brown Valley Creek (Elwell 1958k).

Leidy sampled Napa Creek in January 1994 upstream of Jefferson Street. He did not find *O. mykiss* (Leidy 2002). Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Napa Creek was found to have *O. mykiss* at density level “1” (Ecotrust and FONR 2001).

### *Browns Valley Creek*

Browns Valley Creek consists of approximately 4.5 miles of channel flowing generally southeast to the city of Napa. It is tributary to Napa Creek.

In November 1958, DFG visually surveyed portions of Browns Valley Creek accessible by car. No fish were found. Because Browns Valley Creek typically dried by early spring, DFG considered this creek to have no fishery functions except contributing flows to Napa Creek (Elwell 1958l). In October 1966, DFG again visually surveyed Browns Valley Creek from the mouth to the headwaters. No *O. mykiss* were observed, and DFG reported that the creek did not support *O. mykiss* (McCurdy 1966).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. One reach (of four) in Browns Valley Creek was found to have *O. mykiss* at density level “1” (Ecotrust and FONR 2001).

### *Redwood Creek*

Redwood Creek is tributary to Napa Creek. It consists of approximately 13 miles of channel draining about 15 square miles.

In November 1958, DFG visually surveyed easily accessible reaches of Redwood Creek from the confluence with the Napa River to the headwaters. *Oncorhynchus mykiss* (75-100 mm average length) was found to be fairly common in the reach that sustained perennial flow, beginning just upstream of the junction of Browns Valley and Redwood roads and continuing upstream 3.5 miles to a natural falls. As a result, this reach of Redwood Creek was considered to be an excellent nursery ground for juvenile steelhead (Elwell 1958k).

In April 1965, the Napa Water Department inadvertently discharged chlorine into Redwood Creek, killing more than 10,000 fingerling steelhead in a 1.5 mile reach (Greenwald 1965a). In June 1966, DFG visually surveyed portions of Redwood Creek accessible by automobile. *Oncorhynchus mykiss* were found at a density of 250-330 per 30 meters upstream of the Redwood and Mt. Veeder roads junction. Most of the fish sighted were YOY, with only a very few larger than 75 mm FL. Upstream of the confluence with Pickle Canyon Creek, YOY and other *O. mykiss* up to 230 mm in length were observed at an estimated density of 70-100 per 30 meters. Two five-pound steelhead also were observed in the upper reach (Hicks and McCurdy 1966b). According to DFG, natural propagation appeared to be good throughout the section surveyed (Hicks and McCurdy 1966b).

In June 1967, DFG surveyed Redwood Creek upstream of the confluence of Redwood and Pickle Canyon creeks. *Oncorhynchus mykiss* density in two miles of the creek was estimated on average to be 25 per 30 meters. The greatest densities occurred immediately upstream of the Pickle Canyon Creek confluence, where *O. mykiss* density was estimated at 50 per 30 meters. Fish captured ranged between 25 and 75 mm in length (Thompson 1967b). Using population densities from earlier surveys, DFG estimated that 24,200 and 8,600 juvenile steelhead used 4.25 miles of Redwood Creek for “nursery purposes” in 1966 and 1967, respectively (Jones 1967).

In October 1969, DFG electrofished Redwood Creek one mile northwest of Mont La Salle School, near the end of Redwood Road. Of the 70 *O. mykiss* collected, 68 had fork lengths ranging from 38-76 mm (Anderson 1969c). A 112 mm and a 132 mm steelhead also were noted. Density was estimated at 75 per 30 meters. Based on the survey results, DFG estimated the 1969 standing crop of steelhead juveniles to be between 21,400 and 29,700 fish in Redwood Creek and its tributaries (Anderson 1969c).

In April 1977, DFG visually surveyed Redwood Creek from the mouth to near the headwaters. A small flowing reach near the mouth did not support live *O. mykiss*, although a dead adult steelhead was found at the upstream end of this reach. From five miles upstream of the mouth to the headwaters, *O. mykiss* (100–180 mm) were found at an estimated density of 10 per 30 meters (Gillespie and Rowser 1977).

In October and November 1984, DFG visually surveyed Redwood Creek from the Redwood Road crossing near Dry Creek Road upstream to the end of Redwood Road. *Oncorhynchus mykiss* (50–125 mm) was observed most commonly in the main canyon upstream of the Mt. Veeder Road crossing (Emig 1984c).

In November 1985, DFG electrofished two Redwood Creek sites, one immediately downstream, the other extending 0.25 miles upstream from the intersection of Redwood and Mount Veeder roads. Two juvenile steelhead were caught, one 91 mm in length and the other 92 mm in length (Gray 1986c).

In June and July 1987, DFG visually surveyed Redwood Creek from Castle Rock to the mouth. *Oncorhynchus mykiss* was observed throughout the creek, with various age classes in the upper portion but very few YOY. In the lower part of the creek, most of the trout were YOY (Montoya 1987c). *Oncorhynchus mykiss* was estimated to average 65 mm in length (Montoya 1987c).

Leidy sampled 30-meter reaches at three Napa River locations in January 1994. About 0.3 miles upstream from Castle Rock, he caught 13 *O. mykiss* (50-132 mm FL) and two larger *O. mykiss* (245, 260 mm) (Leidy 2002). The lack of spotting on the sides and the condition of the anal and pectoral fins suggested anadromy in the larger fish. At Castle Rock, Leidy caught five *O. mykiss* (57-93 mm) and observed six others reflecting two size classes (4: 60-100 mm; 2: 125-150 mm). The most downstream station, immediately downstream of the Redwood Road Bridge, produced three *O. mykiss* (104, 119, 122 mm).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of 21 Redwood Creek reaches, eight were found to have *O. mykiss* at density level "1," while five reaches had density level "2" and three reaches had level "3" (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in numerous Redwood Creek reaches, including two reaches at density level "2" (Ecotrust and FONR 2002).

### *Pickle Canyon Creek*

Pickle Canyon Creek is tributary to Redwood Creek and consists of about 3.5 miles of channel. It drains a relatively undeveloped area southwest of the city of Yountville.

In June 1966, DFG visually surveyed Pickle Canyon Creek from the mouth to the headwaters. Numerous juvenile *O. mykiss* (25-75 mm) and a few fish ranging from 150-250 mm in length were observed in the lower two miles of stream. Densities were estimated at 50-70 per 30 meters (Hicks and McCurdy 1966a). In June 1967, DFG again surveyed the entire creek length. *Oncorhynchus mykiss* densities were estimated at 25-30 per 30 meters in the lower two miles of stream. In the upper survey area, densities dropped to less than one fish per 30 meters (Thompson 1967a). Using population densities from earlier surveys, DFG estimated that 6,200 and 2,900 juvenile steelhead used two miles of Pickle Canyon Creek for rearing in 1966 and 1967, respectively (Jones 1967).

In May 1978, DFG electrofished four stations on Pickle Canyon Creek upstream and downstream of its confluence with an unnamed tributary. A total of 36 *O. mykiss* were caught at the four sites. Fish ranged in length from 61-84 mm FL (Baracco 1978). Population densities were found to range between 6.5 and 11.5 per 30 meters of stream.

In June 1981, DFG surveyed the lower 3.2 miles of Pickle Creek to locate stranded steelhead juveniles for rescue. Most of the creek was dry, although a few steelhead juveniles were spotted in isolated pools (Ambrosins 1981c).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of eight Pickle Canyon Creek reaches, two were found to have *O. mykiss* at density level "1," while two reaches had density level "2" and two reaches had level "3" (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in two Pickle Canyon Creek reaches (Ecotrust and FONR 2002).

### *Milliken Creek*

Milliken Creek drains an area of 30 square miles (DCE 1999). The city of Napa's Lake Milliken dam was constructed on the creek in 1924 without a fishway and serves as an impassable barrier to upstream migration.

A June 1940 DFG lake survey report noted natural populations of steelhead having moderate success in Milliken Reservoir with YOY (50-65 mm) observed in inlet streams (Shapovalov 1940a). Draining of Milliken Reservoir in 1954 revealed only a few trout (Evans 1954). In 1958, DFG characterized the six miles of Milliken Creek downstream of the reservoir as useful for spawning by steelhead (Elwell 1958c).

In February 1959, DFG surveyed Milliken Creek upstream of Milliken Reservoir, including a two mile reach downstream of a 40 foot falls that served as a complete barrier to fish migration. Although no fish were observed, the dam's caretaker reported spawning runs of *O. mykiss* from the lake upstream in Milliken Creek in late fall of that year (Fisher 1959b).

