June 17 and 18, 1976

REDWOOD CREEK Marin

Fork of Rattlesnake

Entire & Bootjack Creeks Mouth 4.8 miles

Pacific Ocean

Muir Moods Creek Independent

Personal observation, Park Ranger (Muir Woods), and DFG Stream survey of 21 March 1956.

EXTENT OF OBSERVATION: The stream was walked from the fork of Rattlesnake and Bootjack Creeks to the mouth on 17 and 18 June, 1976. Fish and Wildlife Seasonal Aids Ron Curtis and Gary Scoppettone conducted the survey.

LOCATION: Redwood Creek is 10 miles north of San Francisco and 4 miles south of Stinson Beach. It drains the west and southwestern slope of Mt. Tamalpais.

RELATION TO OTHER WATERS: Redwood Creek is a perennial stream, with headwaters at the confluence of Rattlesnake and Bootjack Creeks and emptying into the Pacific Ocean. Spike Buck and Fern Creek are its 2 major tributaries with several unnamed streams also flowing into it. Anadromous salmonids use Redwood Creek and Fern Creek as spawning and nursery areas.

GENERAL DESCRIPTION:

Watershed: In its upper reaches, the stream drains a narrow, steep-sided canyon vegetated with redwood, Douglas fir, tanbark oak, bigleaf maple, and California laurel. The raid to lower reaches flow through a narrow valley (Frank Valley) with floodplains ranging between 0.10 and 0.5 miles in width. Frank Valley is flanked by dry, exposed, moderate to gently sloped hills supporting grassland, oak-buckeye forest, and soft chaparral biotic communities.

Immediate Drainage Basin: Redwood Creek flows southeasterly and southerly, draining approximately 9.9 square miles. The upper half of the drainage basin is V-shaped and steep-sided. Redwood, red-alder, blue elderberry, creek dogwood, western azalea, and bigleaf maple line the channel. The lower half forms the bottom of a narrow, exposed valley, where streamside vegetation is dominated by red-alder and willow. Riparian growth is abundant along the stream's entire length. The stream channel is well defined, ranging from 3 to 10 feet deep and 15 to 40 feet wide from the upper boundary of Muir Wood National Monument to Muir Beach. Upstream, the channel is narrow, steep-sloped, and deeply incised.

Altitude: Fork of Bootjack and Rattlesnake Creeks (4.8 stream miles) - 720 feet above sea level; northernmost Muir Woods Road crossing below Muir Moods National Monument (2.9 stream miles) - 140 feet; confluence with Pacific Ocean (0.0 stream miles) - zero feet Gradient: The stream drops 305.3 feet per mile from Fork of Bootjack and Rattlesnake Creeks to the northernmost Muir Woods Road crossing, and 48.3 feet per mile from the latter crossing to the mouth.

Width: Ranged from 1 to 30 feet, averaging approximately 8 feet. A lagoon was present at the mouth of Redwood Creek. Normally, it has confluence with the Pacific Ocean during the late winter months. The width of the lagoon ranged from 20 to 40 feet, averaging approximately 30 feet.

Depth: Ranged from 0.1 to 3.5 feet, averaging approximately 0.5 feet. The deepest pools were found above Fern Creek tributary and in the lowermost reach of the park's boundary. The depth of the lagoon ranged from 1 to 5 feet, averaging approximately 2.75 feet.

