Western Mattole Subbasin

Western Subbasin near Ettersburg.

Introduction

The Western Subbasin is located between Bear Creek in the estuary (RM 0.3) and the headwaters of the South Fork of Bear Creek (RM 50) along the western side of the Mattole mainstem and Wilder Ridge for a distance of about 60 miles (Figure 119). Elevations range from 20 feet at the estuary to approximately 2800 feet in the headwaters of the tributaries in the King Range. Kings Peak, at 4088 feet, is the highest point in the Mattole Basin.

The NCWAP team's Western Subbasin results and analyses are presented in three basic sections. First, general information describing the subbasin is presented by different disciplines. Secondly, this information is integrated and presented to provide an overall picture of how different factors interact within the subbasin. Lastly, an overall assessment of the Western Subbasin is presented. The NCWAP team developed hypotheses, compiled supportive and contrary evidence, and used these six assessment questions to focus this assessment:

- What are the history and trends of the sizes, distribution, and relative health and diversity of salmonid populations within this subbasin?
- What are the current salmonid habitat conditions in this subbasin? How do these conditions compare to desired conditions?
- What are the relationships of geologic, vegetative, and fluvial processes to natural events and land use history?
- How has land use affected these natural processes?
- Based upon these conditions trends, and relationships, are there elements that could be considered to be limiting factors for salmon and steelhead production?
- What habitat improvement activities would most likely lead toward more desirable conditions in a timely, cost effective manner?

The assessment questions are answered at the end of this section.

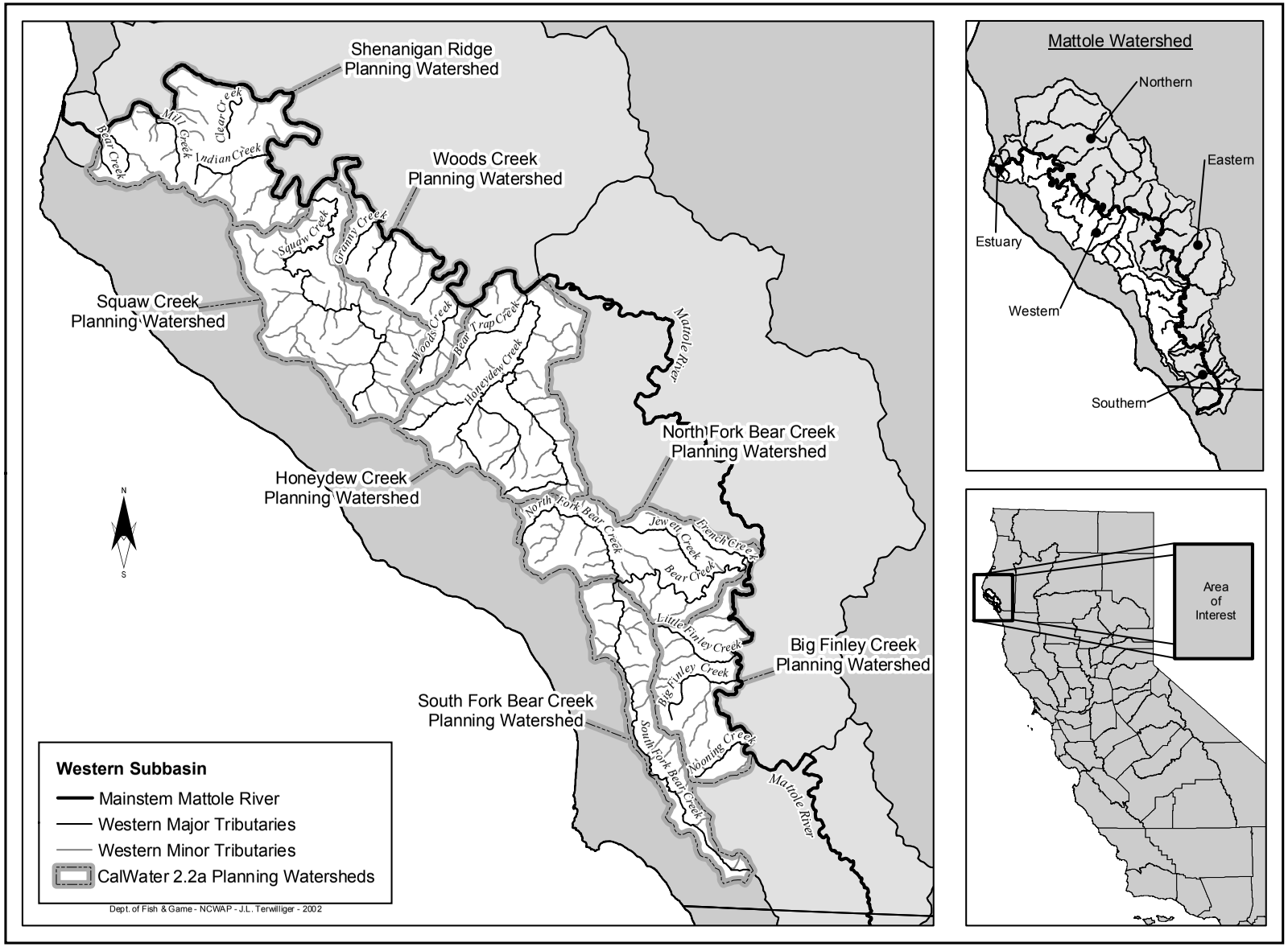

Figure 119. Mattole Western Subbasin.

Climate

The Western Subbasin is greatly influenced by the King Range, which is its western boundary. Temperatures have a wide range because the mountains cut off the moderating effect produced by marine air. Precipitation totals vary from 70 to 100 inches annually. Annual rainfall averages are highest in the center of this subbasin because the greatest orographic effect occurs here due to the presence of the King Ranges' tallest peaks.

Hydrology

The Western Subbasin is made up of six complete CalWater Units and most of the Shenanigan Ridge CalWater Unit (Figure 119). There are 85.8 perennial stream miles in 33 perennial tributaries in this subbasin (Table 138). Eighteen of these tributaries have been inventoried by CDFG. There were 33 reaches, totaling 49.9 miles in the inventory surveys. The inventories included channel and habitat typing, and biological sampling.

Table 138. Streams with estimated anadromy in the Western Subbasin.

Stream	CDFG Survey (Y/N)	CDFG Survey Length (miles)	Estimated Anadromous Habitat Length (miles)*	Reach	Channel Type
Bear Creek	N		0.3		
Stansberry Creek	N		0.5		
Mill Creek (RM 2.8)	Y	1.1	1.4	1	B2
Mill Creek (RM 2.8) Tributary 1	Y	0.2		1	A2
Mill Creek (RM 2.8) Tributary 2	Y	0.1		1	A2
Clear Creek	N		0.7		
Indian Creek	N		1.2		
Wild Turkey Creek	N		0.1		
Green Fir Creek	N				
Squaw Creek	Y	4.1	12.7	1	F3
Granny Creek	N				
Cook Gulch	N				
Saunders Creek	N		0.4		
Hadley Creek	N				
Kendall Gulch	N				
Woods Creek	Y		1.5		
	Y	1.2		1	F4
	Y	0.7		2	B4
Bundle Prairie Creek	N				
Honeydew Creek	Y		5.9		
	Y	1.4		1	F4
	Y	0.9		2	F4
	Y	1.1		3	F3
	Y	0.7		4	A2
Bear Trap Creek	Y		0.1		
	Y	2.9		1	F3
	Y	1.7		2	F2
	Y	1.6		3	B2
	Y	1.1		4	F2
High Prairie Creek	N		0.6		
East Fork Honeydew Creek	Y	2.9	6.0	1	F2
Upper East Fork Honeydew Creek	Y	1.0	0.0	1	F2
West Fork Honeydew Creek	Y	0.7	0.2	1	B2
Bear Creek	Y		6.5		

Stream	CDFG Survey (Y/N)	CDFG Survey Length (miles)	Estimated Anadromous Habitat Length (miles)*	Reach	Channel Type
	Y	1.4		1	B2
	Y	0.3		2	A2
French Creek	N		0.4		
Jewett Creek	Y	2.7	2.4	1	F4
North Fork Bear Creek	Y		4.3		
	Y	2.5		1	B4
	Y	0.9		2	A3
North Fork Bear Creek Tributary	Y	1.4		1	B2
	Y	0.3		2	A2
South Fork Bear Creek	Y		10.7		
	Y	1.9		1	B2
	Y	4.6		2	F3
	Y	5.3		3	B3
	Y	0.3		4	F4
Little Finley Creek	N				
Big Finley Creek	Y		0.1		
	Y	1.3		1	B4
	Y	0.3		2	A2
South Fork Big Finley Creek	Y	1.3		1	B3
Nooning Creek	Y		1.5		
	Y	0.1		1	F3
	Y	1.4		2	B2

* Data from the Mattole Salmon Group.

In their inventory surveys, CDFG crews utilize a channel classification system developed by David Rosgen (1994) and described in the *California Salmonid Stream Habitat Restoration Manual*. Rosgen channel typing describes relatively long stream reaches using eight channel features: channel width, depth, velocity, discharge, channel slope, roughness of channel materials, sediment load and sediment size. There are eight general channel types in the Rosgen classification system.

In the Western Subbasin, there were seven type A channels, totaling 2.8 miles; twelve type B channels, totaling 20.6 miles; and 13 type F channels, totaling 25.7 miles. Type A stream reaches are narrow, moderately deep, single thread channels. They are entrenched, high gradient reaches with step/pool sequences. Type A reaches flow through steep V- shaped valleys, do not have well-developed floodplains, and have few meanders. Type B stream reaches are wide, shallow, single thread channels. They are moderately entrenched, moderate to steep gradient reaches, which are riffle-dominated with step/pool sequences. Type B reaches flow through broader valleys than type A reaches, do not have well-developed floodplains, and have few meanders. Type F stream reaches are wide, shallow, single thread channels. They are deeply entrenched, low gradient reaches and often have high rates of bank erosion. Type F reaches flow through low-relief valleys and gorges, are typically working to create new floodplains, and have frequent meanders (Flosi, et al., 1998).

Geology

The south and central portions of the Western Subbasin straddle the boundary between the King Range terrane on the west and the Coastal terrane to the east. The lower portion of both the North Fork and South Fork of Bear Creek are subsequent streams that follow the zone of faulting and shearing associated with the structural suture between the two terranes, the King Range thrust fault. To the west, the dramatic relief and steep slopes of the King Range are a reflection of the hard terrain, resulting from the relatively intact and stable bedrock underlying the middle of the mountain range coupled with rapid, ongoing regional uplift.

Overall, approximately 17% of the subbasin is underlain by historically active or dormant landslides, a lower proportion than any subbasin except the Southern Subbasin (Figure 120). The relatively few deep-seated landslides mapped along the eastern flanks of the King Range appear to be dormant. Abundant debris slide slopes have been mapped in this area, along with a moderate number of historically active

debris slide scars concentrated adjacent to drainages. Historically active debris slides are common along the portions of Bear Creek that lie along the King Range thrust fault. West of Honeydew and in the middle reaches of Squaw Creek, bedrock is pervasively disrupted along the broad, west-trending Cooskie shear zone that forms the northern boundary of the King Range terrane. Large deep-seated landslides, historically active earthflows, and gully erosion on grass-covered highlands have been mapped in association with soft terrain in this area of the subbasin. Similar conditions are found in soft terrain in the lower portion of Honeydew Creek. A map showing the distribution of geologic units, landslides, and geomorphic features related to landsliding is presented on Plate 1 of the Geologic Report, Appendix A.

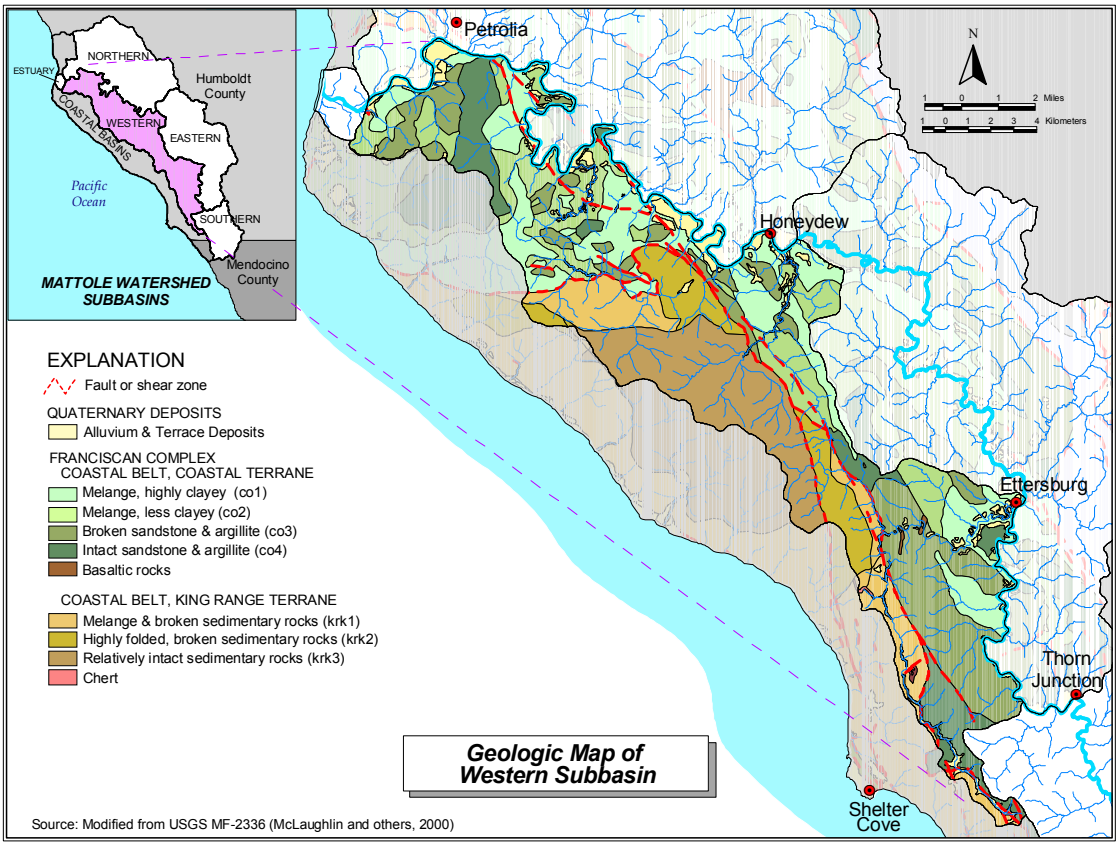

Figure 120. Geologic map of the Western Subbasin.

Vegetation

Unless otherwise noted, the vegetation description in this section is based on manipulation of CalVeg 2000 data. This is vegetation data interpreted from satellite imagery by the United States Forest Service, Remote Sensing Lab. The minimum mapping size is 2.5 acres.

Mixed hardwood and conifer forests cover 55% of the area, conifer forest 7%, and hardwood forest 25% for a total of 87% forested area (Figure 121). Grassland occupies 10% of the subbasin. Shrub, barren, agricultural lands, and urban classifications together cover the remaining 3% of the area. The forested vegetation reflects the impacts of harvesting. Fifty-Eight percent of the Western Subbasin is in the 12 to 23.9 inch diameter breast height (dbh) size class. Twenty percent is in a diameter size class greater than 24 inches dbh.