In May 1966, DFG visually surveyed Milliken Creek from the mouth upstream to Milliken Reservoir. One 405 mm *O. mykiss* was found at the base of the Silverado Country Club Diversion Dam upstream from Atlas Peak Road. Between the diversion dam and Milliken Reservoir, *O. mykiss* were observed ranging from 50-150 mm and at an estimated density of 40 per 30 meters (Brackett 1966b).

In March 1967, DFG visually surveyed Milliken Creek from the mouth to Milliken Reservoir. A 510 mm steelhead was observed at the base of the Silverado Country Club Diversion Dam (Thompson 1967c).

In July 1975, DFG visually surveyed Milliken Creek from Milliken Reservoir upstream 3.6 miles. Downstream of a natural falls, *O. mykiss* ranging in size from 50-100 mm were observed at an estimated density of 5 per 30 meters. No *O. mykiss* were found upstream of the falls (Henry and Coleman 1975).

In November and December 1975, DFG visually surveyed Milliken Creek from the Silverado Country Club Diversion Dam to Milliken Reservoir. About two miles upstream of the country club, a 20-foot barrier was identified where the city of Napa built a diversion dam at a bedrock outcrop. No fish were found upstream of this barrier. Steelhead were observed ranging from 50-255 mm downstream of the barrier, at an estimated density of 20 per 30 meters (Tyler and Holstine 1975).

In April and May 1980, DFG visually surveyed Milliken Creek from its mouth to the Napa Diversion Dam. This effort was followed up with an electrofishing survey at four stations. Upstream of the Napa City Diversion Dam, five *O. mykiss* were caught ranging from 115-199 mm FL. At the mouth of Milliken Canyon, 13 *O. mykiss* were caught ranging from 117-187 mm in length. Numerous *O. mykiss* fry were seen but not collected (Ellison et al. 1980).

In June 1981, DFG visually surveyed Milliken Creek from the mouth to the Silverado Country Club Diversion Dam in order to locate steelhead stranded by low flows. No steelhead were found (Ambrosins 1981b).

In July 1987, DFG visually surveyed Milliken Creek from its mouth to Milliken Reservoir, and recorded two *O. mykiss* (50, 380 mm) (Montoya 1987b). In July 1988, DFG electrofished Milliken Creek at the Silverado Country Club and found 11 *O. mykiss* from 61-268 mm (Montoya 1988b).

Leidy found no *O. mykiss* when electrofishing at the Trancos Road Bridge in August 1993 (Leidy 2002). However, in June 1998, he found *O. mykiss* at two other sites electrofished on Milliken Creek. At Atlas Peak Road, Leidy caught one *O. mykiss* (61 mm FL) and at Westgate Drive in the Silverado Country Club he caught two *O. mykiss* (50, 53mm FL) (Leidy 2002).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of seven Milliken Creek reaches, three were found to have *O. mykiss* at density level “1,” while two reaches had density level “3” (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in numerous Milliken Creek and Millien Creek tributary reaches, including three reaches at density level “3” (Ecotrust and FONR 2002).

#### *Sarco Creek*

Sarco Creek drains the area northeast of the city of Napa. Its mouth on Milliken Creek is located immediately upstream from Milliken Creek’s confluence with the Napa River.

In August 1987, DFG visually surveyed the lower five miles of Sarco Creek from the mouth to Mount George, and also the lower 3.9 miles of a major unnamed tributary that joins Sarco Creek just upstream of its confluence with Milliken Creek. No *O. mykiss* were observed in either creek (Montoya 1987d, 1987e).

In August 1990, DFG electrofished Sarco Creek at an area off Langley Park Lane. One *O. mykiss* (210 mm FL) was caught. Three *O. mykiss* of comparable size as well as two smaller individuals were observed but not caught (Gray 1990g). The survey report noted that the fish were presumed to be resident forms of an ancestral stock of steelhead.

In August 1993, Leidy electrofished Sarco Creek at the Trancos Road Bridge. No *O. mykiss* were found (Leidy 2002). Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of two Sarco Creek reaches, one was found to have *O. mykiss* at density level “1” (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in five Sarco Creek reaches, including one reach at density level “2” (Ecotrust and FONR 2002).

#### *Camp Creek*

Camp Creek is tributary to Milliken Reservoir. In June 1940, DFG identified *O. mykiss* ranging from 50-65 mm in length in a flowing reach of Camp Creek just upstream of the mouth. According to the Milliken Reservoir caretaker, steelhead spawned in portions of the creek downstream from an impassable natural falls (Shapovalov 1941).

#### *Salvador Outfall Channel*

Salvador Outfall Channel is the local name for an otherwise unnamed tributary to the Napa River. Its confluence with the Napa River is located north of Trancas Avenue.

In March 1977, DFG surveyed approximately one mile of the Salvador Outfall Channel from Vintage High School to the mouth. Six adult steelhead were observed between Big Ranch Road and the mouth. Staff from DFG speculated that adult steelhead used this stream when low flows prevented access to more suitable upstream tributaries of the Napa River, but that flows and water quality were inadequate for juvenile fish (Baracco 1977).

### *Soda Creek*

This Napa River tributary consists of approximately six miles of channel between the headwaters and the mouth. Soda Creek joins the Napa River approximately three miles north of the city of Napa. A natural falls occurs nearly three miles upstream of the mouth and appears to constitute a barrier to upstream migration.

In June 1940, DFG identified *O. mykiss* ranging from 50 to 75 mm in length near the mouth of an unnamed tributary of Soda Creek (Shapovalov 1940d). In November 1958, DFG visually surveyed Soda Creek from the mouth to the headwaters. Small numbers of *O. mykiss* ranging between 75 and 100 mm in length were observed in the middle section of drainage that had recorded flows on this date (Elwell 1958n). The upper and lower reaches were dry at the time of the survey. In the survey report, DFG cited the local warden as saying that each year steelhead runs occurred that were smaller than only the Dry Creek and Redwood Creek runs. A 14-foot bedrock barrier was described near the junction of Soda Canyon and Soda Springs roads. (Elwell 1958n).

A November 1958 DFG report noted that the lowermost three miles of Soda Creek was utilized by steelhead for spawning purposes (Elwell 1958e). The report also noted that the lowest one-mile portion of this reach maintained permanent flows and served as a nursery area for juvenile steelhead (Elwell 1958n).

In February 1964, ten female and four male steelhead kelts were rescued from a drying pool in Soda Creek approximately two miles upstream of the mouth. The rescued fish were transported to the Napa River. Additional fish were reportedly poached in the previous week (Jones 1964a).

In May 1980, Soda Creek was surveyed visually from the Silverado Trail to the headwaters. Three sites were electrofished. The first station, at the first junction with Soda Canyon Road, produced seven *O. mykiss* (52-67 mm). The second site, at Loma Vista Drive, had six *O. mykiss* (57-69 mm). The last site, approximately 2.3 mile upstream of the mouth, had 37 *O. mykiss* (60-279 mm) (Ellison and Carnine 1980).

In December 1985, DFG caught 18 wild *O. mykiss* in Soda Creek while monitoring the movement of stocked steelhead. Sizes of fish ranged from 79-202 mm, and a 159 mm male was found to be sexually mature (Gray 1986a). Planted *O. mykiss* also were recovered during the survey. In February 1986, three wild *O. mykiss* (75-125 mm) and 104 planted steelhead were caught during a monitoring study (Gray 1986d). In May 1986, an additional 16 *O. mykiss* (180-270 mm) were caught, nine of which were assumed to be wild (Gray 1986e).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system between June and September 2002. *Oncorhynchus mykiss* were found in four Soda Creek reaches (Ecotrust and FONR 2002).

### *Dry Creek*

Dry Creek drains an area of 20 square miles (DCE 1999). From its headwaters near Bald Mountain, the creek flows generally southeast to its confluence with the Napa River north of the city of Napa.

In October 1969, DFG electrofished Dry Creek in the vicinity of Dry Creek Road. Steelhead ranged in size from 38-81 mm, with one 170 mm trout. Estimated density of fish was 92 per 30 meters (Anderson 1969a).

In June 1981, DFG electrofished Dry Creek and caught more than 200 steelhead ranging in size from 33-86 mm FL (Ellison 1981c). In June 1981, DFG rescued 970 steelhead YOY, presumably trapped in drying portions of Dry Creek, and transferred them to the Silverado Field Operations Base (Baker 1981). Another 212 *O. mykiss* were reported dead.

In 1983, a DFG fish population survey included an estimate of steelhead density of 46 fish per 30 meters (Emig 1992b). In March 1987, DFG electrofished lower Dry Creek and caught a juvenile steelhead (50 mm FL). Several adult steelhead were seen spawning nearby (Gray 1987b).