Flow: The stream's flow was measured on 18 June 1976 at two stations. The upper station: at the park's lowermost boundary bordering Muir Woods Road crossing measured 0.284 cfs. The lower station at Muir Beach Road crossing measured 0.07 cfs. It should be noted that the 1975/76 rain season has been one of the driest in California's history. The flows observed during this survey are probably typical of late summer or fall.
Velocity: Stream velocity was rapid in the riffles and moderate to sluggish in the pools in the very lower reaches the stream gradient becomes slight resulting in sluggish velocities.
Bottom: Riffle areas above the confluence of Fern Creek consisted primarily of boulders and nibble. Gravel predominated the riffles below Fern Creek. In pool areas, bottom material consisted primarily of gravel above Fern Creek and sand below. From the Fork of Rattlesnake and Bootjack Creeks to the confluence of Fern Creek, the bottom consisted of approximately 40% boulders, 30% rubble, 20% gravel, 55% sand, and 5% silt. From Fern Creek, tributary to the park's lowermost boundary, the bottom consisted of approximately 60% rubble, 30% gravel, 5% sand, and 5% silt. Below this point to the stream's mouth, the bottom consisted of approximately 30% rubble, 30% gravel, 30% sand and 10% silt.
Spawning Areas: Spawning substrate in Redwood Creek ranged from fair in the very lowermost reach below Muir Beach Road, to good in the reaches extending to approximately 0.2 mile above the confluence of Fern Creek. Spawning conditions decline above this point. The most ideal spawning substrate is found in the confines of Muir Woods National Monument. Appropriate gravel size was found in abundance in all but the uppermost reaches above the confluence of Fern Creek. Loose gravels predominated the stream.
Pools: From the Fork of Rattlesnake and Bootjack Creeks to the upper boundary of Muir Woods National Monument, pools were primarily formed by large boulders. The pools were approximately 6 feet in diameter, averaging 3 feet in depth, with boulders providing good shelter. The pool:riffle ratio approximated 80:25 in this reach. Within the boundaries of Muir Woods National Monument few distinct pools were observed, save for the very lowermost reach. Past bank stabilization using rip-rap and removal of fallen trees and branches are primarily responsible for the scarcity of pools. The lowest reach within the park has not been disturbed and is relatively natural. Pools within the boundaries of the park, save for its lowermost reach, were approximately 25 feet in length, 10 feet in width, and 2.5 feet deep. Submerged roots, small boulders end extensive undercut banks provided poor to fair shelter. The pool:riffle ratio approximated 30:70. From the park's lowermost reach to the mouth, pools were primarily formed by stream meandering, undercut banks, fallen logs, and branches. These pools averaged approximately 12 feet in diameter (although several pools were elongated) and 3 feet deep. Fair to good shelter was provided by submerged roots and logs, limited overhanging vegetation, fallen logs and moderate to extensive undercut banks. The pool:riffle ratio approximated 50:50 in this reach. The gradient becomes slight at the mouth, resulting in increased glide habitat.
Shelter: Above and below Muir Woods National Monument, shelter was fair to good. The shelter was provided by undercut banks, submerged logs and roots, boulders, fallen logs and overhanging vegetation. Shelter in the Monument, except for the lowermost reach of stream was poor to fair and was provided by submerged roots, boulders, and undercut banks. The low stream flows left much of the potential shelter above water, especially within the park.
Barriers: The most significant barriers were found near to and including the Fork of Rattlesnake and Bootjack Creeks, and at the mouth of Redwood Creek. The mouth of Redwood Creek was totally blocked by an approximately 40-foot wide and 3-foot high sand bar. Numerous small to medium log jams were noted, especially in the reach above Monument Park. Most log jams were loosely packed. Boulders up to 10 feet in diameter, causing numerous 2 to 5-foot drops, were found approximately 0.4 mile above Fern Creek to the Fork of Rattlesnake and Bootjack Creeks. Boulders in several series up to 150 feet in length resulted in steep gradients and probably seriously impede fish passage, especially in low flow years. Approximately 300 yards downstream from the main fork, an 8 to 10-foot natural fall restricts all fish passage upstream (Site #l). A cascading falls exists on both Bootjack and Rattlesnake Creek at a point where they converge to form Redwood Creek. These falls were approximately 80 feet in length, with a 75-85 degree slope, again restricting all upstream fish passage.

Diversions: Only two significant diversions were noted during the walkout. An active diversion, consisting of two 2-inch pipes, was located approximately 200 feet downstream from the northernmost bridge crossing at Muir Woods Road (Site #2). A second diversion, consisting of a galvanized 6-foot diameter pipe sunk vertically in the stream, with its ton covered, was noted approximately 200 yards below the southernmost bridge crossing at Muir Woods Road (Site #3).