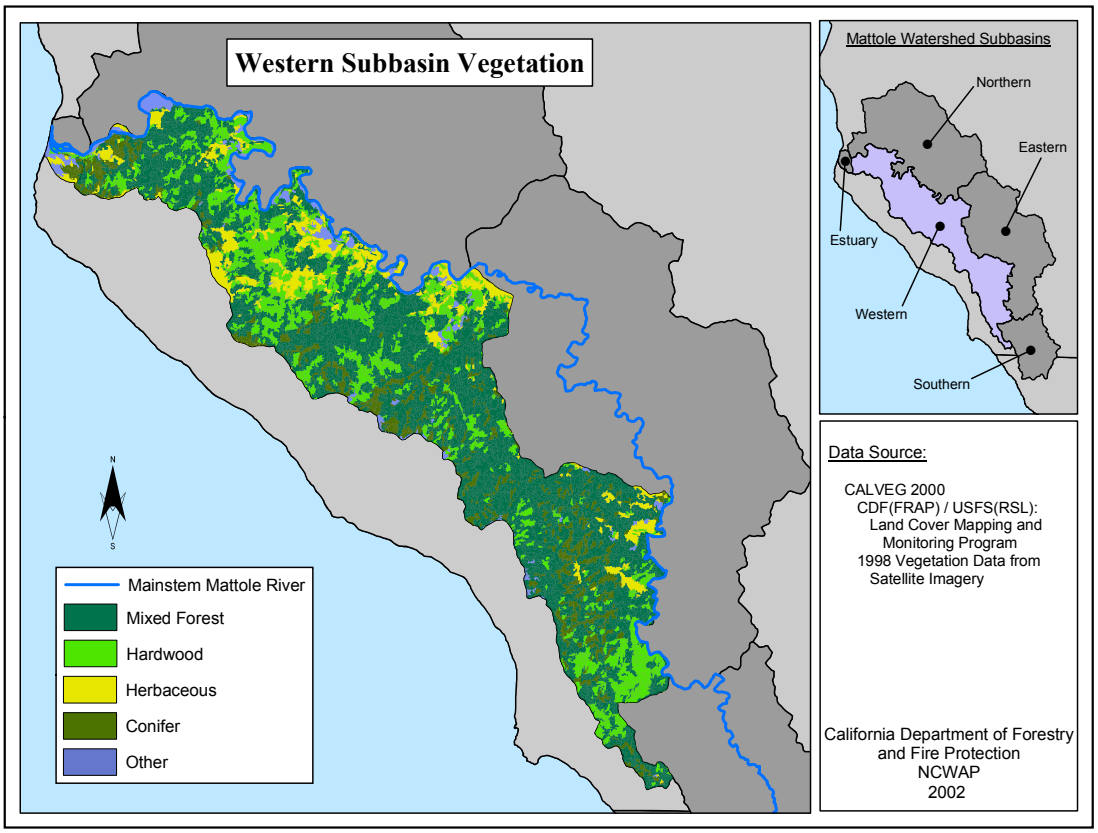

Figure 121. Vegetation of the Western Subbasin.

Land Use

The subbasin is largely in public ownership managed by the Bureau of Land Management (BLM) as part of the King Range National Conservation Area (KRNCA) (Figure 122). The area has a relatively small amount of subdivision. The major land use activity on privately owned land is ranching and some timber management. Controversy over BLM management and public access to the resources of the KRNCA, both supportive and critical, are ongoing issues. Timber harvest issues have occurred in the past, focused on stands in Honeydew Creek, but most timber is now managed for late seral reserve (Figure 123, Figure 124, and Table 139). The 220-acre Mill Creek (RM 2.8) Forest, the last old-growth Douglas fir and tan oak forest in the lower Mattole Basin, is located in the lowest downstream part of this subbasin. Timber harvest activity was extensive prior to 1961 and steadily decreased as a proportion of land area since.

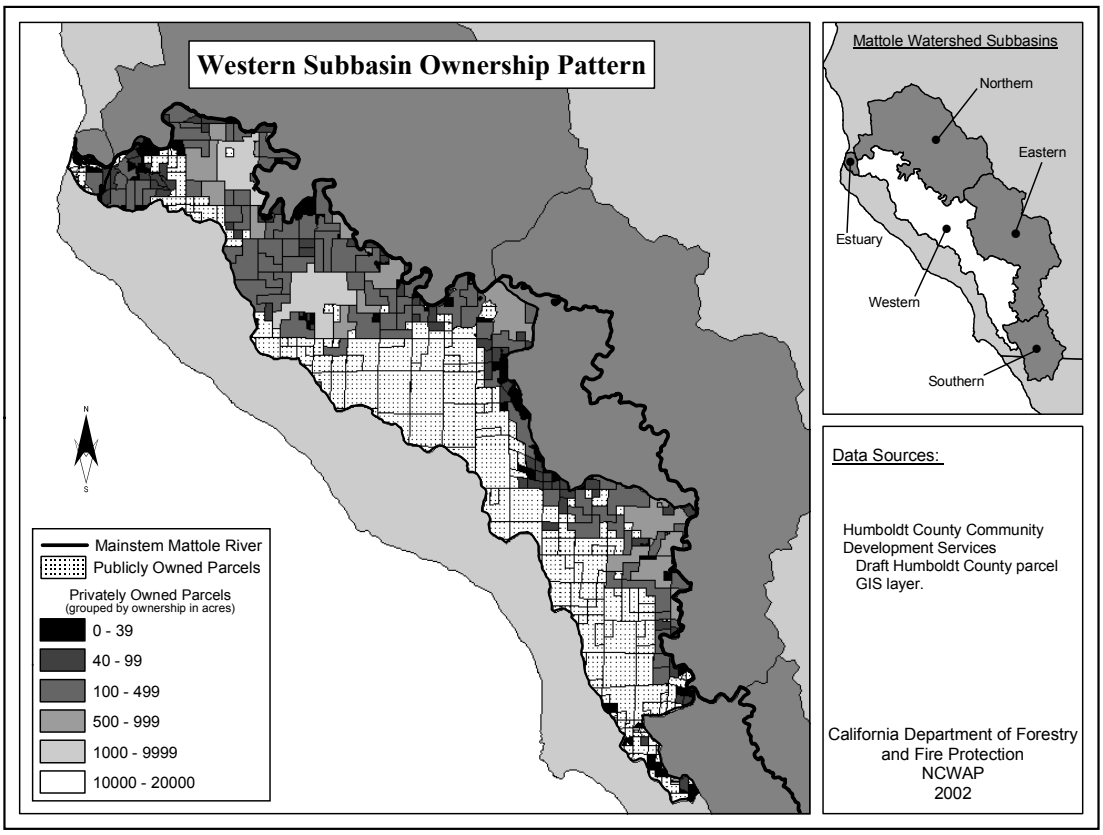

Figure 122. Ownership pattern of the Western Subbasin.

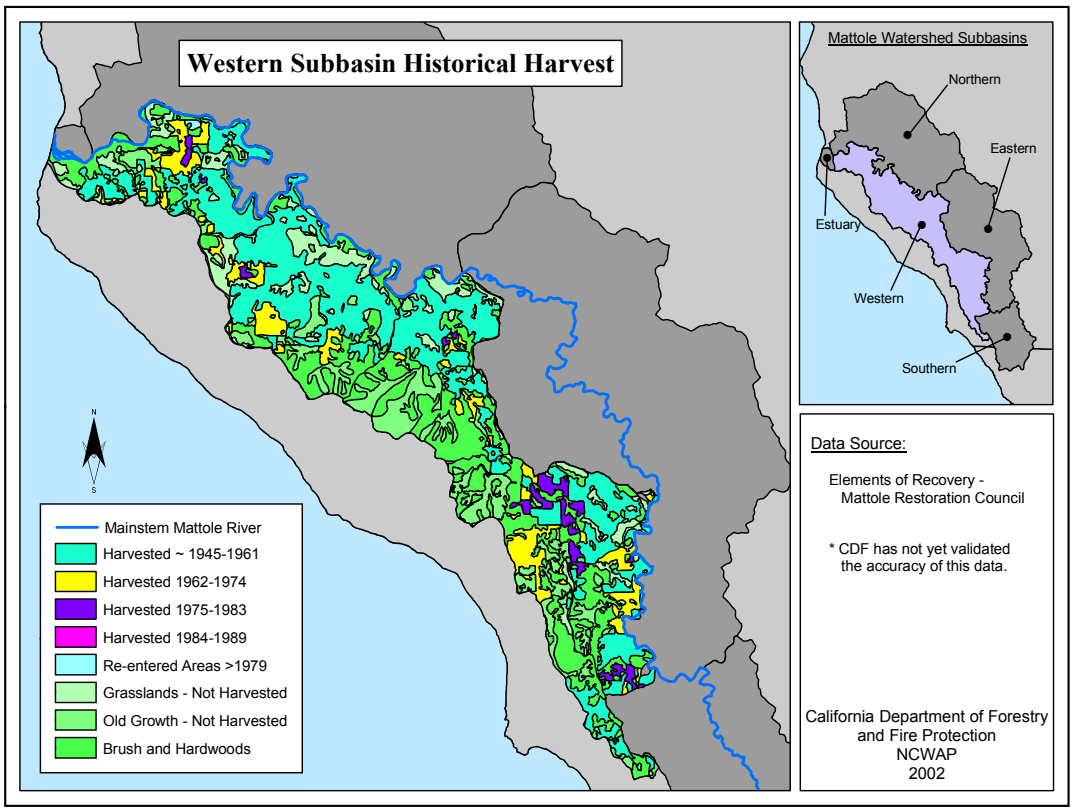

Figure 123. Timber harvest history for the Western Subbasin.

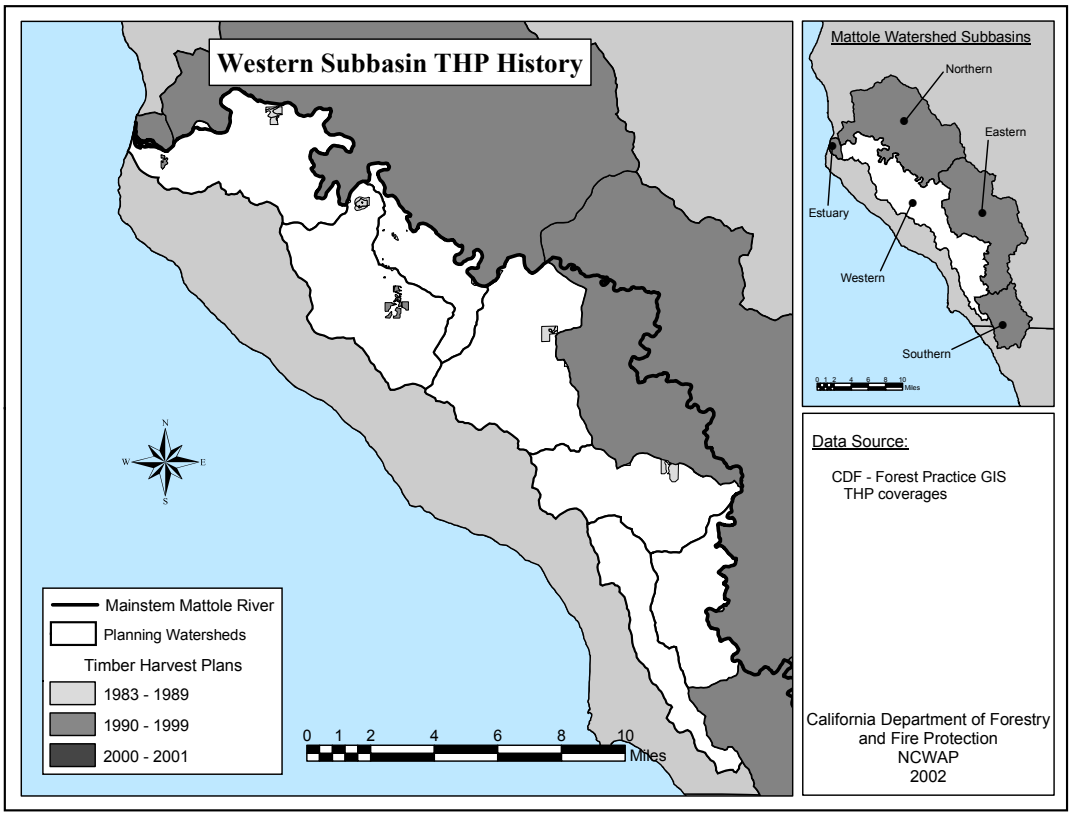

Figure 124. Timber harvesting plans 1983-2001, Western Subbasin

Table 139. Timber harvest history, Western Mattole Subbasin.

TIMBER HARVEST HISTORY - WESTERN SUBBASIN*				
	Total Harvested Acres	**Total Area Harvested (%)**	**Average Annual Harvest (ac)**	**Annual Harvest Rate (%)**
Harvested ~1945 - 1961**	20,544	36%	1,208	2%
Harvested 1962 - 1974**	5,222	9	402	<1
Harvested 1975 - 1983**	1,584	3	176	<1
Harvested 1984 - 1989	536	1	60	<1
Harvested 1990 - 1999	228	<1	23	<1
Harvested 2000 - 2001	87	<1	44	<1
Not Harvested:				
Grasslands	6,353	11		
Brush and Hardwoods	17,560	30		

* Does not add to 100% due to data discrepancies, re-harvest areas, and uncut timber areas.
** CDF has not yet validated the accuracy of this data (obtained from MRC).

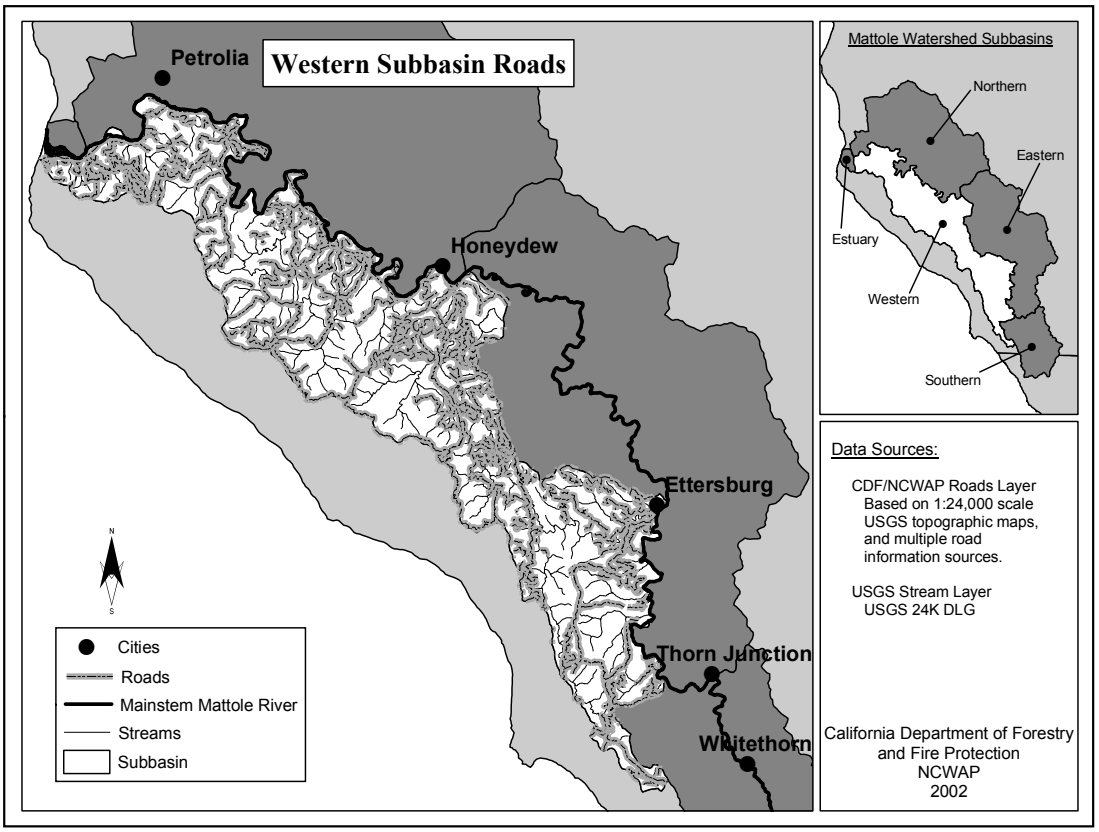

Figure 125. Western Subbasin roads.