Leidy electrofished Dry Creek in June 1996 and again in August 1997. In 1996, he caught 16 *O. mykiss* (58-210 mm FL) at the intersection of Oakville Grade and Dry Creek Road, and estimated trout density at 25 per 30 meters of stream. Leidy found four *O. mykiss* (110-210 mm) at the Highway 29 frontage road, with an estimated fish density of 10 per 30 m. In 1997, about one mile upstream from the lower one-lane bridge on Dry Creek Road, Leidy caught two *O. mykiss* (140, 147 mm) and estimated fish density at 5 per 30 meters. Immediately upstream, he collected five *O. mykiss* (125-142 mm) and estimated density at 10 per 30 meters (Leidy 2002).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of 17 Dry Creek reaches, four were found to have *O. mykiss* at density level "1," while six reaches had density level "2" and three reaches had level "3" (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in numerous Dry Creek and Dry Creek tributary reaches, including 31 reaches at density level "3" (Ecotrust and FONR 2002).

### *Hopper Creek*

Hopper Creek is tributary to Dry Creek. A reservoir on Hopper Creek formerly supplied water supply for the city of Yountville and constituted the upper limit of the system for anadromous fish usage. The reservoir appears to have been constructed immediately upstream from a natural falls that acted as a passage barrier (Pinkham 1976).

In August 1976, DFG visually surveyed Hopper Creek from Highway 29 to its headwaters. No *O. mykiss* were observed, but local residents reported that the stream downstream of the reservoir supported runs of steelhead during high water years (Pinkham 1976).

In June 1981, DFG visually surveyed the lower 1.9 miles of Hopper Creek to locate stranded steelhead juveniles for rescue. No *O. mykiss* were observed (Harris and Ambrosins 1981e).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. One Hopper Creek reach was surveyed and *O. mykiss* were not observed (Ecotrust and FONR 2001). Staff from the Napa County Resource Conservation District report that the creek is likely to be used by *O. mykiss* in some years (J. Koehler pers. comm.).

#### *Hinman Creek*

Hinman Creek drains an area of about 2.5 square miles and is tributary to Hopper Creek. Hinman Reservoir dam is a fish passage barrier occurring about 2.5 miles upstream from the mouth.

In June 1966, DFG visually surveyed Hinman Creek from the mouth to Hinman Reservoir. No *O. mykiss* were observed (Hicks 1966). Hinman Reservoir was sampled by DFG using gill nets in November 1974 and again no *O. mykiss* were found in the fish assemblage. In January 1975, 25 *O. mykiss* 50–75 mm in length were found when Hinman Reservoir was drained. At this time, DFG also poisoned the creek immediately upstream of the reservoir and afterward found six dead *O. mykiss*. Dorsal fin deformation indicated that these fish were of hatchery origin (Week 1975).

In January 1984, DFG electrofished Hinman Creek near the Domaine Chandon property and found four *O. mykiss* ranging from 50–160 mm in length (Gray 1990b). In April 1987, DFG electrofished the same reach of Hinman Creek but did not encounter *O. mykiss* (Gray 1990b). The survey report speculated that *O. mykiss* probably were present in the system. Staff from the Napa County Resource Conservation District report that the creek may be used by *O. mykiss* in some years (J. Koehler pers. comm.).

#### *Segassia Canyon Creek*

Segassia Canyon Creek is tributary to Dry Creek from the west. The creek appears to be less than one mile in length, draining the eastern slopes of Mt. Veeder.

Ecotrust and FONR carried out surveys in tributaries of the Napa River system between June and September 2002. *Oncorhynchus mykiss* were found in several Segassia Canyon Creek reaches, including one reach at density level “3” (Ecotrust and FONR 2002).

#### *Wing Canyon Creek*

Wing Canyon Creek is tributary to Dry Creek from the west. The creek appears to be less than one mile in length, draining the eastern slopes of Mt. Veeder.

Ecotrust and FONR carried out surveys in tributaries of the Napa River system between June and September 2002. *Oncorhynchus mykiss* were found in several Wing Canyon Creek and tributary creek reaches, including six reaches at density level “3” (Ecotrust and FONR 2002).

#### *Campbell Creek*

Campbell Creek is the local name for an otherwise unnamed tributary of Dry Creek. A February 1997 DFG field note reported that Campbell Creek was known to have populations of steelhead (Emig 1997).

In June 1996, Leidy electrofished an unnamed tributary of Dry Creek known locally as Carmel Creek or Campbell Creek immediately upstream of Oakville Grade Road. He caught ten *O. mykiss* averaging from 41-73 mm FL, and estimated population density at 20 per 30 meters (Leidy 2002).

### *Montgomery Creek*

Montgomery Creek is a seasonal tributary to Dry Creek with a watershed of about two square miles. It drains a portion of the range forming the west side of the Napa Valley and flows generally north to join Dry Creek at the junction of Dry Creek and Mt. Veeder roads.

In December 1975, DFG visually surveyed Montgomery Creek from the mouth to the Mount Veeder Road crossing. No fish were observed. In the survey report DFG noted residents' reports that the creek dried up early in spring (Holstine 1975).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of three Montgomery Creek reaches and two reaches in a tributary, one reach was found to have *O. mykiss* at density level "2," while two reaches had density level "3" (Ecotrust and FONR 2001).

### *Conn Creek*

Conn Creek drains an area of 60 square miles (DCE 1999). Construction of the Conn Valley Reservoir (Lake Hennessey) in 1945 completely curtailed access to more than eight miles of Conn Creek and numerous tributary streams, including Chiles, Moore, Sage and Fir creeks.

In September 1945, DFG observed large numbers of trout in the upper sections of Conn Creek (Ott 1945). In 1946, DFG noted that a moderately large population of trout, from fingerlings to 200 mm in length, was present in the tributary streams of Conn Valley Reservoir (Murphy 1949). In a May 1947 creel census, DFG found both hatchery and wild *O. mykiss* in the group taken by anglers from the reservoir. However, by 1948, practically no trout were present in the tributary streams (Murphy 1949). The Department of Fish and Game concluded that the trout fishery would not be self-maintaining even in years of "good" flows in spawning streams because of low survival of adults in the reservoir (Murphy 1949).

In February 1959, DFG made a cursory survey of eight sites near road access on Conn Creek upstream of Lake Hennessey. No *O. mykiss* were observed, but residents reported catching small numbers of *O. mykiss* up to 300 mm in length (Fisher 1959a).

In April 1979, DFG electrofished two sites above the reservoir on Conn Creek in relation to an oil spill. Approximately 400 feet upstream of Linda Falls, five *O. mykiss* were caught (131-192 mm FL). Behind the Angwin Fire Station on College Road, another seven *O. mykiss* were collected (95-157 mm). Additional *O. mykiss* were seen at both sites, but evaded capture (Cox 1979).

In September 1988, DFG electrofished two reaches on Conn Creek above the reservoir, near the Rossi Road Bridge. A total of seven *O. mykiss* were caught measuring 55-186 mm in length (Gray 1988a).

Leidy found *O. mykiss* downstream of the reservoir at two locations electrofished in July 1994. Just downstream from Domain Chandon vineyard he caught five *O. mykiss* (78-100 mm FL) with an estimated density at 10 per 30 meters of stream. At the confluence with Rector Creek, he collected two *O. mykiss* (75, 95 mm) and estimated density at 5 fish per 30 meters (Leidy 2002).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Two Conn Creek reaches were surveyed, and *O. mykiss* were not observed (Ecotrust and FONR 2001).

#### *Rector Creek*

Rector Creek is tributary to Conn Creek downstream of Hennessey Reservoir. It drains an area of 12 square miles (DCE 1999). Rector Reservoir, located immediately upstream of the Silverado Trail, is a complete barrier to upstream steelhead migration.

In December 1985, DFG electrofished a 300 meter reach of Rector Creek upstream of Rector Reservoir. A total of 41 *O. mykiss* (52-116 mm FL) were caught and kept for disease analysis. One female and three males were found to be sexually mature (Gray 1986b).

In March 1986 DFG electrofished Rector Creek between the Silverado Trail and the spillway of Rector Reservoir, which was spilling at the time of the survey. Three adult *O. mykiss* (approximately 305 mm FL) and 30 *O. mykiss* juveniles (100-150 mm) were caught. Some fish were silvery, indicating smolt transformation (Emig 1986).

In February 1988, DFG electrofished approximately 600 meters of Rector Creek upstream from the reservoir collecting *O. mykiss* for bacterial kidney disease analysis. A total of 53 *O. mykiss* were caught ranging in size from 60-400 mm FL. According to DFG, the two largest individuals (315 and 400 mm) were in spawning condition (Gray 1988b). A 2004 survey found *O. mykiss* in Rector Creek (J. Koehler pers. comm.).