Temperature: *On* 17 and 19 June 1976 — Fern Creek tributary at 1930 hours air temperature 55°F, water temperature 55°F; northernmost crossing of Muir Moods Road at 1530 hours air 60°F, water 56°F; southernmost crossing of Muir Woods Road at 1130 hours air 54.5°F, water 53.8°F; Muir Beach Road crossing at 1230 hours air 57°F, water 54 F.

Food: Potential salmonid food items were fairly numerous. Through Muir Woods, caddis fly larva, mayfly nymphs and flying dipterans were abundant. Insect diversity and biomas may be reduced by the removal of fallen branches and trees from the stream. Downstream from the park, mayfly nymphs wore abundant while caddis fly and coleopteron larva were common. This reach was more productive.

Aquatic Plants: Filamentous algae was common in the upper half of the stream and common to abundant in the more exposed lower half.

Winter Conditions: Erosion scars suggest the stream rises two feet in riffle habitat during normal peak winter runoff. Pollution! No polluted discharges were observed.

FISHES PRESENT: Fingerling salmonids were observed from 0.4 mile downstream from the Fork of Rattlesnake and Bootjack Creeks to Muir Beach. The greatest concentration was through Muir Woods National Monument. Several yearling fish were observed upstream from the National Monument. These were probably resident rainbow trout progeny since it is doubtful this year's low winter flows permitted successful navigation this far upstream. Although the stream reach through the Monument offers the best spawning conditions, there is generally a scarcity of pools and shelter for juvenile salmonids. The frequency of age 1 and age 2 salmonids increases markedly downstream from the Monument where the banks have not been rip-rapped and where fallen vegetation is not removed.

OTHER ANIMALS: (Mammals) raccoon, striped skunk, and black-tailed deer — (Birds) Stellar's jay, scrub jay, western robin, Swainson's thrush, blackheaded grosbeak, song sparrow, house finch, American goldfinch, crow, raven, white-crowned sparrow, Wilson's warbler, mourning dove, violet-green swallow, California quail, downy woodpecker, arid hummingbird -— (Herptiles) rough-skinned newt.

FISHING INTENSITY: According to Warden Ild approximately 50 steelhead/silver salmon were caught from Muir Ranch surf and Big Lagoon in 1976. There is only light fishing pressure for ago 1 and 2 salmonids, which occurs upstream and downstream from Muir Woods National Monument. The Monument itself is closed to fishing.

OTHER RECREATIONAL USE: In its upper reaches, the stream flows through Mt. Tamalpais State Park and Muir Woods National Monument. It is a center for hiking, nature walks, and public observation of salmonid reproductive behavior. The mouth opens at Muir Beach and may be used for wading.

ACCESSIBILITY: Through Muir Woods and Mt. Tamalpais State Park, Redwood Creek is bordered by a good trail. Downstream from the adjoining parks, public roads parallel the stream to Muir Beach. Access is made difficult, however, by abundant riparian vegetation and a deeply incised channel. The stream is easily approached at its mouth.