Fluvial Geomorphology

The fluvial geomorphology of the Western Subbasin is characterized by a highly variable concentration of mapped channel characteristics, the lowest increase in the number of gullies among the subbasins, and a wide-ranging pattern of lateral-bar development (Table 140). Comparison of the 2000 and 1984 air photos reveals that six of the seven PWs within the Western Subbasin have shown a significant decrease in MCCs. Wide channels and displaced riparian vegetation decreased dramatically (see Figure 34 and Figure 35). Similar to other subbasins, the length of gullies about doubled across the subbasin between 1984 and 2000. Two PWs, Big Finley and Squaw Creeks, have shown notable decreases in lateral-bar development (Table 140), which suggest decreases in excess sediment in those PWs.

Significant improvement was observed between 1984 and 2000 in the proportion of blue line streams in bedrock and adjacent to or within LPM 4 and 5 that were affected by NMCCs. In 1984, fewer than 50% of such streams reaches were affected by NMCCs, while in 2000 about 20% were affected (CGS Geologic Report Table 14). Considering the low concentration of NMCCs in the upstream Southern Subbasin and the increase in sediment in the alluvial reaches, it appears that sediment is being produced internally or from the adjacent Eastern Subbasin.

The Western Subbasin displays a trend similar to the Eastern Subbasin in the significant decrease in MCCs between 1984 and 2000. The exception to this trend is found in the Shenanigan Ridge PW, in which mapped channel characteristics have increased approximately 36% since 1984 (Table 140). Areas with a high percentage of MCCs in 1984 include portions of the Honeydew Creek, Big Finley Creek, Squaw Creek, and North Fork Bear Creek PWs. These PWs showed decreases in MCC lengths of between 34% and 76% between 1984 and 2000 (Table 140).

Table 141 documents the number of sites and summarizes the lengths of eroding-bank features within the Western Subbasin. Stream-bank erosion has been observed in all but one of the planning watersheds of this subbasin. The number of eroding-bank sites range from two in the Shenanigan Ridge PW to 11 in the Honeydew Creek PW. The Squaw Creek PW has been mapped with the greatest total length of eroding banks, approximately 5700 feet.

Table 140. Fluvial geomorphic features - Western Subbasin.

	2000 Photos			1984 Photos		
Planning Watersheds1	**Length of Mapped Channel Characteristics2 (feet)**	**Total Gully Length3 (feet)**	**Lateral Bar Development4**	**Length of Mapped Channel Characteristics2 (feet)**	**Total Gully Length3 (feet)**	**Lateral Bar Development4**
Bear Creek, North Fork	24,700	28,000	2-3	57,300	8,000	3-4
Bear Creek, South Fork	8,400	8,500	1-2	24,000	4,100	2-3
Big Finely Creek	14,800	15,000	1-2	62,000	8,700	3-4
Honeydew Creek	48,600	38,200	3	74,000	17,200	3-4
Shenanigan Ridge	67,000	5,200	2-3	49,300	6,300	1-2
Squaw Creek	47,900	61,600	2	100,100	42,600	3-4
Woods Creek	32,600	24,200	2-3	54,000	4,800	3
Western Subbasin Totals	**244,000**	**180,700**		**420,700**	**91,800**	

1 See Figure 2 for locations.
2 Features include negative and neutral characteristics including: wide channels, displaced riparian vegetation, point bars, distribution and lateral or mid-channel bars, channel bank erosion, shallow landslides adjacent to channels.
3 Gullies include those that appear active, have little to no vegetation within the incised area, and are of sufficient size to be identified on aerial photos.
4 Lateral bars include mappable lateral, mid-channel bars and reflect sediment supply and storage. Rankings range from 1-5. Higher values suggest excess sediment

Table 141. Eroding stream bank lengths - Western Subbasin.

2000 Photos				
Western Subbasin Planning Watersheds1	**Number of Sites2**	**Maximum Length (feet) of Eroding Bank3**	**Total Length (feet) of Eroding Bank4**	**Eroding Bank (%)5**
Bear Creek, No. Fork	6	700	2,700	2
Bear Creek, So. Fork	N.O.	N.O.	N.O.	N.O.
Big Finely Creek	3	800	1,500	2
Honeydew Creek	11	600	4,100	2
Shenanigan Ridge	2	300	600	<1
Squaw Creek	10	1,700	5,700	3
Woods Creek	4	1,400	3,500	8

1 See Figure 2 for locations.
2 Number of sites mapped from air photos within PW.
3 Maximum length of a continuous section of eroding stream bank within PW.
4 Combined total length of all sections of eroding stream bank within PW.
5 Approximate percentage of eroding stream bank relative to total stream length within PW.
N.O.- Not Observed

Aquatic/Riparian Conditions

Unless otherwise noted, the vegetation description in this section is based on manipulation of CalVeg 2000 data. This is vegetation data interpreted from satellite imagery by the United States Forest Service, Remote Sensing Lab. The minimum mapping size is 2.5 acres.

Vegetation within 150 feet of the centerline of streams is 58% mixed conifer and hardwood forest, 16% hardwood, and 15% conifer forest. One percent of the forest type is riparian hardwood while another 1% is hardwood occupied commercial timberland site. The barren classification makes up 5 % of the riparian area, all of it adjacent to the Mattole River. Annual grassland is 3% of the area, while shrubs, water, and agricultural lands comprise the remaining 2%. Trees in the twelve to 23.5 inch diameter size class cover 66% of the riparian. The area occupied by this single-width zone is 13% of the total Western Subbasin acreage.

Fish Habitat Relationship

Anadromous stream reach conditions in the Western Subbasin were somewhat unsuitable as evaluated by the stream reach EMDS. The anadromous reach condition EMDS is composed of water temperature, riparian vegetation, stream flow, and in channel characteristics. More details of the EMDS are in the EMDS Appendix C).

Data on water temperature and stream flow have not yet been incorporated into EMDS. However, water temperature data is presented in the NCRWQCB Appendix E and stream flow data is presented in the DWR Appendix D and in individual stream survey report summaries in the CDFG Appendix F. Temperature records were available for Mill Creek (RM 2.8) and Stansberry Creek; Squaw Creek; Honeydew Creek, the Lower SF Honeydew Creek, WF Honeydew Creek, and the Upper EF Honeydew Creek; Bear Creek, NF Bear Creek, and the LNF Bear Creek; SF Bear Creek in the South Fork Bear Creek CalWater Unit; and Big Finley Creek and Nooning Creek. Except for Mill Creek (RM 2.8) during 1996, 1999, and 2001, Stansberry Creek during 1999 and the borderline ± 60 °F in the Lower North Fork Bear Creek during 1996 and 2001, and Big Finley Creek in 1999 all Western Subbasin tributaries sampled had temperatures that exceeded the fully supportive 50 - 60°F MWAT range considered suitable for optimal salmonid survival from 1996-2001.

Stream attributes that were evaluated by the anadromous stream reach EMDS included canopy cover, embeddedness, percent pools, pool depth, and pool shelter. These attributes were collected in 18 streams in the Western Subbasin by CDFG (see CDFG Appendix F) for stream survey report summaries).

Stream attributes tend to vary with stream size. For example, larger streams generally have more open canopy and deeper pools than small streams. This is partially a function of wider stream channels and greater stream energy due to higher discharge during storms. Surveyed streams in the Western Subbasin ranged in drainage area from 0.3 to 21.7 square miles (Figure 126).

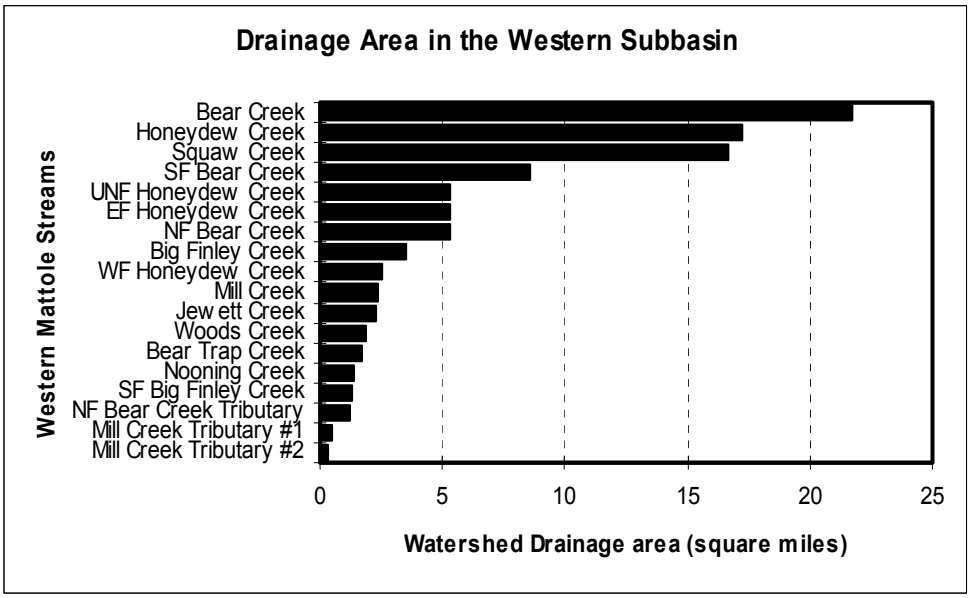

Figure 126. Drainage area of stream surveyed by CDFG in the Western Subbasin.

Canopy density, and relative canopy density by coniferous versus deciduous trees were measured at each habitat unit during CDFG stream surveys. Near-stream forest density and composition contribute to microclimate conditions that help regulate air temperature, which is an important factor in determining stream water temperature. Furthermore, canopy levels provide an indication of the potential present and future recruitment of large woody debris to the stream channel, as well as the insulating capacity of the stream and riparian areas during winter.

In general, the percentage of stream canopy density increases as drainage area, and therefore channel width, decrease. Deviations from this trend in canopy may indicate streams with more suitable or unsuitable

canopy relative to other streams of that subbasin. As described in the EMDS response curves, total canopy (sum of conifer and deciduous canopy) exceeding 85% is considered fully suitable, and total canopy less than 50% is fully unsuitable for contributing to cool water temperatures that support salmonids. The surveyed streams of the Western Subbasin show percent canopy levels (45%-90% total canopy) that vary in their EMDS rating from completely unsuitable to completely suitable (Figure 127). Canopy conditions generally trend with stream size, but the South Fork Bear Creek, Mill Creek (RM 2.8), and Nooning Creek have exceptionally high total canopy cover, while a tributary to Bear Creek, and Bear Trap Creek have exceptionally low total canopy cover. Deciduous trees in this subbasin dominate existing canopy.

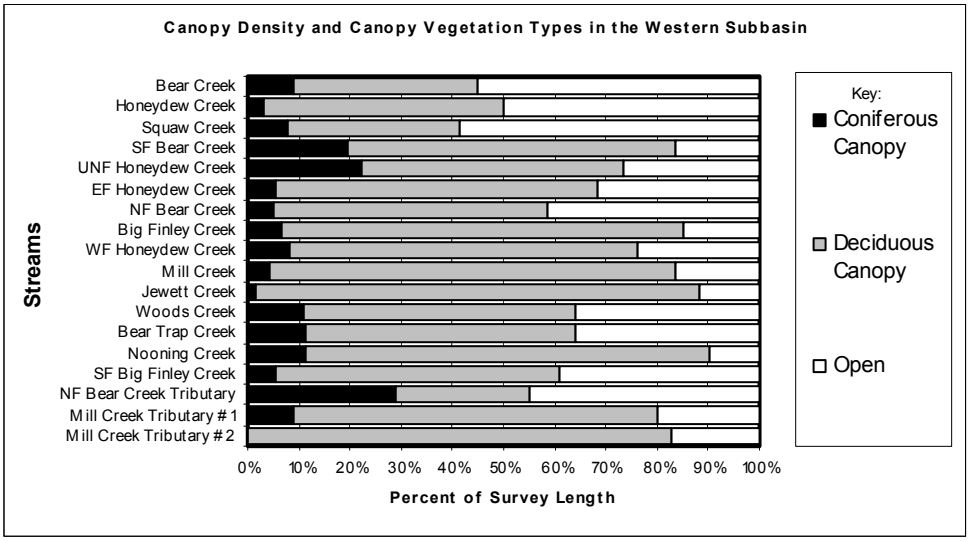

Figure 127. The Relative percentage of coniferous, deciduous, and open canopy covering surveyed streams, Western Subbasin.

Averages are weighted by unit length to give the most accurate representation of the percent of a stream under each type of canopy. Streams are listed in descending order by drainage area (largest at the top). As described in the EMDS response curves, total canopy (sum of conifer and deciduous canopy) exceeding 85% is considered fully suitable, and total canopy less than 50% is fully unsuitable for contributing to cool water temperatures that support salmonids.

Cobble embeddedness was measured at each pool tail crest during CDFG stream surveys. Cobble embeddedness is the percentage of an average sized cobble piece at a pool tail out that is embedded in fine substrate. Category 1 is 0-25% embedded, Category 2 is 26-50% embedded, Category is 3 51-75% is embedded, Category 4 is 76-100% embedded, and Category 5 is unsuitable for spawning due to factors other than embeddedness. Cobble embedded deeper that 51% is not within the fully supported range for successful use by salmonids. The EMDS Reach Model considers cobble embeddedness greater than 50% to be somewhat unsuitable and 100% to be fully unsuitable for the survival of salmonid eggs and embryos. Embeddedness values in the Western Subbasin are somewhat unsuitable or worse for the survival of developing salmonid eggs and embryos with the exception of Bear Creek and its tributaries where somewhat suitable conditions do exist (Figure 128). Figure 128 also illustrates how stream reaches rated as unsuitable overall may actually have some suitable spawning gravel sites distributed through the stream reach.