#### *Chiles Creek*

Chiles Creek originates in Chiles Valley and drains an area of about 20 square miles. The creek has a channel length between the headwaters and the mouth of approximately 7.8 miles. Chiles Creek is tributary to Conn Creek via Lake Hennessey and has one major tributary, Moore Creek.

In July 1945, the year Hennessey Dam was constructed, DFG sampled Chiles Creek upstream of the mouth of Moore Creek and caught *O. mykiss* to 75 mm in length (Curtis 1945a). In August 1945, several 100 mm *O. mykiss* were observed during a poisoning operation (Curtis 1945b). In September 1945, DFG found that the lower two miles of Chiles Creek were dry, but noted numerous *O. mykiss* upstream (Ott 1945).

In 1946, DFG noted that a moderately large population of trout, from fingerlings to 200 mm in length, was present in the tributary streams of Conn Valley Reservoir (Murphy 1949). By 1948, practically no trout were seen in the tributary streams (Murphy 1949).

Six *O. mykiss* were collected by DFG from Chiles Creek in April 1947. The fish ranged from 148-320 mm in length. Scale analysis demonstrated that they were not hatchery fish (CDFG 1947). The resulting report noted that the presence of large numbers of trout fingerlings indicated that steelhead stock had spawned in Chiles Creek that season (Curtis 1947a). A DFG note indicated that conservatively, 75,000 *O. mykiss* YOY were present in three miles of Chiles Creek examined in May 1947 (Shapovalov 1948).

In August 1947, DFG found no trout at several sites upstream of the Whiskey Crossing Bridge (*i.e.*, two miles upstream of the mouth), but found several 150-255 mm *O. mykiss* immediately downstream of the bridge (Curtis 1947a). In July 1949, thorough surveys in this reach revealed no YOY *O. mykiss*, although a few 150-255 mm *O. mykiss* were found just downstream of the Whiskey Crossing Bridge (CDFG 1950).

In August 1956, DFG visually surveyed Chiles Creek where access permitted, between the mouth and 0.5 mile upstream of the headwater fork. A few rainbow trout were seen in the middle flowing portion of the stream (Fisher 1956).

In September 1990, DFG electrofished one site on Chiles Creek along Chiles-Pope Valley Road near Mile Marker 2.75. One *O. mykiss* (150 mm FL) was caught and at least two of the same size were observed but evaded capture (Gray 1990a).

#### *Moore Creek*

Moore Creek flows generally south to join Chiles Creek about one and one-half mile east and upstream of Lake Hennessey. The creek's headwaters are east of the town of Angwin and are perennial.

A July 1945 DFG field note reported *O. mykiss* in Moore Creek approximately 1.5 miles upstream of the Chiles Creek confluence (Curtis 1945c). In August 1945, DFG staff observed numerous trout in Moore Creek (Ott 1945).

In September 1990, DFG electrofished sites up- and downstream of a wooden bridge over the creek. A total of 30 *O. mykiss* were caught ranging from 48-146 mm FL (Gray 1990c).

#### *Sage Creek*

Sage Creek is tributary to Conn Creek via Lake Hennessey. The creek consists of approximately 5.2 miles of channel.

In June 1940, a DFG visual survey of the entire length of Sage Creek found steelhead (100-125 mm) to be common (Shapovalov 1940c). In July 1945, DFG seine sampling on Sage Creek approximately four miles upstream of Chiles Creek produced only YOY *O. mykiss* (Curtis 1945a). A subsequent poisoning operation found 104 *O. mykiss* ranging from 40-65 mm in length, and one 75 mm individual in an isolated pool (Curtis 1945b).

In 1946, DFG noted that a moderately large population of trout, from fingerlings to 200 mm in length, was present in the tributary streams of Conn Valley Reservoir (Murphy 1949). In August 1947, DFG found *O. mykiss* fingerlings to be fairly plentiful in Sage Creek at a reach about two miles upstream of the mouth (Curtis 1947b). By 1948, DFG noted that practically no trout were present in the tributary streams (Murphy 1949).

In March 1956, DFG received reliable reports that an *O. mykiss* spawning run occurred up Sage Creek from Lake Hennessey in the early spring (Evans 1956). In August 1956, DFG found *O. mykiss* ranging in size from 125-255 mm to be common in the middle section of the creek (Evans et al. 1956). *Oncorhynchus mykiss* were assumed to be derived from the steelhead stock that migrated into the reaches upstream from the lake prior to its filling (Evans et al. 1956).

In September 1990, DFG electrofished Sage Creek near the confluence of its tributary, Fir Canyon Creek. A total of six *O. mykiss* were collected from the main channel and the tributary (Gray 1990f).

Leidy caught two *O. mykiss* (81, 160 mm FL) when he electrofished Sage Creek immediately upstream from the junction of Pope Valley and Sage Creek roads in July 1996 (Leidy 2002).

### *Bale Slough*

Bale Slough is a small Napa River tributary that enters the river from the west in the vicinity of Rutherford. According to DFG, Bale Slough serves primarily as a migration corridor for steelhead into and out of Bear Canyon Creek (Elwell 1958a).

In June 1981, DFG visually surveyed the lower one-mile of Bale Slough to locate stranded steelhead. The channel was dry and thus no fish were observed (Ambrosins 1981a). Juvenile *O. mykiss* were observed in Bale Slough in 2004 (J. Koehler pers. comm.).

### *Bear Canyon Creek*

Bear Canyon Creek flows generally east from its headwaters near the Sonoma/Napa county border. The creek is perennial and is tributary to Bale Slough.

In October 1958, DFG visually surveyed the lower 4.5 miles of Bear Canyon Creek. Approximately 1.5 miles upstream of the confluence with Bale Slough, a 25-foot concrete dam at the Inglenook Winery was identified as a barrier to upstream migration. *Oncorhynchus mykiss* averaging 75 mm in length were fairly common in the 0.5-mile section of the creek with water in it downstream of the Inglenook Dam. Also, *O. mykiss* from 75–150 mm were common throughout the three miles surveyed upstream of the dam (Elwell 1958h). The survey noted that this stream was one of the better spawning reaches in the Napa River drainage (Elwell 1958h).

In May 1966, DFG surveyed Bear Canyon Creek downstream of the Inglenook dam. Steelhead juveniles at an estimated density of 15 per 30 meters were found in the 0.5-mile perennial reach directly downstream of the dam (CDFG 1966).

In September 1975, DFG surveyed the lower 3.3 miles of Bear Canyon Creek and the tributaries in this reach. *Oncorhynchus mykiss* were observed throughout the surveyed reach, but were most abundant upstream of the Inglenook Dam. *Oncorhynchus mykiss* ranged in size from 25–255 mm TL and averaged 75–100 mm (Henry and Van Zandt 1975). Density was estimated at 35 fish per 30 meters throughout the surveyed section.

In regards to an application to divert water from Bear Valley Creek in 1995, DFG stated that Bear Valley Creek supported a run of steelhead trout (Turner 1995). Minimum in-stream flows were required as a condition of approval of the proposed diversion. The application was later withdrawn.

### *Sulphur Creek*

Sulphur Creek drains an area of about ten square miles and consists of about 4.2 miles of channel (DCE 1999). It is perennial in its upper reaches and flows generally east from its headwaters near the Sonoma/Napa county border to join the Napa River east of the town of St. Helena.

In August 1941, a DFG survey noted *O. mykiss* in Sulphur Creek at the McLure Kelley Ranch. Residents reported a steelhead run. Stocking was not recommended, presumably because the lower reach was reported to dry up in July before reaching the Napa River (Curtis 1941a).

In 1957 the local game warden identified Sulphur Creek as one of the most important steelhead spawning tributaries to the Napa River (Elwell 1957b). The warden had observed steelhead in the 1.5 mile reach upstream from the bridge at Highway 29. In October 1958, DFG visually surveyed Sulphur Creek from the mouth to the headwaters. *Oncorhynchus mykiss* ranging from 50-150 mm long were common in the lower section of the creek. The upper-most portion had fewer trout. The survey report noted that the lower portion of the creek was typically dry during the summer (Elwell and Jones 1958).

In August 1969 DFG electrofished Sulphur Creek at Sulphur Canyon Road. Steelhead density was estimated at 170 fish per 30 meters of stream for the reach. A total of 164 fish were collected, with 35 measured fish having a size range of 33-86 mm FL and one larger individual measuring 135 mm (Anderson 1969f).