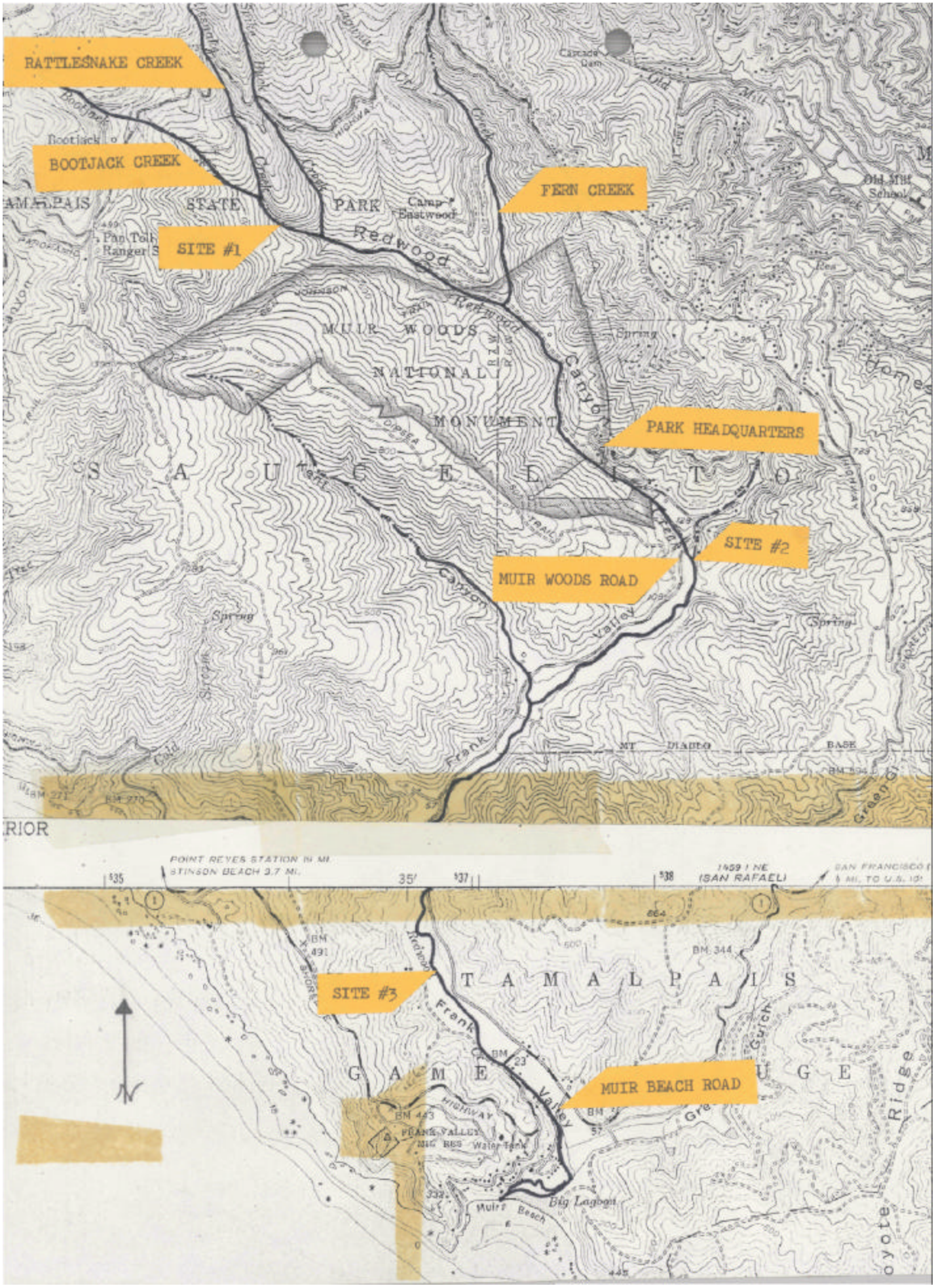
OWNERSHIP: The upper reach is in the confines of Muir Woods National Monument and Mt. Tamalpais State Park. The former is under the Jurisdiction of the U.S. National Park Service, and the latter is a California State Park. At the mouth, Muir Beach is a state beach. Through Frank Valley, Redwood Creek is bordered by private land holdings.

POSTED OR OPEN: Posted against trespassing only for 75-yard reach adjacent to Muir Beach Road.

GENERAL ESTIMATE: Redwood Creek offers good silver salmon and steelhead spawning conditions but limited Juvenile nursery habitat. Low summer flows and a scarcity of fish shelter and pool habitat reduce the stream's Juvenile salmonid carrying capacity. The reach through Muir Woods National Monument represents the stream's best spawning substrate and riffle systems, but provides the least shelter and pool habitat. Through the park

the stream is heavily shaded and terrestial plant debris is an important component of the aquatic ecosystem. Removal of fallen trees and branches deprives fishlife of protective shelter and reduces insect biomass.
RECOMMENDED MANAGEMENT: Redwood Creek should be managed as a steelhead and silver salmon stream. The creation of artificial pools through Muir Woods National Monument would substantially increase the stream's carrying capacity of age 1 and age 2 salmonids. As a consequence, there would be an increase in the number of salmonids spawning within the boundaries of the National Monument, and a better opportunity for the public to view salmonid reproductive behavior. Strategically placed rip-rap dams 2.5 feet high would not distract from the stream's beauty, but would partially mitigate the negative effects of early bank stabilization work and current stream manicuring practices.
MAP REFERENCE: USGS 7.5-minute maps: Point Bonita and San Rafael quadrangles.