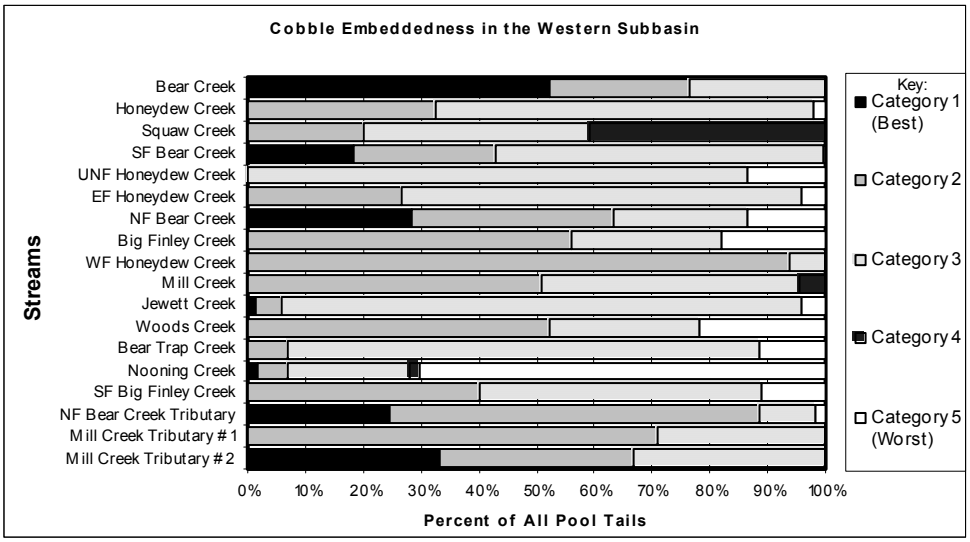

Figure 128. Cobble embeddedness categories as measured at every pool tail crest in surveyed streams, Western Subbasin.

Cobble embeddedness is the % of an average- sized cobble piece at a pool tail out that is embedded in fine substrate: Category 1 = 0-25% embedded, Category 2 = 26-50% embedded, Category 3 = 51-75% embedded, Category 4 = 76-100%, and Category 5 = unsuitable for spawning due to factors other than embeddedness (e.g. log, rocks). Substrate embeddedness Categories 3, 4, and 5 are considered by EMDS to be somewhat unsuitable to fully unsuitable for the survival of salmonid eggs and embryos. Streams are listed in descending order by drainage area (largest at the top).

Pool, flatwater, and riffle habitat units observed were measured, described, and recorded during CDFG stream surveys. During their life history, salmonids require access to all of these types of habitat. EMDS does not evaluate the ratio of these habitat types, but a balanced proportion is desirable. Most surveyed Western Subbasin streams have less than 20% pool habitat by length (Figure 129). This is well below the range considered fully suitable as described below. Dry units were also measured, and obviously indicate poor conditions for fish.

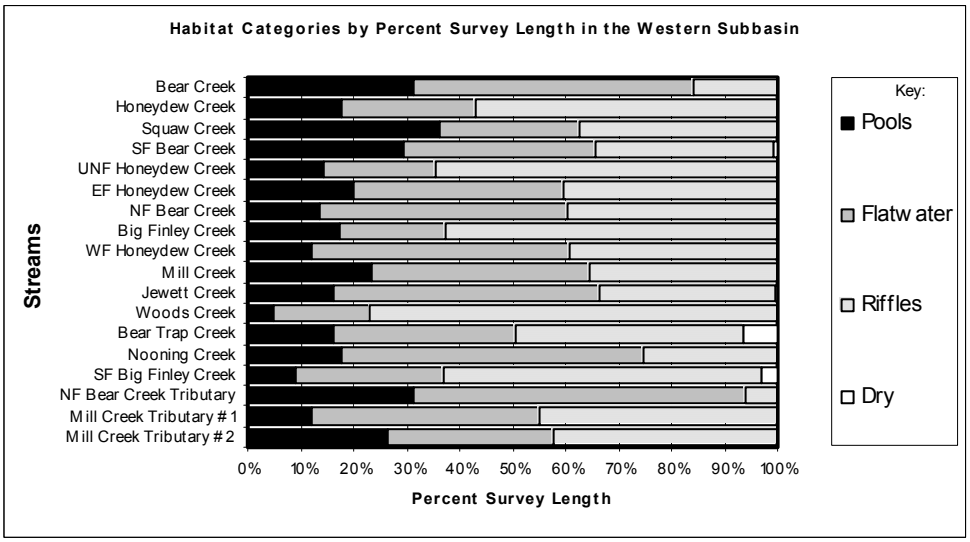

Figure 129. The percentage of pool habitat, flatwater habitat, riffle habitat, and dewatered channel by survey length, Western Subbasin.

EMDS does not evaluate the ratio of these habitat types, but a balanced proportion is desirable. Streams are listed in descending order by drainage area (largest at the top).

Pool depths were measured during CDFG surveys. The amount of primary pool habitat of sufficient depth to be fully suitable for anadromous salmonids is considered in the EMDS Reach Model. Primary pools are determined by a range of pool depths, depending on the order (size) of the stream. Generally, a reach must

have 30 – 55% of its length in primary pools for its stream class to be in the suitable ranges. Generally, larger streams have deeper pools. Deviations from the expected trend in pool depth may indicate streams with more suitable or unsuitable pool depth conditions relative to other streams of that subbasin. The frequency of deeper pools in the Western Subbasin (Figure 130) yields EMDS ratings that vary from fully suitable to fully unsuitable. Pool depth is generally higher than for any other Mattole subbasin.

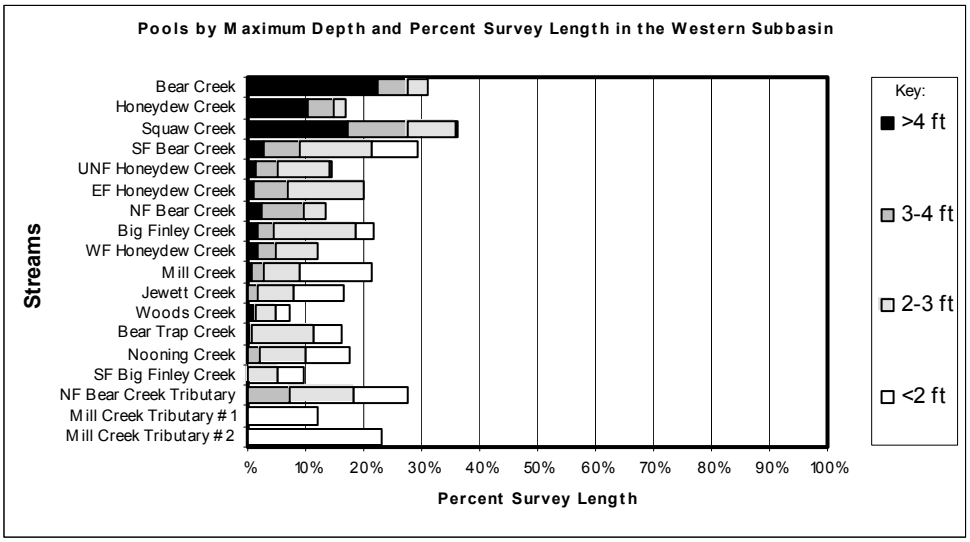

Figure 130. Percent length of a survey composed of deeper, high quality pools, Western Subbasin.

Values sum to the length of percent pool habitat in Figure 129. As described in the EMDS response curves, a stream must have 30-55% of its length in primary pools to provide stream conditions that are fully suitable for salmonids. Streams with <20 % or >90% of their length in primary pools provide conditions that are fully unsuitable for salmonids. Streams are listed in descending order by drainage area (largest at the top).

Pool shelter was measured during CDFG surveys. Pool shelter rating illustrates relative pool complexity, another component of pool quality. Ratings range from 0-300. The Stream Reach EMDS model evaluates pool shelter to be fully unsuitable if less than a rating of 30. The range from 100 to 300 is fully suitable. Pool shelter ratings in the Western Subbasin yield EMDS ratings that vary from fully suitable to fully unsuitable (Figure 131).

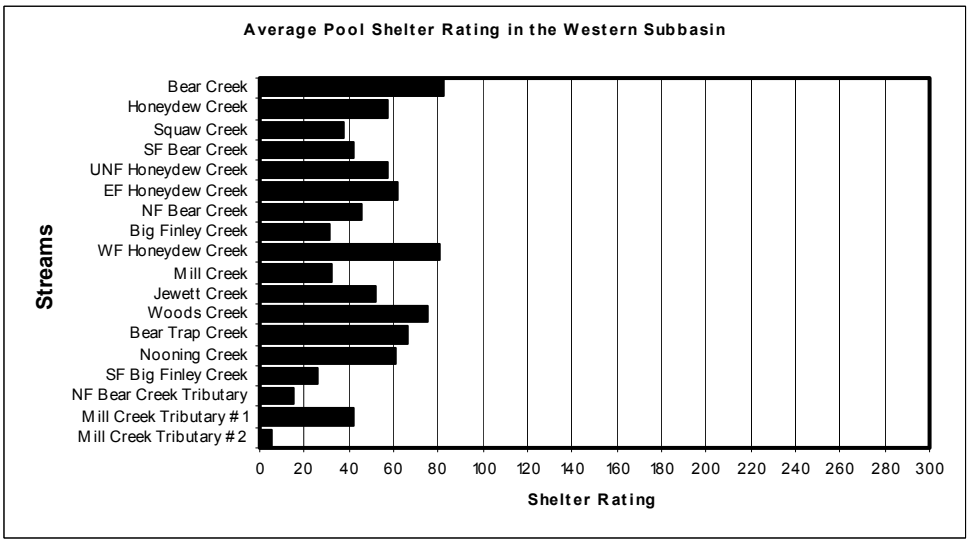

Figure 131. Average pool shelter ratings from CDFG stream surveys, Western Subbasin

As described in the EMDS response curves, average pool shelter ratings exceeding 80 are considered fully suitable and average pool shelter ratings less than 30% are fully unsuitable for contributing to shelter that supports salmonids. Streams are listed in descending order by drainage area (largest at the top).

In terms of the fish habitat relationship present in the Western Subbasin, it appears that habitat is somewhat unsuitable for salmonids as evaluated by EMDS. Additionally, data on fish passage barriers and water temperature (two important parameters considered by our assessment but not currently included in the

EMDS analysis) shows that there are two temporary and partial barriers, two partial salmonid barriers, five total salmonid barriers, and that several streams exceed temperatures suitable for salmonids in this subbasin. However, refugia from poor habitat conditions and suitable conditions for canopy density have allowed coho salmon to persist in six studied streams and steelhead trout to persist in nine surveyed streams.

Fish Passage Barriers

Stream Crossings

Nine stream crossings were surveyed in the Western Subbasin as a part of the Humboldt County culvert inventory and fish passage evaluation conducted by Ross Taylor and Associates (2000). Lighthouse Road near Petrolia has culverts on Bear Creek (RM 1.0), Mill Creek (RM 2.8), Stansberry Creek, and Titus Creek; the Mattole Road between Petrolia and Honeydew has culverts on Clear Creek, Granny Creek, Indian Creek and Saunders Creek; and Wilder Ridge Road has a culvert on High Prairie Creek. The culverts on Bear Creek, Clear Creek, High Prairie Creek, Stansberry Creek, and Titus Creek were found to be total salmonid barriers and the culverts on Indian Creek and Saunders Creek were found to be partial salmonid barriers (Table 142);*(Taylor, 2000; G. Flosi, Personal Communication).* The culverts on Granny Creek and Mill Creek (RM 2.8) were found to be temporary and partial salmonid barriers. In a list of priority rankings of 67 culverts in Humboldt County for treatment to provide unimpeded salmonid passage to spawning and rearing habitat, rankings of culverts in the Western Subbasin ranged from five for Stansberry Creek to 64 for Granny Creek. Criteria for priority ranking included salmonid species diversity, extent of barrier present, and risk of culvert failure, current culvert condition, salmonid habitat quantity, salmonid habitat quality, and a total salmonid habitat score. The culvert on Mill Creek (RM 2.8) is scheduled for improvements in 2002, the culvert on Clear Creek was improved in 2001, the culvert on Stansberry Creek was proposed and scheduled for improvement in 2001 but funding ran out, and the culvert on Saunders Creek is currently proposed for improvement (G. Flosi, personal communication).

Table 142. Culverts surveyed for barrier status in the Western Subbasin.

Stream Name	Road Name	Priority Rank	Barrier Status	Upstream Habitat	Treatment
Bear Creek	Lighthouse Road	15	Total barrier. Excessive under sizing probably creates a velocity barrier.	0.3 miles of potential salmonid habitat.	Proposed but not funded
Clear Creek	Mattole Road	7	Total barrier. An extremely steep gradient creates a total velocity barrier. Parallel steel tracks probably contribute to passage problems by increasing velocities, as they have minimal roughness, and interfering with a fish's swimming motion.	0.7 miles of good salmonid habitat.	Improved in 2001
Granny Creek	Mattole Road	64	Temporary and partial barrier. This culvert is a partial/temporary barrier for adult steelhead (only 20% passable) and a complete barrier for adult coho and all juveniles. Water levels are too shallow at low flows, and excessive velocities exist at higher flows. Both excessive slope and the long length of the culvert cause passage problems.	0.7 miles of poor salmonid habitat.	None proposed at this time
High Prairie Creek	Wilder Ridge Road	50	Total barrier. The culvert is a complete barrier for all adults and juveniles. Water levels are too shallow at low flows, and excessive velocities exist at higher flows. Both excessive slope and a smooth floor cause passage problems. The baffles are poorly installed, and flow is turbulent and fast during even moderate runoff. The outlet pool is not deep enough for salmonids to jump into the culvert.	1.4 miles of poor salmonid habitat.	None proposed at this time
Indian Creek	Mattole Road	13	Partial barrier. Partial barrier for adults, nearly complete barrier for juveniles. Water levels are too shallow at low flows, and excessive velocities exist at higher flows. Direct observation of juveniles suggests that the entry jump and flow velocities were problems.	1.2 miles of good salmonid habitat.	Proposed but not funded
Mill Creek (RM 2.8)	Lighthouse Road	20	Temporary and partial barrier. A temporary barrier for adults. Excessive velocities at higher migration flows exist. A barrier for juveniles. An excessive jump is required to enter the culvert and velocities appear excessive even with baffles.	1.35 miles of good salmonid habitat.	Improved in 2002
Saunders Creek	Mattole Road	16	Partial barrier. Partial barrier for adult steelhead (only 24% passable) and a complete barrier for adult coho and all juveniles. Water levels are too shallow at low flows and excessive velocities exist at higher flows. Both excessive slope and a smooth floor cause passage problems. Juveniles were observed failing to swim even several feet up the culvert due to velocity. Measured velocities were 10-12 ft per second during a low-moderate winter migration flow.	0.7 miles of fair salmonid habitat.	Proposed but not funded
Stansberry Creek	Lighthouse Road	5	Total barrier. An excessive jump is required to enter the culvert, while there is a lack of depth to execute such a jump. A steep gradient and excessive under sizing creates a velocity barrier.	0.7 miles of potential salmonid habitat.	Proposed but not funded
Titus Creek	Lighthouse Road	46	Total barrier. Steep gradient, length and excessive under sizing create a velocity barrier.	0.4 miles of poor salmonid habitat.	None proposed

Dry Channel

CDFG stream inventories were conducted for 49.9 miles on 33 reaches of 18 tributaries in the Western Subbasin. A main component of CDFG Stream Inventory Surveys is habitat typing, in which the amount and location of pools, flatwater, riffles, and dry channel is recorded. Although the habitat typing survey only records the dry channel present at the point in time when the survey was conducted, this measure of dry channel can give an indication of summer passage barriers to juvenile salmonids. Dry channel

conditions in the Mattole Basin generally become established from late July through early September. Therefore, CDFG stream surveys conducted outside this period are less likely to encounter dry channel.