In May 1980, DFG visually surveyed Sulphur Creek from the mouth to the headwaters, and electrofished four sites. Six *O. mykiss* ranging from 39-63 mm in length were caught in St. Helena near the confluence with the Napa River. Two *O. mykiss* (57 mm and 245 mm) were collected in Sulphur Canyon and 17 *O. mykiss* (33-270 mm) were caught at the headwater fork (Ellison and Hobson 1980).

In June 1981, DFG rescued 525 steelhead YOY trapped in a drying, intermittent reach of Sulphur Creek. Another 165 YOY steelhead (37-82 mm FL) died due to handling. The largest fish was positively identified as YOY by scale analysis (Ellison 1981b).

In July 1989, DFG electrofished three sites on Sulphur Creek from the White Sulphur Springs Resort to the confluence with Iron Mine Creek. All sites had juvenile steelhead measuring approximately 60 mm FL, with one individual at nearly 80 mm FL (Week 1989).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of five Sulphur Creek reaches and two reaches in a tributary, three reaches were found to have *O. mykiss* at density level "1," while one reach had density level "2" (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in numerous Sulphur Creek reaches, including three reaches at density level "3" (Ecotrust and FONR 2002).

### *Heath Canyon Creek*

Heath Canyon Creek is tributary to Sulphur Creek. According to staff at the Napa County Resource Conservation District, local landowners report the presence of *O. mykiss* in this stream historically (J. Koehler pers. comm.). A 2001 survey noted juvenile *O. mykiss* in Heath Canyon Creek (J. Koehler pers. comm.).

### *Iron Mine Creek*

Iron Mine Creek is tributary to Sulphur Creek. In July 1989, DFG electrofished the lower 0.1 mile of Iron Mine Creek as well as a site on the Marston Vineyard near a water diversion. One *O. mykiss* (60 mm FL) was found approximately 300 yards upstream of the mouth (Week 1989).

Staff from the Napa County Resource Conservation District report juvenile *O. mykiss* in the south fork of Sulphur Creek (Iron Mine Creek) currently. Snorkel survey and visual observations were made in 2001 and 2002, respectively (J. Koehler pers. comm.).

### *York Creek*

York Creek originates on the western side of the Napa Valley and joins the Napa River near the city of St. Helena. St. Helena operates diversion facilities in the York Creek channel that divert water into a larger off-channel reservoir. The creek drains about six square miles and consists of approximately 7.2 miles of channel, including tributary reaches.

A 1941 DFG report noted anecdotal evidence of trout in York Creek upstream of a 12-foot dam in the middle reach of the creek (Curtis 1941b). In 1962, DFG determined that two diversion dams restricted all flow during the critical steelhead egg incubation period. A study was recommended to determine adequate flow releases to protect steelhead spawning and whether to require provision for fish passage at the dams (Day 1962).

In July 1973, DFG visually surveyed portions of York Creek from the mouth to the second diversion dam. No *O. mykiss* were observed (Nelson and Finlayson 1973). In June 1974, DFG again surveyed York Creek from the mouth to the upper end of St. Helena's reservoir. Both YOY (estimated at over 100 per 30 meters) and age 1+ steelhead (20 per 30 meters) were abundant between the Spring Mountain Road Bridge in St. Helena and the upper reservoir (Bruns 1974).

In August 1975, DFG visually surveyed York Creek from the city of St. Helena reservoir upstream to the headwaters. *Oncorhynchus mykiss* juveniles (25-100 mm) believed to be from steelhead descent were observed at approximately 20 per 30 meters throughout the surveyed reach (Henry 1975).

In June 1981, while locating stranded fish for rescue, DFG observed salmonids in York Creek near the Highway 29 crossing and the mouth (Ambrosins and Hams 1981). In April 1986, DFG electrofished a 150 meter reach upstream from the in-channel reservoir. A total of ten *O. mykiss* were caught ranging in size from 92-198 mm (Gray 1986f). The fish were assumed to be resident, as the two downstream dams were deemed impassable to steelhead (Gray 1986f).

In August 1992, DFG identified one dead *O. mykiss* in York Creek and discovered evidence of more dead *O. mykiss* that had been consumed by scavengers. The DFG report noted the presence of recent sediment deposition up to 18 inches deep, which likely resulted from operations at the city of St. Helena in-channel reservoir (Emig 1992c).

In September 2000, DFG electrofished York Creek downstream of the York dam along Spring Mountain Road. Juvenile steelhead were abundant and uniformly distributed throughout the entire reach (Cox 2000). The vast majority was YOY (40-100 mm), with lesser numbers of age 1+ (100-140 mm) and still fewer age 2+ and 3+ individuals (140-180 mm). The survey also revealed an unusually large number of older *O. mykiss* (200-250 mm), which was attributed to particularly good physical conditions (e.g., shade, pools, food, and instream cover) rather than anadromy (Cox 2000).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of seven York Creek reaches, two were found to have *O. mykiss* at density level "1," while two reaches had density level "2" (Ecotrust and FONR 2001).

#### *Bell Canyon Creek (Howell Creek)*

Bell Canyon Creek drains approximately 14 square miles. It enters the Napa River about 2.5 miles north of St. Helena. The creek historically was a perennial steelhead stream that maintained flow in the headwaters even after numerous diversions caused the lower reach to become intermittent. Bell Canyon Reservoir, constructed in 1958, blocked steelhead passage to the upper, perennial reaches. The dam is located about two miles upstream from the Napa River confluence.

In February 1957, DFG visually surveyed portions of Bell Canyon Creek accessible by car, from the mouth upstream about 3.5 miles. No *O. mykiss* were observed, but residents stated that they had observed many small steelhead in the middle and lower sections of the creek in the early part of the year (Elwell 1957a).

In May 1958, DFG visually surveyed Bell Canyon Creek from the headwaters to a point approximately 3.5 miles upstream from the mouth. *Oncorhynchus mykiss* (40-50 mm) were common in the lower portion of the surveyed reach and appeared to be YOY (Elwell 1958i). A large population of *O. mykiss* (100-150 mm) that was deemed to be native stock was observed downstream of a natural falls about 5.5 miles upstream of the mouth (Elwell 1958i).

A May 1966 DFG field note identified *O. mykiss* (40-100 mm) at 5 per 30 meters in a flowing reach of Bell Canyon Creek downstream of Bell Canyon Reservoir. In another downstream reach with water in the channel, *O. mykiss* were estimated at 100 per 30 meters. In the lower 30 meters of this reach, approximately 100 dead *O. mykiss* were found (Brackett and Duff 1966).

A 1967 DFG memorandum stated that 2.5 miles of Bell Canyon Creek were available to steelhead prior to construction of Bell Canyon Reservoir. The memo noted the obligation by DFG to substantiate their claim for a flow release of 5 cubic feet per second from the reservoir (Nokes 1967).

In June 1969, DFG visually surveyed two miles of Bell Canyon Creek from the mouth to the reservoir. *Oncorhynchus mykiss* (25-365 mm) were observed in intermittently flowing reaches at densities of 50-100 fish per 30 meters. Maximum density was noted immediately upstream of the confluence of the south fork (Howell Creek) (Thompson and Michaels 1969). In July 1969, DFG

conducted an electrofishing survey in the same reach. Steelhead (40-150 mm FL) were estimated at 86 fish per 30 meters at a site one mile downstream of the Bell Canyon Dam, and 34 fish per 30 meters at the confluence with the south fork. The report conservatively estimated a steelhead standing crop of 4,100 fish (Anderson 1969e).

A 1970 DFG memorandum regarding St. Helena water rights states that Bell Canyon Creek at that time supported an average annual run of approximately 40 to 50 adult steelhead. The memo included an estimate of run size prior to construction of the reservoir of about 100 adult fish (Greenwald 1970).

In July 1975, DFG visually surveyed Bell Canyon Creek from the mouth to the reservoir. Intermittently flowing reaches had *O. mykiss* from 13-100 mm in length, at approximately 25 fish per 30 meters (Coleman and Van Zandt 1975). In April 1978, DFG investigated a fish kill downstream of the Bell Canyon Reservoir chlorination facility. Staff found 106 dead YOY steelhead (mean length 57 mm) and one larger individual (~200 mm) (Cox 1978).

In July 1981, DFG observed steelhead juveniles at the Silverado Trail and the Glen Mountain Lane crossings, but found the mile of channel below the reservoir to be dry (Harris and Ambrosins 1981a). In June 1987, DFG visually surveyed Bell Canyon Creek from the mouth to the reservoir. *Oncorhynchus mykiss* were observed averaging 50 mm in length. Natural propagation of *O. mykiss* was not considered “good” in the system (Montoya 1987a).