Ron Curtis and Gary Scoppettone
Fish and Wildlife Seasonal Aids
Region 3


RATTLESNAKE CREEK
BOOTJACK CREEK
FERN CREEK
SITE #1
PARK HEADQUARTERS
SITE #2
MUIR WOODS ROAD
SITE #3
MUIR BEACH ROAD
STATE PARK
MUIR WOODS NATIONAL MONUMENT
Redwood Creek
Frank Valley
Big Lagoon
Muir Beach
MT DIABLO BASE
POINT REYES STATION 9 MI.
STINSON BEACH 3.7 MI.
1459 I NE (SAN RAFAEL)

California Department of Fish and Game - Region 3
Stream Flow Measurement

Gaging of Redwood Creek At, near northernmost Muir Woods Rd. Bridge Crossing (southside)

Date: 18 June 19 76 Time 1530 A.T. 60° W.T. 56° Meter No. TL0479

Measured by R.Curtis / G.Scoppettone Notes by R. C. Comp. by _____ Checked by _____

Method .6, .2, .8, other _____ Gage Height _____ Location 100 ft. below bridge crossing

Dist fr init pt	Width Ft.	Depth in Ft. Total	Depth in Ft. of Obs	Revolutions	Time Sec.	Velocity Mean in Sec.	Area Sq. Ft.	Q.	Remarks
RB 4.0									
4.5	.5	.23	.1	60	.17	.115	.020		
5.0	.5	.23	.1		.35	.115	.040		
5.5	.5	.28	.11		.45	.140	.063		
6.0	.5	.30	.12		.43	.150	.064		
6.5	.5	.24	.1		.33	.120	.040		
7.0	.5	.28	.11		.31	.0140	.043		
7.5	.5	.28	.11		.10	.140	.014		
8.0	.5	.24	.1		ø	.120	.000		
LB 8.5	.5								
						Q =	0.284		
	4.5 ft.								
Total									

Q= 0.284

Sheet No. one

FG3 9/65 300 IF 65

California Department of Fish and Game - Region 3
Stream Flow Measurement (downstream location)

Gaging of Redwood Creek At, near Muir Woods Rd. Bridge Crossing (southside)

Date: 18 June 19 76 Time 1630 A.T. 57.5° W.T. 56° Meter No. TL0479

Measured by R.Curtis / G.Scoppettone Notes by R. C. Comp. by R. C. Checked by

Method (.6), .2, .8, Gage Height Location 50 ft. below bridge

Dist fr init pt	Width Ft.	Depth in Ft. Total	Depth in Ft. of Obs	Revolutions	Time Sec.	Velocity Mean in	Area Sq. Ft.	Q.	Remarks
RB 3.0									
3.25	.25	.19	.1	ø	60	ø	.048	.000	
3.5	.25	.21	.1	5		.08	.052	.004	
3.75	.25	.24	.1	7		.12	.060	.007	
4.0	.25	.22	.1	13		.21	.055	.012	
4.25	.25	.26	.1	11		.18	.065	.012	
4.5	.25	.28	.11	3		.05	.070	.004	
4.75	.25	.25	.1	9		.15	.062	.009	
5.0	.25	.24	.1	6		.10	.060	.006	
5.25	.25	.24	.1	4		.07	.060	.004	
5.5	.25	.22	.1	6		.10	.055	.006	
5.75	.25	.22	.1	6		.10	.055	.006	
6.0	.25	.22	.1	ø		ø	.055	.000	
6.25	.25	.16	.1	ø		ø	.040	.000	
LB 6.5	.25								
							Q =	0.070	
	3.5 ft.								
Total									

Q = 0.070

Sheet No. two

FG3 9/65 300 IF 65