Dry channel disrupts the ability of juvenile salmonids to move freely throughout stream systems. Juvenile salmonids need well-connected streams to allow free movement to find food, escape from high water temperatures, escape from predation, and migrate out of their stream of origin. The amount of dry channel reported in surveyed stream reaches in the Western Subbasin is 0.04% of the total length of streams surveyed. Dry channel was found in three streams (Table 143, Figure 132). Dry habitat units occurred near the mouth of Bear Trap Creek and the South Fork of Big Finley Creek, in the middle reaches of Jewett Creek, and at the upper limit of anadromy in the South Fork of Bear Creek. Dry channel at the mouth of a tributary disconnects that tributary from the mainstem Mattole River, which can disrupt the ability of juvenile salmonids to access tributary thermal refugia in the summer. Dry channel in the middle reaches of a stream disrupts the ability of juvenile salmonids to forage and escape predation. Lastly, dry channel in the upper reaches of a stream indicates the end of anadromy.

Table 143. Dry channels recorded in CDFG stream surveys in the Western Subbasin.

Stream	Survey Period	# of Dry Units	Dry Unit Length (ft)	% of Survey Dry Channel
Mill Creek (R.M. 2.8)	July	0	0	0
Mill Creek (R.M. 2.8) Tributary #1	July	0	0	0
Mill Creek (R.M. 2.8) Tributary #2	July	0	0	0
Squaw Creek	September	0	0	0
Woods Creek	June	0	0	0
Honeydew Creek	July	0	0	0
Bear Trap Creek	July-August	1	638	6.5
Upper North Fork Honeydew Creek	July	0	0	0
East Fork Honeydew Creek	August	0	0	0
West Fork Honeydew Creek	July	0	0	0
Bear Creek	September	0	0	0
Jewett Creek	July	1	30	0.2
North Fork Bear Creek	July	0	0	0
North Fork Bear Creek Tributary #1	July	0	0	0
South Fork Bear Creek	June-July	1	400	0.6
Big Finley Creek	September	0	0	0
South Fork of Big Finley Creek	October	1	202	3.0
Nooning Creek	June	0	0	0

Fish History and Status

Historically, the Western Subbasin supported runs of Chinook salmon, coho salmon, and steelhead trout. Interviews with local residents indicate that coho salmon and steelhead trout have been found in the Bear Creek (RM 1.0), Stansberry Creek, Clear Creek, Indian Creek, Squaw Creek, and Woods Creek; and Chinook salmon have been found in Stansberry Creek, Indian Creek, Squaw Creek, and Woods Creek (Coastal Headwaters Association 1982). CDFG stream surveys before 1970 found steelhead trout in 15 streams, unidentified salmonids in six streams, and coho salmon in Mill Creek (RM 2.8), Clear Creek, Woods Creek, Bear Trap Creek, and Bear Creek. High densities of steelhead trout were estimated by CDFG for the South Fork of Bear Creek and Indian Creek (200-300 per 100 feet of stream) in 1966.

A study of Mattole Basin salmonids conducted in July and August 1972 (Brown, 1973b) examined Squaw Creek near its mouth. The steelhead trout density was 74 fish per 100 feet of stream.

Figure 132. Mapped dry channels of the Western Subbasin.

BLM, Coastal Headwaters Association, MSG, and CDFG stream surveys have continued to document the presence of steelhead trout in most streams in the Western Subbasin over time. BLM surveys in the 1970s and early 1980s found juvenile steelhead trout in seven streams. Coastal Headwaters Association surveys in 1981 and 1982 found steelhead trout in ten streams. MSG carcass surveys found steelhead trout in Mill Creek (RM 2.8), Honeydew Creek, Bear Creek, and the South Fork of Bear Creek in the late 1990s. CDFG surveys found steelhead trout in Squaw Creek, Bear Trap Creek, the East Fork of Honeydew Creek, and Jewett Creek in the 1980s and ten streams in the 1990s.

Unidentified salmonids were found in Indian Creek, Squaw Creek, the Upper East Fork of Honeydew Creek, Jewett Creek, and Nooning Creek by CDFG in the 1980s. These could have been Chinook or coho salmon. In addition, coho salmon were detected in Mill Creek (RM 2.8) and Bear Creek in the 1990s by CDFG stream surveys and in Big Finley Creek in 1995 by the Redwood Sciences Lab. MSG carcass surveys found coho salmon in Bear Creek and the South Fork of Bear Creek in the late 1990s and early 2000s. CDFG electrofishing in the 1990s also found coho salmon in Mill Creek (RM 2.8), the North Fork of Bear Creek, and the South Fork of Bear Creek. A 1997-99 Redwood Sciences Laboratory study of juvenile coho salmon distributions in relation to water temperatures in the Mattole Basin (Welsh et al. 2001) found coho salmon in Big Finley Creek and the South Fork of Bear Creek. The 2001 CDFG Coho Inventory found coho salmon in Mill Creek (RM 2.8), Woods Creek, and Honeydew Creek. More detailed summaries of stream surveys and fisheries studies in the Western Subbasin are provided in the CDFG Appendix F.

Western Subbasin Issues

- Instream habitat diversity and complexity, based on available survey data (i.e. pool depths, cover, and large woody debris) may be adequate for salmonid production. Based on current surveys, instream habitat appears to be recovering.
- Available data from sampled streams suggests that high summer temperatures are deleterious to summer rearing salmonid populations in some streams in this subbasin.
- Instream sediment throughout this subbasin may be approaching or exceeding levels considered unsuitable for salmonid populations.
- Although, the rural road system is not as extensive as in the other subbasins, there is concern that inadequate maintenance and storm-proofing of existing roads, both active and abandoned, are causing large amounts of sediment to be contributed to local stream systems.
- Large woody debris recruitment potential is poor in this subbasin.

Western Subbasin Integrated Analysis

The following tables provide a dynamic, spatial picture of watershed conditions for the freshwater lifestages salmon and steelhead. The tables' fields are organized to show the extent of watershed factors' conditions and their importance of function in the overall watershed dynamic. Finally a comment is presented on the impact or condition affected by the factor on the watershed, stream, or fishery. Especially at the tributary and subbasin levels, the dynamic, spatial nature of these processes provides a synthesis of the watershed conditions and indicates the quantity and quality of the freshwater habitat for salmon and steelhead.

Geology

Introduction

The potential for sediment production is strongly influenced by the underlying geology. The following IA tables compiled by CGS examine the influence of geology on sediment production by comparing the distribution of geomorphic terrains (hard, moderate, and soft bedrock terrains, and the separately grouped Quaternary surficial deposits) against the observation of landslides and geomorphic features related to mass wasting within the subbasin. The first table presents the proportions of the subbasin underlain by each of the terrains. The next table looks at hillside gradient within the subbasin. The distribution of historically active landslides, gullies, and inner gorges by terrain are then considered. Finally, the landslide potential map developed by CGS is examined with respect to the terrains.

Table 144. Geomorphic terrains as a proportion of the Western Subbasin.

Proportion of Western Subbasin Basin Underlain by the Different Geomorphic Terrains				
Feature/Function			**Significance**	**Comments**
Terrain Type	**Proportion of Subbasin Area**	**Terrain Area within Subbasin as a Proportion of Mattole Basin Area**	The geomorphic terrains represent groupings of geologic map units based on similarities in geology, geomorphic expression, and landslide occurrence. They provide a simplified division of the watershed useful in comparing the influence of bedrock geology to the distribution of other mapped features.	This subbasin is second only to the Southern Subbasin in the proportion of hard terrain and, because of its larger size, actual includes more area of hard terrain than any other subbasin. The limited area of soft terrain are concentrated along the Cooskie shear zone in the northern portion of the subbasin.
Hard	50%	15%		
Moderate	24%	7%		
Soft	19%	6%		
Quaternary[1]	7%	2%		
1 Areas where young (Quaternary) surficial units have been mapped covering bedrock; includes alluvium, as well as terrace deposits, active stream channel deposits, and other alluvial deposits.				

Table 145. Hillside gradient in the Western Subbasin.

Hillside Gradient in the Western Subbasin							
Feature/Function						**Significance**	**Comments**
Proportion of Subbasin Area						Hillside slope is an important indicator of potential instability (steeper is generally less stable). The terrain type influences the degree to which hillside slope affects the slope stability.	This subbasin ranks first within the Mattole Basin for the highest percentage of moderately steep to very steep slopes areas. Typically, the steeper slopes reflect the presence of hard and moderate terrain while the less steep slopes reflect the presence of soft terrain.
Range in % slope							
0-10	**10-30**	**30-40**	**40-50**	**50-65**	**>65**		
5	14	15	18	25	23		

Table 146. Small historically-active landslides by terrain in the Western Subbasin.

Distribution of Small Historically-Active Landslides by Geomorphic Terrain in the Western Subbasin				
Feature/Function			**Significance**	**Comments**
Terrain Type	**Small Point Landslides1 Mapped from year 19812, 1984, or 2000 Photographs**		The relative number of small point slides is used to evaluate which geomorphic terrains are more prone to small, localized slope failures.	The majority of small failures occur in the hard terrain and consist primarily of shallow debris slides associated with steep slopes. However, the larger number of point slides in the hard and moderate terrain is somewhat a reflection of the greater areal extant of these terrains within the subbasin.
	Point Count	**Area3 (acres)**		
Hard	866	86		
Moderate	526	52		
Soft	296	29		
Quaternary	13	1		
1 Mapping was compiled at a 1:24,000 scale. Landslides smaller than approximately 100 feet in diameter were captured as points in the GIS database; larger features were captured as polygons. 2Landslides included from year 1981 photographs are from previous mapping by Spittler (1983 and 1984) covering limited portions of the Mattole Basin. 3 Based on assumed average area of 400 square meters (roughly 1/10th acre) for small landslides.				

Table 147. All historically-active landslides by terrain in the Western Subbasin.

Distribution of All Historically-Active Landslides by Terrain in the Western Subbasin				
Feature/Function			**Significance**	**Comments**
Terrain Type	**Combined Area (acres) of All Historically-Active Landslides1**	**Proportion of Total Active Landslide Area within Subbasin**	The relative percentage of area covered by historically-active slides identifies which geomorphic terrains are most prone to relatively large-scale slope failures.	Only about 14% of the total area occupied by active landslides in the Mattole Basin are found in the Western Subbasin. Soft terrain forms less than a fifth of the subbasin, yet contains more than a third of the total landslide area within the subbasin.
Hard	511	36%		
Moderate	362	25%		
Soft	544	38%		
Quaternary	9	1%		
1 Includes small point and larger polygon features mapped from year 1981, 1984 and 2000 photos. Where landslides overlapped (i.e., the same or similar features mapped from more than one photo set) the area of overlap was counted only once. Small landslides captured as points in the GIS database were assumed to have an average area of 400 square meters (roughly 1/10th acre).				

Table 148. Gullies and inner gorges by terrain in the Western Subbasin.

Distribution of Gullies and Inner Gorges by Terrain in the Western Subbasin				
Feature/Function			**Significance**	**Comments**
Terrain Type	**Proportion of Total Mapped Gully Lengths1 in Subbasin**	**Proportion of Total Mapped Inner Gorge Lengths1 in Subbasin**	Gullies and inner gorges are an important indicator of ongoing sources of sediment to the fluvial system.	Soft terrain forms less than a fifth of the Western Subbasin, yet the large majority of mapped gully lengths in the subbasin are located in soft terrain; gully erosion is a significant, on-going contributor of sediment from soft terrain areas. Because inner gorges are found preferentially in hard terrain, and to a lesser degree moderate terrain, the distribution of inner gorges reflects the greater areal extant of hard and moderate terrains within the subbasin. Inner gorges act as sediment source areas primarily through debris sliding.
Hard	12%	59%		
Moderate	11%	26%		
Soft	75%	13%		
Quaternary	2%	2%		
[1] Includes only those features mapped from year 2000 photographs.				

Table 149. Landslide potential by terrain in the Western Subbasin area.

Distribution of Landslide Potential Categories by Terrain as a Proportion of the Western Subbasin Area							
Feature/Function						Significance	Comments
Terrain Type	Landslide Potential Category1						
	1	2	3	4	5		
Hard	0.2%	6.1%	17.5%	8.5%	17.9%	Categories 4 and 5 represent the majority of unstable areas that are current or potential future sources of sediment.	Hard and moderate terrains are similarly represented in LPM Categories 4 and 5 relative to their areal extant within the subbasin; in comparison, soft terrain is proportionally over represented relative to its areal extent. The presence of steep to very steep slopes over nearly half of the subbasin contributes to the large proportion of unstable areas.
Moderate	0.2%	1.5%	11.7%	5.4%	5.3%		
Soft	0.1%	0.4%	4.2%	9.0%	5.2%		
Quaternary	4.0%	2.0%	0.6%	0.1%	0.2%		
Subbasin Total2	**4.5%**	**10.0%**	**34.0%**	**23.0%**	**28.6%**		
1 Categories represent ranges in estimated landslide potential, from very low (category 1) to very high (category 5); see Geologic Report, Plate 2. 2 Percentages are rounded to nearest 1/10 %; sum of rounded values may not equal 100%.							

Discussion

Encompassing the dramatic relief of the King Range, the Western Subbasin has the highest proportion of steep to very steep slopes (areas exceeding 50% gradient) in the Mattole Basin. Despite this, the Western Subbasin is comparatively stable with only a small proportion (about 14%) of the total area occupied by historically active landslides within the Mattole Basin being found here. Most of the steeper slope areas are located in the half of the subbasin underlain by hard terrain, where landsliding typically occurs in the form of small debris slides. More than one third of the area occupied by larger landslides, as well as 75% of the gully lengths within the subbasin, are concentrated in the 19% of the subbasin underlain by soft terrain.

Vegetation and Land Use

Introduction

CDF NCWAP developed a number of tables that are intended to help identify and highlight how current patterns of vegetation and land use are expressed in relation to the geology of the watershed. First, vegetation and land use are related to the underlying bedrock geology or terrain type. These patterns are then explored by examining the current vegetation and recent timber harvesting in relation to their occurrence in landslide potential classes, the product of a model that uses terrain type, vegetation, and landslides as variables. Landslide causality was not assigned and recent timber harvest activity has occurred in low percentages in most of the planning watersheds. The significance of the geologic characteristics in these tables is expressed as a relative rating and is not characterized numerically.

Table 150. Vegetation types associated with terrain types in the Western Subbasin.