In August 1990, DFG electrofished Bell Canyon Creek sites to determine if the reach upstream of the reservoir contained *O. mykiss*. The survey area upstream from Angwin contained pools suitable as trout habitat, but no *O. mykiss* were observed (Gray 1990h).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of *O. mykiss* was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of four Bell Canyon Creek reaches, one was found to have *O. mykiss* at density level “1” (Ecotrust and FONR 2001).

### *Mill Creek*

Mill Creek consists of about 3.2 miles of channel draining about 1.75 square miles. The creek enters the Napa River about three miles north of St. Helena.

In July 1965, DFG visually surveyed the length of Mill Creek between the mouth and Stone Hill Winery. The stream was dry at the mouth, but the flowing middle reach had 150-200 *O. mykiss* fingerlings per 30 meters (Culley and Fox 1965). Survey notes from May 1966 indicated that DFG found *O. mykiss* (25-175 mm) at densities of 25-50 fish per 30 meters throughout the length of Mill Creek (Brackett and Duff 1966).

In August 1978, DFG visually surveyed Mill Creek from its mouth to one mile downstream of the headwaters. *Oncorhynchus mykiss* averaging 50 mm in length were observed with estimated densities of 25-50 fish per 30 meters in the upper and lower surveyed reaches, and 5-10 fish per 30 meters in the middle reach (Lee and Namba 1978a).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of nine Mill Creek reaches,

three were found to have *O. mykiss* at density level “1,” while two reaches had density level “2” and one reach had level “3” (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in numerous Mill Creek reaches, including two reaches at density level “3” (Ecotrust and FONR 2002).

### *Ritchie Creek*

Ritchie Creek drains an area of 2.8 square miles and consists of approximately 3.5 miles of channel. The creek joins the Napa River approximately three miles south of the city of Calistoga.

In March 1964, DFG responded to reports of adult steelhead attempting to jump a diversion dam in Bothe-Napa Valley State Park. Up to ten adult steelhead had been seen by park officials at any one time attempting to pass the obstacle. Staff from DFG found an adult male (510 mm) and female (660 mm) that were moved upstream of the dam (Jones 1964b). In December 1965, DFG requested the State Division of Beaches and Parks remove or modify the dam for fish passage (Greenwald 1965b).

In July 1967, DFG visually surveyed Ritchie Creek between the mouth and the headwaters. Upstream of the eight foot diversion dam, juvenile steelhead (50 -75 mm) were estimated at a density of five individuals per 30 meters. Upstream from the Highway 29 bridge, steelhead density was determined to be 10 per 30 meters, and six measured fish ranged from 50-140 mm. Near the mouth, steelhead were estimated at 25 fish per 30 meters in pools, with the largest individual measuring approximately 250 mm (Thompson 1967d).

In August 1969, DFG electrofished Ritchie Creek at two locations. At a site just upstream of Highway 29, 40 *O. mykiss* were caught (43-152 mm FL), at an estimated density of 52 individuals per 30 meters. Upstream of the diversion dam, 56 *O. mykiss* were caught, with lengths measuring from 46-79 mm excluding a 102 mm and a 122 mm fish. Density upstream of the dam was estimated at 71 fish per 30 meters. Based on the sampling results, a standing crop of 7,000 juvenile steelhead was estimated for Ritchie Creek (Anderson 1969d).

In October 1973, DFG visually surveyed Ritchie Creek from the mouth to the headwaters. Steelhead from 75–150 mm were observed at densities of 15 fish per 30 meters downstream of the diversion dam, and 40 fish per 30 meters upstream of the dam (Finlayson 1973). According to DFG, the creek at that time offered good spawning and nursery areas for steelhead trout (Finlayson 1973).

In July 1978, DFG visually surveyed Ritchie Creek from its mouth to the headwaters. Steelhead 50–100 mm in length were observed in the upper portions of the creek. Estimated population density was five fish per 30 meters (Lee and Namba 1978b).

In May 1984, DFG visually surveyed Ritchie Creek from its mouth to the headwaters. Juvenile *O. mykiss* were observed from immediately upstream of its confluence with the Napa River, to the upper reaches of the stream (Emig 1984d). In addition to numerous 40-50 mm juveniles attributed to a recent stocking event, additional *O. mykiss* ranging from 25–150 mm were believed to indicate that recent spawning of anadromous steelhead had occurred (Emig 1984d).

In December 1989, DFG electrofished Ritchie Creek upstream of the diversion dam within Bothe Napa Valley State Park. A total of seven *O. mykiss* were caught ranging from 57–148 mm FL (Gray 1990e).

A 1993 correspondence states the intention of California Department of Parks and Recreation in cooperation with DFG to remove the diversion dam on Ritchie Creek. The removal was to make an estimated two miles of spawning and rearing habitat available to steelhead (Hunter and Getty 1993).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of seven Ritchie Creek reaches, three were found to have *O. mykiss* at density level "1," while three reaches had density level "2" (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in numerous Ritchie Creek reaches, including four reaches at density level "3" (Ecotrust and FONR 2002).

#### *Dutch Henry Creek*

Dutch Henry Creek consists of about 4.5 miles of stream channel and enters the Napa River near the midway point between Calistoga and St. Helena. It is characterized as having intermittent flow and has one notable tributary, Biter Creek.

In November 1958, DFG visually surveyed Dutch Henry Creek from the mouth to its headwaters. Although the lower channel was completely dry, *O. mykiss* averaging 75-125 mm in length were present in the intermittent, spring-fed pools in the middle and upper sections of the drainage (Elwell 1958j). A 1958 DFG evaluation stated that all of the approximately four miles of stream in the Dutch Henry Creek drainage was used by steelhead (Elwell 1958b). The evaluation noted that, except for intermittent springs in the upper portion of the drainage, the entire stream was dry in the summer-fall months (Elwell 1958b).

In June 1981, DFG visually surveyed 1.8 miles of Dutch Henry Creek upstream from its mouth. The channel was completely dry and no fish were found (Harris and Ambrosins 1981d). On two occasions in February 1987, DFG electrofished the creek immediately upstream and downstream of the Silverado Trail. During the first sampling, four *O. mykiss* were caught, ranging from 150-200 mm FL in size. The second sampling produced several *O. mykiss*, ranging in length from 50-75 mm. In the week between the sampling events, stream flow decreased from 3-4 cubic feet per second to 0 cubic feet per second (Gray 1987a). Staff of the Napa County Resource Conservation District reports observations of *O. mykiss* in Dutch Henry Creek in 2001 (J. Koehler pers. comm.).

#### *Nash Creek*

Nash Creek is tributary to the Napa River and drains a portion of the western slopes of the Napa Valley. Flow is intermittent, with springs present in the upper reaches.

In July 1965, DFG visually surveyed the approximately two-mile length of Nash Creek and found it completely dry (Culley and Fox 1965). The DFG surveyor stated there were no spawning or nursery areas in the creek.

In May 1974, DFG visually surveyed Nash Creek from the mouth to a diversion dam approximately 0.7 miles upstream. With the exception of the intermittent reaches adjacent to springs, the channel was dry. No fish were observed, but the DFG surveyor speculated that prior to water diversions, Dutch Henry Creek was capable of supporting steelhead runs (Lee 1974).

### *Diamond Mountain Creek*

Diamond Mountain Creek is tributary to St. Helena Reservoir and consists of about 1.5 miles of channel. Both spawning and rearing habitats for *O. mykiss* have been identified in the creek (Culley and Fox 1965).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Diamond Mountain Creek was found to have *O. mykiss* at level "1" density (Ecotrust and FONR 2001).

### *Simmons Creek*

Simmons Creek consists of about 3.5 miles of channel and joins the Napa River approximately one mile southeast of the town of Calistoga. Its headwaters are on the slopes of the Napa Valley northeast of Calistoga.

In November 1958, DFG visually surveyed the lower reaches of Simmons Creek by car and the upper reaches on foot. No fish were observed. The local game warden reported he had never seen steelhead in Simmons Creek. The DFG surveyor suggested the absence of fish was the result of the stream's tendency to become dry as early as late April (Elwell 1958m). In a 1958 letter, DFG stated that two miles of Simmons Creek were utilized by spawning steelhead (Elwell 1958d).

In June 1981, DFG visually surveyed the lower 1.8 miles of Simmons Creek for the purpose of rescuing steelhead stranded by low flows. Small numbers of *O. mykiss* were observed in pools downstream of a spring located approximately 0.5 miles upstream of the mouth (Ambrosins and Harris 1981).

### *Cyrus Creek*

Cyrus Creek is tributary to Porter Creek. It consists of about 1.75 miles of channel. The creeks' confluence is located approximately one mile west of Calistoga. A steelhead barrier is presented by the Calistoga water supply reservoir on the creek 0.2 miles upstream of the Porter Creek confluence (Jones 1964c).