Vegetative Condition in the Western Subbasin								
Feature/Function							Significance	Comments
Terrain Type	Vegetation Type							
	Conifer	Mixed	Hardwood	Grassland	Other	Total		
Hard	12%	63%	22%	2%	1%	100%	The differences between the slope, soils, and stability of the geologic terrain results in a different mosaic of vegetation in each of these areas. The combination of the geologic and vegetative conditions between the terrain results in some differences in land use and sensitivity to impacts from land use.	While grassland is strongly associated with the soft and quaternary terrain types, the majority of acreage is in tree dominated vegetation. Timber harvesting impacts in soft terrain may be higher than the THP required estimated surface soil erosion hazard rating (EHR) worksheet may indicate.
Moderate	10%	63%	21%	4%	2%	100%		
Soft	5%	43%	21%	27%	4%	100%		
Quaternary	2%	21%	16%	26%	35%	100%		

Table 151. Riparian vegetation (within 150 feet of streams) types associated with terrain types in the Western Subbasin.

Riparian Vegetative Condition in the Western Subbasin									
Feature/Function								Significance	Comments
Terrain Type	Riparian Vegetation Type							The differences between the slope, soils, and stability of the geologic terrain results in a different mosaic of vegetation in each of these areas. The combination of the geologic and vegetative conditions between the terrain results in some differences in land use and sensitivity to impacts from land use. The riparian vegetation in this zone is the primary source of large woody debris. The species and size of large woody debris provided to the stream system over time is at least partially dependent upon the inherent slope stability of the underlying terrain type.	Riparian vegetation is in tree-type vegetation at a proportionately higher percentage than the overall subbasin landscape. Vegetation removal impacts in riparian soft terrain should considered the heightened susceptibility of soft terrain to gullying. The large percentage of barren ground in the quaternary terrain type includes areas of expansive stream channel.
	Conifer	Mixed	Hardwood	Grassland	Barren	Other	Total		
Hard	21%	64%	14%	1%	<1%	<1%	100%		
Moderate	15%	65%	17%	1%	<1%	2%	100%		
Soft	6%	58%	20%	11%	1%	4%	100%		
Quaternary	3%	25%	20%	8%	32%	12%	100%		

Table 152. Land use associated with terrain types in the Western Subbasin..

Land Use in the Western Subbasin						
Feature/Function					Significance	Comments
Terrain Type	Landuse Type				About half of the Western Subbasin is in public ownership. Most of the soft terrain type is privately owned and in an agriculture or timber land use designation. The other category often includes housing and contains many parcels 160 acres or less in size. The town of Honeydew is within the western subbasin.	Historic logging occurred across all ownership types, leaving a legacy of young vegetation and dirt-surfaced roads. The Bureau of Land Management currently administers the King Range National Conservation Area, about 50% of the subbasin acreage, as a Late Successional reserve. Residents are interested in restoration work if funding and assistance is provided. The Mattole Restoration Council, a local watershed group, is an active participant and coordinator of restoration projects in this subbasin, with several projects including the Good Roads, Clear Creeks Program, and Mattole River and Range Partnership.
	Public	Ag/Timber	Other	Total		
Hard	65%	26%	9%	100%		
Moderate	43%	43%	14%	100%		
Soft	12%	74%	14%	100%		
Quaternary	10%	58%	32%	100%		

Table 153. Road mileage and density associated with terrain types in the Western Subbasin.

Roads in the Western Subbasin				
Feature/Function			Significance	Comments
Terrain Type	Miles (of road)	Road Density (miles per sq. mile)	Roads crossings on steep slopes in hard and moderate terrain may increase the potential for debris slides while roads within the soft terrain may increase the potential for small earthflows, gullies, and erosion. The alluvium terrain type tends to be relatively flat, but proximity to watercourses may allow for direct delivery of sediment from the roads to the streams.	While current practices locate roads on less environmentally sensitive locations, typically gentle ground high on the hillslope, the presence of soft terrain in these areas should be considered. Roads in soft terrain require construction and maintenance standards that recognize the inherent instability of this terrain type.
Hard	162	3.5		
Moderate	98	4.3		
Soft	94	5.5		
Quaternary	46	7.9		
Total	**400**	**4.4**		

Table 154. Data summary table for the Western Subbasin..

Factor	Western Subbasin	
Timber Harvest 1990 -2000[1]	**acres**	**% area**
Silviculture Category 1		
Tractor	0	0.0%
Cable	0	0.0%
Helicopter	24	0.0%
TOTAL	24	0.0%
Silviculture Category 2		
Tractor	6	0.0%
Cable	0	0.0%
Helicopter	24	0.0%
TOTAL	30	0.1%
Silviculture Category 3		
Tractor	54	0.1%
Cable	0	0.0%
Helicopter	61	0.1%
TOTAL	115	0.2%
TOTAL	**170**	**0.3%**
Other Land Uses	acres	% area
Grazing	4,023	7.0%
Agriculture	611	1.1%
Development	3	0.0%
Timberland, No Recent Harvest	48,598	84.1%
TOTAL	**53,235**	**92.2%**
Roads		
Road Density (miles/sq. mile)	4.4	
Density of Road Crossings (#/stream mile)	0.6	
Roads within 200 feet of Stream (miles/stream mile)	0.1	

Silvicultural Category 1 includes even-aged regeneration prescriptions: clear-cut, rehabilitation, seed tree step, and shelter wood seed step prescriptions. Category 2 includes prescriptions that remove most of the largest trees: shelter wood prep step, shelter wood removal step, and alternative prescriptions. Category 3 includes prescriptions that leave large amounts of vegetation after harvest: selection, commercial thin, sanitation salvage, transition, and seed tree removal step prescriptions.

Table 155. Land use and vegetation type associated with historically active landslides in the Western Subbasin.

Historically Active Landslide Feature1	Western Subbasin	Woodland and Grassland2	THPs 1990 - 20005	Timberland, No Recent Harvest3	Roads4	
	% of Area	% of Area	% of Area	% of Area	Length (miles)	% of Total Length
Earthflow	0.7%	0.4%		0.2%	2.6	0.7%
Rock Slide	0.2%	0.0%	0.0%	0.2%	1.1	0.3%
Debris Slide	1.3%	0.1%		1.0%	4.4	1.1%
Debris Flow	0.0%			0.0%	0.0	0.0%
All Features	**2.2%**	**0.6%**	**0.0%**	**1.4%**	**8.1**	**2.1%**

A larger percentage (4.7%) of the woodland/grassland vegetation type is occupied by slides than the timberland type (1.7%). Within the woodland/grassland category, earthflows are the dominant landslide feature while debris slides occupy 71% of the slide acreage in the timberland type, almost all of which has had harvest activity prior to the last ten years. Recent THPs occupy 0.3% percent of the subbasin acreage. The road length by percent that intersects historically active slides is the same as the proportion of landslide acres across the subbasin.

1 This category includes only large polygon slides and does not include point slides.
2 Woodland and grassland includes areas mapped in 1998 as grassland and non-productive hardwood.
3 Area of timberlands that were not contained in a THP during the 1991 to 2000 period.
4 Roads layer is from the Information Center for the Environment (ICE) at UC Davis.
5 THP's are complete or active between the 1990 and 2000 timeframe.
Empty cells denote zero.
Percent of area is based on the unit of analysis: Watershed, subbasin, or planning watershed.

Table 156. Land use and vegetation type associated with relative landslide potential in the Western Mattole Subbasin.

Relative Landslide Potential1	Western Subbasin	Woodland or Grassland2	THPs 1990 - 20005	Timberland, No Recent Harvest3	Roads4	
	% of Area	% of Area	% of Area	% of Area	Length (miles)	% of Total Length
Very Low	4.5%	1.4%	0.0%	1.3%	23.7	6.0%
Low	10.0%	1.5%	0.0%	8.1%	48.7	12.4%
Moderate	34.0%	3.6%	0.1%	30.2%	144.8	36.8%
High	23.0%	3.5%	0.1%	19.0%	94.8	24.1%
Very High	28.6%	2.5%	0.0%	25.6%	81.9	20.8%
TOTAL	**100%**	**12%**	**0%**	**84%**	**393.9**	**100%**

In the Western Subbasin, 12% of the area is in the woodland/ grassland vegetation type. Half of the acreage for this category is found in the two highest relative landslide potential categories. About 84% of the subbasin is characterized as timberland with no recent harvest and almost half of this area is concentrated in the two highest relative landslide potential classes. The subbasin has about 393 miles of roads, with the proportion of road length in relative landslide potential categories similar to the percentage of total acres in each class, although there is a slight shift towards lower relative landslide potential classes.

1 Refer to Plate 2 and California Geological Survey appendix.
2 Woodland and grassland include areas mapped in 1998 as grassland and non-productive hardwood.
3 Area of timberlands that were not contained in a THP during the 1991 to 2000 period.
4 Roads layer is from the Information Center for the Environment (ICE) at UC Davis.
5 THP's are complete or active between the 1990 and 2000 timeframe.
Percent of area is based on the unit of analysis: Watershed, subbasin, or planning watershed.

Discussion

The Western Subbasin contains about one quarter of the soft terrain found in the Mattole Basin, similar to the amount found in the Eastern Subbasin. In addition, the Western Subbasin contains the second highest percentage of acreage (51%) in the two highest relative landslide potential categories. It also contains the second lowest percentage of land area in both historically active (2%) and dormant landslide features (16%). The large percentage of the subbasin in high landslide potential classes suggests that land use practices should have careful site-specific evaluation in order to avoid land use accelerated sedimentation in the streams. The large block of reserved public land (BLM, King Range) allows for the possibility of monitoring the progression of stream recovery in the absence of additional timber harvesting and grazing in some streams in the Mattole Basin. A joint monitoring agreement between State and Federal agencies would further the scientific basis for government action in regulation and restoration programs. Timber harvesting has occurred on less than 1%, or approximately 57 acres/year, of the subbasin since 1990, while grazing continues on private grasslands. Current land use activities, including grazing and most road use and maintenance for grazing and residential access, are often outside the current regulatory process. Education and economic incentives for road improvements and livestock management provide the greatest opportunities for near-term benefits for fisheries.

Fluvial Geomorphology

Introduction

Fluvial geomorphic mapping of channel characteristics was conducted along blue line streams in the Mattole Basin to document channel characteristics that are indicative of excess sediment production, transport, and/or response (deposition); these features are referred to as negative mapped channel characteristics (NMCCs). The following CGS Integrated Analysis (IA) Tables present some of the findings of this investigation. To understand the distribution of these NMCC's we present: the predominant NMCC's identified; the relative distribution of these features between the bedrock terrains and the Quaternary units; the changes in amount and distribution of NMCC's observed between 1984 and 2000; and the relationship between areas of projected slope instability and portions of streams with evidence of excess sediment.

Table 157. Negative mapped channel characteristics in the Western Subbasin.

Negative Mapped Channel Characteristics in the Western Subbasin						
Feature/Function					**Significance**	**Comments**
		From 1984 Photos	**From 2000 Photos**	**%4 Change 1984 to 2000**	The reduction in the total length of NMCC's over time qualitatively reflects the degree of improvements within the blue line streams. These NMCC's were chosen to be highlighted in these figures because in both photo years, the NMCC's observed were dominated by wide channels and, secondarily, by displaced riparian vegetation. Most of this observed improvement results from reductions in the proportion of streams affected by displaced riparian vegetation and wide channels.	That portion of the fluvial system observed to be affected by wide channel in 1984 has recovered extensively by 2000.
Blue Line Streams where Wide Channel (wc) Observed		See Figure 34				
Blue Line Streams where Displaced Riparian Vegetation (dr) Observed		See Figure 35				That portion of the fluvial system observed to be affected by displaced riparian vegetation in 1984 has practically disappeared by 2000.
% of the all Blue Line Stream Segments in Basin affected by NMCC's	**Total**	33%	16%	-16%	These values identify how much of the streams have been affected by NMCC's. Decreases in the length of stream affected by NMCC's quantitatively represent the degree of improvement within blue line stream reaches.	The fluvial system in bedrock terrains has experienced significant improvements between 1984 and 2000, but still remains impacted by NMCC's. Alluvial units within this subbasin have experienced an increase in the length of blue line streams affected by NMCC's.
	Bedrock	37%	15%	-22%		
	Alluvium	19%	20%	+2%		

Negative Mapped Channel Characteristics in the Western Subbasin (Continued)					
Feature/Function				Significance	Comments
	From 1984 Photos	From 2000 Photos	%4 Change 1984 to 2000	The magnitude of decrease in affected streams quantitatively represents the degree of improvement within bedrock stream reaches adjacent to unstable areas. Because the streams in the Quaternary units are commonly separated from the surrounding hillsides by alluvial terraces and floodplains, the NMCCs observed there do not directly result from input into the streams from landslides that occur on the surrounding hillsides. Therefore, NMCC's in alluvial areas have been interpreted as having been transported from upstream bedrock reaches. For this reason, the analysis of NMCC's vs. LPM 4 and 5 excludes the NMCC's identified in the Quaternary units and only describes the relationship between these two features as it applies to the bedrock reaches.	The fact that NMCC's are not ubiquitous in bedrock streams adjacent to or within LPM categories 4 and 5 indicates that although entire reaches of the streams have potentially unstable slopes above them, only a portion of those slopes have delivered or transported sediment to the streams. There has been a significant decrease in blue line streams within LPM categories 4 and 5 affected by NMCC's.
Percentage of all Blue Line Stream segments in bedrock that are: 1) adjacent to or within LPM Categories 4 and 53 and 2), affected by NMCC's	44%	18%	-26%		
Percent of total NMCC length in bedrock, within 150 feet of LPM Categories 4 and 52	100%	100%	0%	Percentage reflects likelihood that the presence of NMCC's in bedrock are related to LPM categories 4 and 5 and that these unstable areas represent current and future potential sources of sediment to streams.	Virtually all of the total NMCC's observed in bedrock terrains were found on blue line streams adjacent to or within LPM category 4 and 5. Therefore, we interpret a clear relationship between areas of projected slope instability and portions of streams with negative sediment impacts, and that some portion of hillsides with high landslide potential are delivering sediment to the adjacent streams.

1 Include all areas identified as hard, moderate or soft geomorphic terrain.
2 Areas where young (Quaternary) surficial units have been mapped covering bedrock; includes alluvium, as well as terrace deposits, active stream channel deposits, and other alluvial deposits.
3 Landslide Potential Map developed by CGS for the Mattole Basin; see California Geological Survey Report, Appendix A and Plate 2.
4 Percentages are rounded to nearest 1%; sum of rounded values may not equal rounded totals or 100%.

Discussion

The results of our fluvial geomorphic mapping of channel characteristics that may indicate excess sediment accumulations (NMCC's) can be summarized as follows.

- Changes in the distribution of NMCC's between 1984 and 2000 show different patterns in the bedrock and Quaternary unit reaches.
- Channel conditions in bedrock streams have generally improved between 1984 and 2000.
- Channel conditions in the Quaternary unit reaches have degraded between 1984 and 2000. Considering the low concentration of NMCC's in the Southern Subbasin, it appears sediment is being transported to these reaches from upstream sources inside this subbasin or from the adjacent Eastern Subbasin.
- Virtually all of the NMCC's in bedrock terrains were identified along portions of the streams that are near potentially unstable slopes and the total length of NMCC's in these areas has decreased between 1984 and 2000. Therefore, we conclude that portions, but not all, of the hillslopes in the high to very high landslide potential categories are delivering sediment to the adjacent streams.

Water Quality

Introduction

The Western Subbasin has a more complete record of water quality information due largely to better accessibility to area watercourses in part because of BLMs extensive land ownership in the subbasin. Thermograph data is fairly representative and widespread although, except for Honeydew and Bear Creeks, much of the data was gathered near the confluences of sampled streams with the Mattole mainstem. Thermal imaging took place in three streams, Bear, Honeydew, and Squaw Creeks. Sediment records were available for both V* and D50 (pebble counts) in a number of watercourses. The only physical-chemical information available was for nutrient and fecal coliform sampling conducted by the BLM in the South Fork Bear Creek.

Table 158. Western Subbasin water quality integrated analysis table

Feature/Function		Significance	Comments
Temperature			
MWATs (37 Thermograph Records for 22 Stations)		Maximum weekly average temperature (MWAT) is the temperature range of 50-60°F considered fully suitable of the needs of several West Coast Salmonids.	Unsuitable throughout subbasin
Suitable Records	**Unsuitable Records**		
8	29		
Maximum Temperatures (38 Thermograph Records for 14 Stations)		A maximum-peak temperature of 75°F is the maximum temperature that may be lethal to salmonids if cool water refugia is unavailable.	Mostly suitable throughout subbasin
Suitable Records	**Unsuitable Records**		
30	8		
Thermal Infrared Imaging Median Surface Temperature		Ability to assess surface water temperatures at the river-stream-reach level for a holistic picture of thermal distribution.	On the date and time of imaging median surface temperatures in the three sampled streams were in general agreement with thermograph data that showed they were mostly suitable for salmonids. See below for data limitations of thermal imaging. Data limitations: 1) Assessments generally performed on a specific day and time, 2) not comparable to seasonally assessed MWAT or maximum temperatures, 3) unable to assess below water surface. Note: Thermal imaged median surface temperatures are derived from the minimum and maximum imaged surface temperatures scaled to a particular point in a sample cell (cell approximately = 317 feet x stream width). Cell minimum and maximum rarely varied more than 1-3 °F
Tributary	**Minimum/ Maximum (°F)**		
Bear Creek	60/ 70		
Honeydew Creek	58 / 71		
Squaw Creek	56 / 73		
Sediment			
Tributary	**Date V***	V* measures the percent sediment filling of a streams pool, compared to the total pool volume. Pools with lower V* values are thought to provide suitable salmonid habitat and may also indicate relatively low watershed disturbances. The V* ranges, below, derived from Knopp, 1993, are meant as reference markers and should not be construed as regulatory targets: V* ≤ 0.30 = low pool filling; correlates well with low upslope disturbance V* > 0.30 and ≤ 0.40 = moderate pool filling; correlates well with moderate upslope disturbance V* > 0.40 = High (excessive) rates of pool filling; correlates well with high upslope disturbance	

Feature/Function		Significance	Comments
NFK Bear Creek	1992 0.25		V* = 0.25 indicates moderate pool filling.
WFK Honeydew Creek	2001/ 1992 0.22 / 0.10		Both V* results are indicative of low pool filling with fine sediment and may indicate little watershed disturbance and/or efficient hydraulic sediment transport. Note: Both multi-year data sets were derived from two spatially isolated field sites and are not comparable.
Mill Creek	2001 0.26		V* = 0.26 indicates moderate pool filling with fine sediment.
Squaw Creek	2001 0.24		V* = 0.24 indicates moderate pool filling
Tributary	**Date D50 (mm)**	D50 means that 50 percent of the particles, measured in millimeters, on a riffle are smaller, and 50 percent are larger than the reported value. It is a simple and rapid stream assessment method that may help in determining if land use activities or natural land disturbances are introducing fine sediment into streams. In those Northern California basins with TMDLs where D50s are, or are considered for use as a numeric target, a mean D50 of > 69 mm, and minimum D50 > 37mm are desired future conditions over a specified time interval. Only the Garcia River TMDL has formally adopted these numeric targets and, for the Mattole River, are used as reference points only.	
NFK Bear Creek	1992 62 mm		D50 of 62 mm indicates medium surface particle size transport and deposition on riffles
WFK Honeydew Creek	1992 106 mm		D50 of 106 mm indicates transport and deposition of large to very large particles on riffles.
Water Chemistry and Quality			
pH/Dissolved Oxygen/Conductivity: No data available		Measure of ionic and dissolved constituents in aquatic systems; correlates well with salinity. Quantity/quality of dissolved solids-ions can determine abundance, variety, and distribution of plant/animals in aquatic environments. Osmoregulation efficiency largely dependent on salinity gradients. Estuary salinity essential to outmigrant smoltification.	
Chemistry/Nutrients		Quality and quantity of natural and introduced chemical and nutrient constituents in the aquatic environment, can be toxic, beneficial, or neutral to organisms (whether terrestrial or aquatic), and their various life phases. Chemical composition, in part, influenced by rainfall, erosion and sedimentation (parent bedrock, overlying soils), solution, evaporation, and introduction of chemicals/nutrients through human and animal interactions.	
SFK Bear Creek Fecal coliform sampling in 1995 was non-detectable		Fecal coliform sampling and analysis can indicate the presence/absence of human and animal wastes in surface and groundwater from nearby sewage facilities, livestock, wild animals, etc.	Public concerns prompted BLM to conduct fecal coliform sampling at campgrounds adjacent SFK Bear Creek. Lab results were below minimum health standards and not a threat to human health and or water quality

References: Knopp, 1993; Mattole Salmon Group, 1996-2000, PALCO, 2001; NCRWQCB Appendix E; Watershed Sciences, 2002.

Discussion

The MWAT and maximum temperature records had diametrically opposed results with unsuitable MWATs in approximately 78% of available records while 79% of the records available were suitable for salmonids. In general, the more suitable locations, as expected, and also seen in other subbasins, are in the upstream reaches of streams where this information is available. Thermal imaging in the subbasin's three largest streams, Bear, Honeydew, and Squaw Creeks, corroborates the trend of improving temperature for salmonids as you proceed from their confluences with the Mattole River to headwater reaches. Sediment information is spotty with only two disconnected periods of data available. V* data for the streams reaches sampled had low to moderate rates of pool filling; D50 counts indicate transport and deposition of medium to large particle sizes on those riffles sampled. Trends are difficult to detect because sediment sampling took place first in 1992, then there was an 8-year period where monitoring was not conducted again until 2000 and 2001. The sediment locations for all years were also in different reaches of the same streams adding to the difficulty of detecting monitoring trends. Physical-chemical data were available for nutrient and fecal coliform sampling that was conducted by the BLM in the SFK Honeydew Creek adjacent to restrooms at agency campground; results were non-detectable for all constituents. There were no other water quality data available.

Instream Habitat

Introduction

The products and effects of the watershed delivery processes examined in the geology, land use, fluvial geomorphology, and water quality Integrated Analyses tables are expressed in the stream habitats encountered by the organisms of the aquatic riparian community, including salmon and steelhead. Several key aspects of salmonid habitat in the Mattole Basin are presented in the CDFG Instream Habitat Integrated Analysis. Data in this discussion are not sorted into the geologic terrain types since the channel and stream conditions are not necessarily exclusively linked to their immediate surrounding terrain, but may in fact be both spatially and temporally distanced from the sites of the processes and disturbance events that have been blended together over time to create the channel and stream's present conditions. Instream habitat data presented here were compiled from CDFG stream inventories of 18 tributaries from 1991 to 2002, published research conducted in the Mattole estuary by HSU, the MRC, and MSG in the 1980s and 1990s, and fish passage barrier evaluation reports conducted under contract to CDFG from 1998-2000. Details of these reports are presented in the CDFG Appendix F.

Pool Quantity and Quality

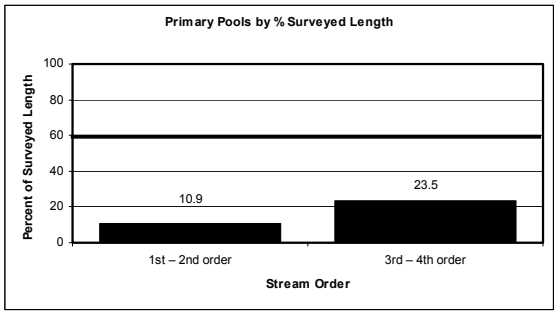

Figure 133. Primary pools in the Western Subbasin.

Pools greater than 2.5 feet deep in 1st and 2nd order streams and greater than 3 feet deep in 3rd and 4th order streams are considered primary pools.

Significance: Primary pools provide escape cover from high velocity flows, hiding areas from predators, and ambush sites for taking prey. Pools are also important juvenile rearing areas. Generally, a stream reach should have 30 – 55% of its length in primary pools to be suitable for salmonids.

Comments: The percent of primary pools by length in the Western Subbasin is generally below target values for salmonids, and appears to be less suitable in lower order streams than in higher order streams.

Spawning Gravel Quality

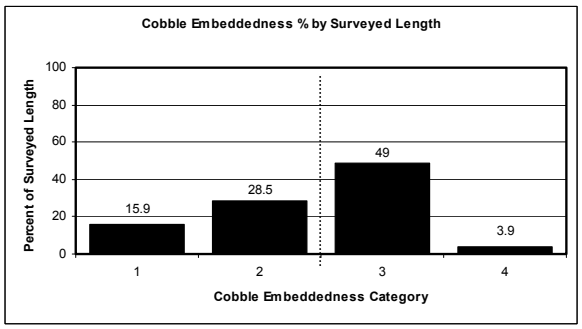

Figure 134. Cobble embeddedness in the Western Subbasin.

Cobble Embeddedness will not always sum to 100% because Category 5 (not suitable for spawning) is not included.

Significance: Salmonids cannot successfully reproduce when forced to spawn in streambeds with excessive silt, clays, and other fine sediment. Cobble embeddedness is the percentage of an average sized cobble piece at a pool tail out that is embedded in fine substrate. Category 1 is 0-25% embedded, category 2 is 26-50% embedded, category 3 is 51-75% embedded, and category 4 is 76-100% embedded. Cobble embeddedness categories 3 and 4 are not within the fully supported range for successful use by salmonids.

Comments: More than one half of the surveyed stream lengths within the Western Subbasin have cobble embeddedness in excess of 50% in categories 3 and 4, which does not meet spawning gravel target values for salmonids

Shade Canopy

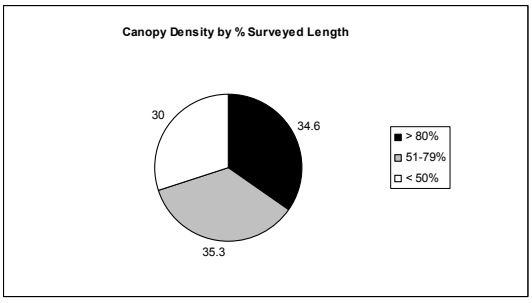

Figure 135. Canopy density in the Western Subbasin.

Significance: Near-stream forest density and composition contribute to microclimate conditions that help regulate air temperature, which is an important factor in determining stream water temperature. Stream water temperature can be an important limiting factor of salmonids. Generally, canopy density less than 50% by survey length is below target values and greater than 85% fully meets target values.

Comments: More than one half of the surveyed stream lengths within the Western Subbasin have canopy densities greater than 50% and more than one third of the surveyed lengths have canopy densities greater than 80%. This is above the canopy density target values for salmonids.

Fish Passage

*Table 159. Salmonid habitat artificially obstructed for fish passage.**

Feature/Function		Significance	Comments
Type of Barrier	**% of Estimated Historic Coho Salmon Habitat Currently Inaccessible Due to Artificial Passage Barriers**	Free movement in well-connected streams allows salmonids to find food, escape from high water temperatures, escape from predation, and migrate to and from their stream of origin as juveniles and adults. Dry or intermittent channels can impede free passage for salmonids; temporary or permanent dams, poorly constructed road crossings, landslides, debris jams, or other natural and/or man-caused channel disturbances can also disrupt stream connectivity. Partial barriers exclude certain species and lifestages from portions of a watershed and temporary barriers delay salmonid movement beyond the barrier for some period of time. Total barriers exclude all species from portions of a watershed	Artificial barriers currently block 12.9% of the estimated historic coho salmon habitat in the Western Subbasin. Total barriers block more habitat than partial and temporary barriers in this subbasin. The CDFG North Coast Watershed Improvement Program funded an improvement of Clear Creek in 2001 and Mill Creek (RM 2.8) in 2002.
All Barriers	12.9		
Partial and Temporary Barriers	6.8		
Total Barriers	10.8		

*(N=9 Culverts) in the Western Subbasin (1998-2000 Ross Taylor and Associates Inventories and Fish Passage Evaluations of Culverts within the Humboldt County and the Coastal Mendocino County Road Systems).

*Table 160. Juvenile salmonid passage in the Western Subbasin.**

Feature/Function		Significance	Comments
Juvenile Summer Passage:	Juvenile Winter Refugia:	Dry channel disrupts the ability of juvenile salmonids to move freely throughout stream systems.	Dry channel recorded in the Western Subbasin during stream surveys has the potential to disconnect Bear Trap Creek from the mainstem Mattole River and to disrupt the ability of juvenile salmonids to forage and escape predation in Jewett Creek. Juvenile salmonids seek refuge from high winter flows, flood events, and cold temperatures in the winter. Intermittent side pools, back channels, and other areas of relatively still water that become flooded by high flows provide valuable winter refugia.
0.2 Miles of Surveyed Channel Dry	No Data		
0.5% of Surveyed Channel Dry			

*(1991-2002 CDFG Stream Surveys, CDFG Appendix F).

Large Woody Debris

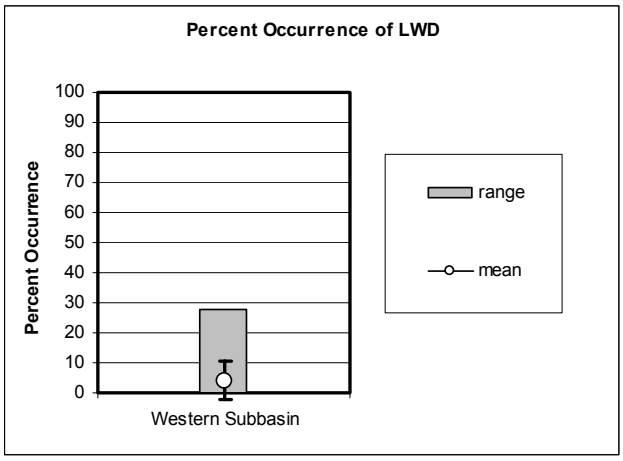

Figure 136. Large woody debris (LWD) in the Western Subbasin.

Error bars represent the standard deviation. The percentage of shelter provided by various structures (i.e. undercut banks, woody debris, root masses, terrestrial vegetation, aquatic vegetation, bubble curtains, boulders, or bedrock ledges) is described in CDFG surveys. The dominant shelter type is determined and then the percentage of a stream reach in which the dominant shelter type is provided by organic debris is calculated.