In January 1964, DFG visually surveyed Cyrus Creek from the mouth to the headwaters. *Oncorhynchus mykiss* (65-100 mm) were observed in bedrock areas at about 5-8 per 30 meters. Propagation and conditions were considered successful enough to warrant protection of flows and to consider modifying a diversion dam to allow steelhead migration (Jones 1964c).

In June 1981, DFG visually surveyed the lower 1.2 miles of Cyrus Creek again, finding surface water only in standing pools near the mouth. No *O. mykiss* (or any other fish) were seen (Harris and Ambrosins 1981c).

Leidy found *O. mykiss* at two locations electrofished on Cyrus Creek in July and August 1997 (Leidy 2002). Immediately downstream of Calistoga's old water supply reservoir he rescued seven *O. mykiss* (111-195 mm FL) from an isolated pool. At 501 Petrified Forest Road Leidy caught ten *O. mykiss* (47-250 mm) in a 30-meter reach (Leidy 2002).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Two Cyrus Creek reaches were surveyed, and *O. mykiss* were not observed (Ecotrust and FONR 2001). Follow-up surveys were performed between June and September 2002. *Oncorhynchus mykiss* were found in four Cyrus Creek reaches (Ecotrust and FONR 2002).

#### *Garnett Creek*

Garnett Creek originates on the northeast side of the Napa Valley, north of Calistoga. It drains approximately six square miles of the southern slopes of Mount Saint Helena and The Palisades.

In June 1970, DFG visually surveyed Garnett Creek from the mouth to 1.5 miles upstream of the Highway 29 Bridge. *Oncorhynchus mykiss* were observed ranging in size from 50-180 mm. Fish were present in intermittent and flowing reaches at densities of approximately 40 per 30 meters in the upper reaches, and 10 per 30 meters in the lower reaches. Residents told the DFG surveyors that springs provided perennial flow in the headwaters (Albert et al. 1970).

In May 1981, DFG rescued 1,189 YOY steelhead from eight isolated pools in Garnett Creek. An additional 108 steelhead died in the process. *Oncorhynchus mykiss* ranged in size from 40-70 mm FL (Ellison 1981a).

In July 1984, DFG visually surveyed Garnett Creek from just downstream of Highway 29 to the Old Toll Road crossing. Although much of the streambed was dry, steelhead were abundant in pools at all sites where water was found. Steelhead typically ranged from 50-75 mm TL, with one 150 mm trout observed (Emig 1984a).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of four Garnett Creek reaches, one was found to have *O. mykiss* at density level "1" (Ecotrust and FONR 2001).

#### *Jericho Canyon Creek*

Jericho Canyon Creek drains an area of about one square mile. It enters Garnett Creek approximately 0.25 miles upstream from Highway 29.

In July 1970, DFG visually surveyed approximately two miles of Jericho Canyon Creek upstream from the mouth. The channel was dry or intermittent for approximately 0.5 miles upstream of the confluence with Garnett Creek. *Oncorhynchus mykiss* (50-330 mm) were found downstream of a series of falls located about 0.5 miles upstream of the Old Toll Road Bridge. Densities were estimated at 30 fish per 30 meters in the middle sections and 10 fish per 30 meters in the upper sections (Albert and Thompson 1970).

In July 1984, DFG visually surveyed Jericho Canyon Creek from its mouth to one mile upstream of the Highway 29 crossing. The lower section of the stream was dry, but juvenile steelhead (50-75 mm FL) at an estimated density of 200 fish per 30 meters were observed at RM 1.5 downstream of an impassable barrier. The barrier was a 15-foot chute located about 0.5 miles upstream of the Old Toll Road crossing. No fish were observed in the approximately two miles of the survey area upstream of the chute. Numerous other potentially impassable barriers were found upstream of the chute (Emig 1984b).

Ecotrust and FONR carried out surveys in tributaries of the Napa River system in July and August 2001. Relative density of steelhead was noted between 1 and 3, with 3 indicating greater than one individual per square meter. Of three Jericho Canyon Creek reaches, one was found to have *O. mykiss* at density level “3” (Ecotrust and FONR 2001).

### *Kimball Canyon Creek*

The Napa River becomes Kimball Canyon Creek above St. Helena Reservoir. Kimball Canyon Creek consists of about 5.5 miles of channel draining the area north and slightly west of Calistoga. St. Helena Reservoir, operated by the St. Helena Water District, is located approximately four miles upstream of the mouth. This reservoir controls flows into the creek and is a complete barrier to upstream migration.

In May 1957, DFG visually surveyed points accessible by car on Kimball Canyon Creek. A few fingerling steelhead (25-40 mm) were observed and were deemed to have originated from a natural population. The game warden observed that steelhead used Kimball Canyon Creek about one in every four years, as flows permitted (Allen 1957).

In July 1965, DFG visually surveyed a headwaters tributary to the Napa River west of Kimball Canyon Creek from the mouth to the headwaters. Surveyors estimated the density of *O. mykiss* fingerlings at 100-200 fish per 30 meters of stream (Culley and Fox 1965).

Leidy electrofished Kimball Canyon Creek at two locations in July 1997. He caught no *O. mykiss* in a pool at the mouth of the creek below the elevation of the full reservoir (Leidy 2002). However, approximately 0.2 miles upstream he found 12 *O. mykiss* (50-242 mm FL) in a five-meter riffle-pool sequence.

**Assessment:** In 1962, DFG called the Napa River “the most important steelhead stream in the counties bordering San Francisco Bay” (CDFG 1962, p. 1). Steelhead historically reproduced in most of the tributary and headwater drainages of the Napa River, although they now are reduced substantially in abundance. We are not aware of recent estimates of the size of the Napa River steelhead run. However, previous estimates place the historical run in the range of 6,000 to 8,000 individuals (Anderson 1972; USFWS and CDFG 1968).

In a 1940 DFG report, Shapovalov observed that the Napa River and its tributaries typically had very low water in the dry season, and that the carrying capacity of these streams for trout was filled by naturally propagated steelhead (Shapovalov 1940b). More recent DFG assessments of the Napa River watershed also indicated that the main limiting factor for steelhead production in the drainage was the lack of adequate nursery areas.

Water diversions from the basin that affect over-summering habitat in quality or extent, therefore, would be expected to directly impact the Napa River system *O. mykiss* population. In 1963, DFG noted, “With the increasing water development in the drainage, nursery areas are disappearing fast” (Robinson 1963, p. 1). A 1969 DFG paper noted that Dry Creek provided the greatest amount of nursery habitat in the Napa River watershed, and that Redwood Creek and Sulphur Creek also were important contributors to the steelhead standing crop (Anderson 1969f). In 1962, DFG listed these three creeks, as well as Soda Creek, as “major” spawning areas (CDFG 1962). Diversions from these drainages are particularly important to steelhead abundance.

Recent surveys carried out by the Friends of the Napa River and Ecotrust indicated that *O. mykiss* are still present in numerous Napa River watershed tributaries, with the highest densities typically recorded in Napa Valley's west-side tributaries such as Redwood and Dry creeks (Ecotrust and FONR 2001). *Oncorhynchus mykiss* density in Sulphur Creek appears to be reduced substantially from historical levels.

The Napa River drainage possibly remains the most important steelhead fishery resource for the San Francisco Estuary, although on-going water development for agricultural uses poses a serious threat to this status. Recovery strategies for Napa River steelhead must address instream flow provisions in order to be successful.

### **Fagan Creek Watershed**

Fagan Creek issues into the Napa River tidal slough. A 15-foot drop on the south side of the Highway 12 crossing may serve as a barrier to migration.

#### *Fagan Creek*

In September 1981, two Fagan Creek sites were sampled by dip net as part of a fish distribution study. No *O. mykiss* were found (Leidy 1984). Ecotrust and FONR surveyed Fagan Creek between May and September 2002. *Oncorhynchus mykiss* were not observed in Fagan Creek reaches (Ecotrust and FONR 2002).

**Assessment:** Insufficient information is available to assess the historical and current status of Fagan Creek as a resource contributing to salmonid populations. Recent surveys indicate that the creek system likely is not used by anadromous fish.

### **American Canyon Creek Watershed**

American Canyon Creek issues into the Napa River tidal slough. It drains the area immediately north of the city of Vallejo.

#### *American Canyon Creek*

Two American Canyon Creek sites were sampled with dip nets as part of a fish distribution study in September 1981. No *O. mykiss* were found at either the American Canyon Road or the Elliot Road sampling sites (Leidy 1984).

A 30-meter reach of American Canyon Creek was sampled by electrofishing in October 1997. *Oncorhynchus mykiss* was not found (Leidy 2002). Ecotrust and FONR surveyed the north and east forks of American Canyon Creek between May and September 2002. *Oncorhynchus mykiss* were not observed in American Canyon Creek reaches (Ecotrust and FONR 2002).

**Assessment:** Insufficient information is available to assess the historical status of American Canyon Creek as a resource contributing to salmonid populations. Recent surveys indicate that the creek system likely is not used by anadromous fish.

Table IX-2. Distribution status of *O. mykiss* in San Francisco Estuary streams of Napa County, California<sup>a</sup>

Watershed	Stream/ Tributary	Yrs. Surveyed/ Quant. Data	Max. Period of Record	Data Type	Life Hist. Stage/ No. Yrs. Data	Anad. Life-Cycle Possible	<i>O. mykiss</i>		Evidence of Pop. Decline	Current Pop. Status	References (Pers. Comm.)
							Hist.	Current			
Huichica Creek	Huichica	11/7	1970- 2002	1, 2, 3	J/5; R/3	Y	DF	DF	Y	I	46, 47, 91, 102, 115, 133, 143, 152
Napa River	Napa River	11/4	1961- 97 <b>1998</b>	0, 1, 2, 3	J/3; S/1; M/2	Y	DF	DF	Y	1, 2, 3	9, 10, 14, 22, 33, 41, 42, 88, 103, 144, 146, 154, 179
	Carneros	4/1	1958- 2002	0, 1, 3	R/1; M/1	Y	DF	DF	Y	I	44, 46, 62, 89, 117
	Suscol	6/4	1949- 2002	0, 1, 2, 3	J/3; S/1; R/1; M/1	Y	DF	DF	Y	1, 2, 3	19, 26, 46, 144, 161
	Tuluca	4/2	1958- 2001	1, 2, 3	J/2; R/2	Y	DF	DF	Y	1, 2, 3	44, 45, 61, 70, 72, 121
	Murphy	4/4	1968- 2001	1, 2, 3	J/3; R/2; M/1	Y	DF	DF	Y	1, 2, 3	45, 77, 107, 135
	Spencer	2/2	2001- 2002	3	-	Y	DF	DF	-	I	45, 46
	Napa	3/1	1958- 2001	1, 2, 3	-	Y	DF	DF	Y	I	44, 45, 66, 144
	Browns Valley	2/0	2001	1	-	Y	DF	DF	-	I	45, 67, 145
	Redwood	12/8	1958- 2002	1, 2, 3	J/10; R/4; M/2	Y	DF	DF	Y	1, 2, 3	11, 45, 46, 66, 74, 90, 94, 112, 127, 134, 144, 149, 171
	Pickle Canyon	6/5	1966- 2002	1, 2, 3	J/4; R/1	Y	DF	DF	Y	I	6, 18, 45, 46, 126, 134, 170
	Milliken	15/9	1940- 2002	1, 2, 3	J/8; R/4; M/3	Y	DF	DF	Y	1, 2, 3	5, 21, 44-46, 51, 81, 87, 123, 144, 148, 153, 172, 175

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			
	Sarco	5/3	1990- 2002	1, 2, 3	J/1; R/1	Y	DF	DF	Y	1, 2, 3	45, 46, 110, 144, 150, 151
	Camp	1/0	1940	1	J/1; R/1	N	DF	UNK	Y	0	167
	Salvador Outfall Channel	2/0	1977 1987	1, 2	M/1	UNK	DF	UNK	Y	0	17
	Soda	7/4	1940- 2002	1, 2	J/3; R/1; M/2	UNK	DF	DF	Y	1	46, 50, 60, 69, 92, 95, 96, 166
	Dry	7/7	1969- 2002	1, 2, 3	J/6; R/2; M/1	Y	DF	DF	Y	1, 2, 3	9, 16, 44-46, 53, 78, 99, 144
	Hopper	3/0	1976 2001	0, 1, 3	M/1	UNK	DF	PB	Y	0	45, 120, 159 (1)
	Hinman	4/1	1966- 84 1987	1, 2, 3	J/2	UNK	DF	PS	Y	0	105, 125, 177 (1)
	Segassia Canyon	1/1	2002	1	-	UNK	DF	DF	-	1	46
	Wing Canyon	1/1	2002	1	-	UNK	DF	DF	-	1	46
	Campbell	2/1	1996- 1997	0, 1, 2	J/2	Y	DF	DF	-	1, 2	80, 144
	Mont-gomery	2/1	2001	1, 3	-	Y	DF	DF	-	1	45, 128
	Conn	9/3	1945- 94 2001	1, 2, 3	J/4; R/5	Y	DF	DF	Y	1, 2, 3	30, 44, 45, 86, 100, 155, 158

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			
	Rector	4/4	1985- 2004	2, 3	J/4; S/1; R/3	UNK	DF	DF	Y	1, 2	44, 76, 93, 101 (1)
	Chiles	7/2	1945- 90	1, 2, 3	J/5; R/3	N	DF	PB	Y	0	24, 25, 36, 37, 39, 85, 104, 155, 158, 168
	Moore	2/1	1945- 90	1, 2	J/1	N	DF	PS	Y	I	38, 106, 158
	Sage	8/2	1940- 96	0, 1, 2, 3	J/6; R/2	N	DF	DF	Y	1, 2, 3	36, 37, 40, 82, 83, 109, 144, 155, 165
	Bale Slough	2/1	2004	1, 3	J/1	Y	DF	DF	-	1, 2	4, 56 (1)
	Bear Canyon	3/2	1958- 75	I	J/3; R/1	UNK	DF	PB	Y	I	28, 63, 124, 174
	Sulphur	7/4	1941- 2001	0, 1, 2, 3	J/5; R/1; M/2	Y	DF	DF	Y	I	14, 34, 44-46, 49, 52, 55, 71, 178
	Heath Canyon	2/1	2001	0, 3	J/1	Y	DF	DF	-	1, 2	(1)
	Iron Mine	1/1	1989	2	J/1	Y	DF	DF	Y	I	178 (1)
	York	9/4	1941- 2001	0, 1, 2, 3	J/4; R/2	Y	DF	DF	Y	1, 2, 3	7, 23, 31, 35, 43, 45, 79, 97, 122, 178
	Bell Canyon	11/5	1957- 2001	0, 1	J/8; R/2; M/1	Y	DF	DF	Y	I	13, 29, 32, 45, 54, 64, 66, 111, 114, 116, 147, 157, 169
	Mill	4/4	1965- 2002	1, 3	J/2	Y	DF	DF	Y	I	22, 33, 45, 46, 141

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			
	Ritchie	9/8	1965- 2002	1, 2, 3	J/6; R/1; M/1	UNK	DF	DF	Y	I	12, 45, 46, 75, 84, 108, 113, 129, 131, 142, 173
	Dutch Henry	4/2	1958- 2001	1, 2, 3	J/3; R/1	Y	DF	DF	Y	1, 2	57, 65, 98, 119 (1)
	Nash	2/0	0 1974	I	-	N	PS	NP	-	0	33, 140
	Diamond Mountain	2/2	1965	1, 3	J/1	N	PB	DF	Y	I	45, 140
	Simmons	2/0	1958- 81	I	-	UNK	DF	PS	Y	0	8, 59, 68
	Cyrus	5/3	1964- 2002	1, 2, 3	J/2; R/1	UNK	DF	DF	Y	1, 2, 3	45, 46, 118, 132, 144
	Garnett	4/4	1970- 2001	1, 3	J/3; R/1	Y	DF	DF	Y	I	1, 45, 48, 72
	Jericho Canyon	3/3	1970- 2001	I	J/2; R/1	Y	DF	DF	Y	I	2, 45, 73
	Kimball Canyon	4/2	1957- 97	1, 2	J/2; R/1; M/1	N	DF	DF	Y	1, 2, 3	3, 33, 144
Fagan Creek	Fagan	2/0	0 2002	3	-	N	PS	NP	-	0	46, 143
American Canyon Creek	American Canyon	3/0	0 2002	2, 3	-	N	UNK	NP	-	0	46, 143, 144

<sup>a</sup> Table headings and codes are defined in the Methods section of this report.

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### **Personal Communications**

1. J. Koehler, Napa County Resource Conservation District, interview with G. Becker, CEMAR, on May 25, 2005 in Napa, California regarding *O. mykiss* distribution in Napa County streams.



## NAPA COUNTY MAPS

Historical status of *Oncorhynchus mykiss* in streams of Napa County, California.

Current status of *Oncorhynchus mykiss* in streams of Napa County, California.