Significance: Large woody debris shapes channel morphology, helps a stream retain organic matter, and provides essential cover for salmonids. There are currently no target values established for the % occurrence of LWD.

Comments: This subbasin has the lowest average percent occurrence of large woody debris in surveyed streams of any of the Mattole subbasins. Additionally, boulders were found to provide the primary form of shelter for salmonids in ten of the thirteen surveyed streams, while bedrock ledges and bubble curtains provided the primary form of shelter for salmonids in two streams.

Discussion

Although instream habitat conditions for salmonids varied across the Western Subbasin, several generalities can be made. Instream habitat conditions were generally poor within this subbasin at the time of CDFG surveys. The percent occurrence of large woody debris was the least suitable for salmonids of any of the Mattole subbasins. Additionally, the percentage of primary pools by survey length and embeddedness values were generally below target values as found in CDFGs California Salmonid Stream Habitat Restoration Manual and calculated by the EMDS. The estimated historic coho habitat inaccessible due to artificial passage barriers was high relative to other Mattole subbasins. However, canopy density was generally greater than 50% and dry channel occurred in 0.2 miles of surveyed stream (0.5% of the surveyed stream length), thus forage and refuge passage for juveniles were not considered to be significant problems in the Western Subbasin.

Draft Sediment Production EMDS

The draft sediment EMDS is currently under review. Preliminary results are presented in the EMDS Appendix C.

Stream Reach Condition EMDS

The anadromous reach condition EMDS evaluates the conditions for salmonids in a stream reach based upon water temperature, riparian vegetation, stream flow, and in channel characteristics. Data used in the Reach EMDS come from CDFG Stream Inventories. Currently, data exist in the Mattole Basin to evaluate overall reach, canopy, in channel, pool quality, pool depth, pool shelter, and embeddedness conditions for salmonids. More details of how the EMDS functions are in the EMDS Appendix C EMDS calculations and conclusions are pertinent only to surveyed streams and are based on conditions present at the time of individual survey.

EMDS stream reach scores were weighted by stream length to obtain overall scores for tributaries and the entire Western Subbasin. Weighted average reach conditions on surveyed streams in the Western Subbasin as evaluated by the EMDS are somewhat unsuitable for salmonids (Table 161). Suitable conditions exist for reach in seven tributaries; for canopy in eight tributaries; for in channel and pool quality in Bear Creek; for pool depth in three tributaries; for pool shelter in four tributaries, and for embeddedness in three tributaries. Unsuitable conditions exist for reach in all tributaries evaluated.

Table 161. EMDS anadromous reach condition model results for the Western Subbasin

Stream	Reach	Water Temperature	Canopy	Stream Flow	In Channel	Pool Quality	Pool Depth	Pool Shelter	Embeddedness
Western Subbasin	**-**	**U**	**+**	**U**	**-**	**-**	**-**	**-**	**- -**
Mill Creek	-	U	++	U	-	- -	- - -	- -	- -
Squaw Creek	-	U	- - -	U	-	-	++	- -	- - -
Honeydew Creek	-	U	-	U	-	-	- -	-	- -
Bear Trap Creek	-	U	-	U	-	-	-	+	- - -
East Fork Honeydew Creek	-	U	+	U	-	-	- - -	+	- -
Upper East Fork Honeydew Creek	-	U	+	U	-	- -	- - -	-	- - -
West Fork Honeydew Creek	-	U	+	U	-	-	- - -	++	-
Bear Creek	-	U	- - -	U	+	++	++	++	+
Jewett Creek	-	U	+++	U	-	- -	- - -	- -	- - -
North Fork Bear Creek	-	U	- -	U	-	-	U	- -	+
North Fork Bear Creek Tributary	-	U	- -	U	-	-	+	- -	+
South Fork Bear Creek	-	U	++	U	-	- -	-	- -	-
Nooning Creek	-	U	++	U	-	- -	- - -	-	- -

Key:

		U	Undetermined
+++	Fully Suitable	-	Somewhat Unsuitable
++	Moderately Suitable	- -	Moderately Unsuitable
+	Somewhat Suitable	- - -	Fully Unsuitable

Analysis of Tributary Recommendations

CDFG inventoried 49.9 miles on 18 tributaries in the Western Subbasin. In Table 162, a CDFG biologist selected and ranked recommendations for each of the inventoried streams, based upon the results of these standard CDFG habitat inventories. More details about the tributary recommendation process are given in the Mattole Synthesis Section of the Watershed Profile.

Table 162. Ranked Tributary Recommendations Summary in the Western Subbasin based on CDFG Stream Inventories.

Stream	# of Surveyed Stream Miles	Bank	Roads	Canopy	Temp	Pool	Cover	Spawning Gravel	LDA	Livestock	Fish Passage
Mill Creek (RM 2.8)	1.1	4	3			2	1				
Mill Creek Tributary #1	0.2			2			1				
Mill Creek Tributary #2	0.03			1			2				
Squaw Creek	4.1	3	4	2	1		5				
Woods Creek	1.9	3	4	5		1	2		6		7
Honeydew Creek	4.4	3		5	4	1	2				
Bear Trap Creek	1.9	1	2	6	5	3	4				
Upper North Fork Honeydew Creek	1.0	3		5	4	1	2				6
East Fork Honeydew Creek	2.9	2	5	4	3	1	6				
West Fork Honeydew Creek	0.7	4		5		2	3				1
Bear Creek	7.2	2		1		3	4				
Jewett Creek	2.7	1				4	5		3	2	
North Fork Bear Creek	3.4	5		2	1	6	3		4		
North Fork Bear Creek Tributary #1	1.8	5		2		4	3				1
South Fork Bear Creek	12.0	2				4	1		3		
Big Finley Creek	1.6	3				1	2				
South Fork of Big Finley Creek	1.3					2	1				
Nooning Creek	1.5	1			5	3	2		4		

Temp = summer water temperatures seem to be above optimum for salmon and steelhead; Pool = pools are below target values in quantity and/or quality; Cover = escape cover is below target values; Bank = stream banks are failing and yielding fine sediment into the stream; Roads = fine sediment is entering the stream from the road system; Canopy = shade canopy is below target values; Spawning Gravel = spawning gravel is deficient in quality and/or quantity; LDA = large debris accumulations are retaining large amounts of gravel and could need modification; Livestock = there is evidence that stock is impacting the stream or riparian area and exclusion should be considered; Fish Passage = there are barriers to fish migration in the stream.

In order to further examine Western Subbasin issues through the tributary recommendations given in CDFG stream surveys, the top three ranking recommendations for each tributary were collapsed into five different recommendation categories: Erosion/Sediment, Riparian/Water Temp, Instream Habitat, Gravel/Substrate, and Other (Table 163). When examining recommendation categories by number of tributaries, the most important recommendation category in the Western Subbasin is Instream Habitat.

Table 163. Three ranking recommendation categories by number of tributaries in the Western Subbasin.

West Subbasin Target Issue:	Related Table Categories:	Count:
Erosion / Sediment	Bank / Roads	13
Riparian / Water Temp	Canopy / Temp	9
Instream Habitat	Pool / Cover	24
Gravel / Substrate	Spawning Gravel / LDA	2
Other	Livestock / Barrier	3

However, comparing recommendation categories in the Western Subbasin by number of tributaries could be confounded by the differences in the number of stream miles surveyed on each tributary. Therefore, the number of stream miles in each subbasin assigned to the various recommendation categories was calculated (Figure 137). When examining recommendation categories by number of stream miles, the most important

recommendation categories in the Western Subbasin are Instream Habitat, Erosion/Sediment, and Riparian/Water Temperature.

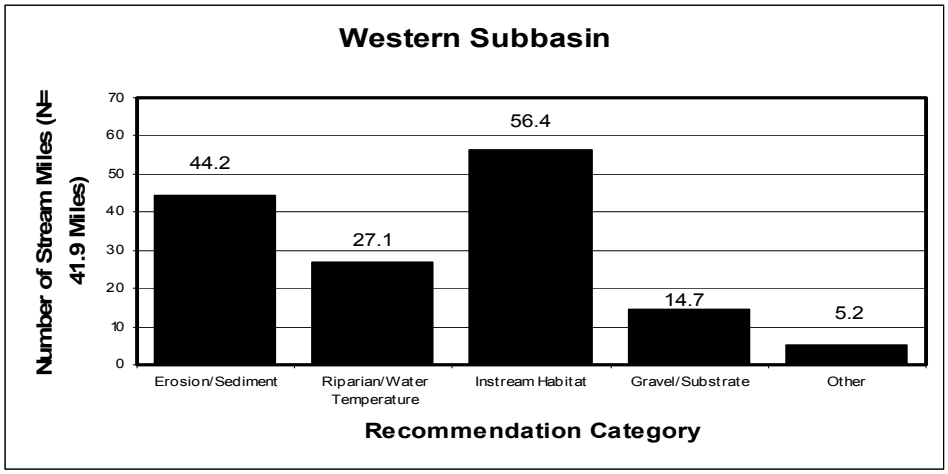

Figure 137. Recommendation categories by stream miles in the Western Subbasin.

The high number of Instream Habitat, Erosion/Sediment Riparian/Water, and Temp Recommendations across the Western Subbasin indicates that high priority should be given to restoration projects emphasizing pools, cover, sediment reduction, and riparian replanting.

Refugia Areas

The NCWAP interdisciplinary team identified and characterized refugia habitat in the Western Subbasin by using expert professional judgment and criteria developed for north coast watersheds. The criteria included measures of watershed and stream ecosystem processes, the presence and status of fishery resources, forestry and other land uses, land ownership, potential risk from sediment delivery, water quality, and other factors that may affect refugia productivity. The team also used results from information processed by NCWAP's EMDS at the stream reach and planning watershed/subbasin scales.

The most complete data available in the Western Subbasin were for tributaries surveyed by CDFG. However, many of these tributaries were still lacking data for some factors considered by the NCWAP team.

Salmonid habitat conditions in the Western Subbasin on surveyed streams are generally rated as medium potential refugia. Bear Creek is the only creek in the Mattole Basin determined to provide high quality refugia. Mill (RM 2.8), North Fork Bear, South Fork Bear, Big Finley, and South Fork Big Finley creeks, and the tributary to North Fork Bear Creek provide high potential refugia in this subbasin, while the remaining surveyed tributaries provide medium quality refugia. The following refugia area rating table summarizes subbasin salmonid refugia conditions:

Table 164. Tributary salmonid refugia area ratings in the Western Subbasin.

Stream	Refugia Categories*:				Other Categories:		
	High Quality	High Potential	Medium Potential	Low Quality	Non-Anadromous	Critical Contributing Area/Function	Data Limited
Mill Creek (RM 2.8)		X					X
Mill Creek (RM 2.8) Tributary #1			X				X
Mill Creek (RM 2.8) Tributary #2			X				X
Squaw Creek			X				X
Woods Creek			X				X
Honeydew Creek			X				X
Bear Trap Creek			X				X
East Fork Honeydew Creek			X				X
Upper East Fork Honeydew Creek			X				X
West Fork Honeydew Creek			X				X
Bear Creek	X						X
Jewett Creek			X				X
North Fork Bear Creek		X					X
North Fork Bear Creek Tributary		X					X
South Fork Bear Creek		X					
Big Finley Creek		X					X
South Fork of Big Finley Creek		X					X
Nooning Creek			X				X
Subbasin Rating			X				

*Ratings in this table are done on a sliding scale from best to worst. See page 71 for a discussion of refugia criteria.

Assessment Focus Areas

Working Hypothesis 1:

Salmonid habitat conditions in the Western Subbasin are adequate for salmonids.

Supporting Evidence:

- V* of 0.26 for Mill Creek, 0.24 for Squaw Creek and 0.22 for Honeydew Creek in 2000 indicating low to moderate residual pool filling (NCRWQCB Appendix E).
- Physical and chemical water quality data was unavailable in the Western Subbasin for pH, DO, and nutrient levels. Limited nutrient sampling during 1993 in South Fork Honeydew Creek showed normal nutrient levels (NCRWQCB Appendix E).
- CDFG has conducted an analysis of macroinvertebrate data collected by BLM since 1996 on five tributary streams. The results showed stream conditions were good.

Contrary Evidence:

- None of 18 tributaries surveyed by CDFG in this subbasin were found to have 40% or more of their survey lengths in pool habitat. Three surveyed tributaries were found to have 30 to 40% of the stream lengths surveyed in pool habitat. Forty percent or more of stream lengths in pool habitat is considered suitable on the North Coast. Additionally, 10.9% of first and second order surveyed streams and 23.5% of third and forth order surveyed streams in this subbasin are composed of primary pools by survey length. Thirty to 55% of survey lengths composed of deep, complex, high quality primary pools is considered desirable (IA Tables, CDFG Appendix F).

- CDFG surveys of Honeydew Creek, Squaw Creek, and Bear Creek found less than 40% of their lower reaches by length were composed of pools, indicating a lack of pool habitat (CDFG Appendix F).
- Two of 18 tributaries surveyed by CDFG in this subbasin were found to have a mean pool shelter rating exceeding 80. This indicates that woody debris elements affecting scour are not present. Thirteen surveyed tributaries had shelter rating scores between 30 and 80. Pool shelter ratings of 80 or more are considered suitable, and ratings less than 30 are unsuitable for contributing to shelter that supports salmonids (CDFG Appendix F).
- Boulders provided the primary form of shelter for salmonids in 14 of the 18 surveyed streams in this subbasin, while bedrock ledges, whitewater, and bubble curtains provided the primary form of shelter for salmonids in three streams and one stream had a mixture of boulders, terrestrial vegetation, and small woody debris as primary shelter (CDFG Appendix F).
- Field observations indicate that amounts of instream large woody debris in the mainstem Mattole River and its tributaries in the Western Subbasin are low
- Historic timber harvest throughout the Western Subbasin tributaries frequently removed large conifer vegetation down to the stream bank, severely reducing the available recruitment supply of large woody debris (CDF Appendix B).
- Removal of instream large woody debris under direction of CDFG occurred in about 49 stream miles in this subbasin during the 1980s. A total of 19,136 cubic feet of wood was removed. This is equivalent to 153 logs 2 feet x 40 feet. This activity likely had adverse local impacts on salmonid habitat conditions (CDFG Appendix F).
- Riparian vegetation is in size classes that are not expected to contribute large woody debris in significant quantities in the near future (CDF Appendix B).
- Large woody debris recruitment is expected to improve over time as a result of the BLM management policies within the King Range National Conservation Area (CDF Appendix B).
- Based on limited sampling, instream conditions indicate moderate sediment levels. The limited data available suggests that there is a degradation of habitat due to instream sediment accumulation in the lower gradient reaches of the larger tributaries (CGS).
- Air photos and field observations show that the Mattole River bordering the Western Subbasin downstream of Honeydew Creek is highly aggraded with sediment (CGS).
- Air photos after the 1955 and 1964 floods indicate significant changes in the stream channel in the Western Subbasin (CGS).
- Seven of 18 tributaries surveyed by CDFG in this subbasin exceeded the recommended shade canopy density levels of 80% for North Coast streams. Additionally, 16 surveyed tributaries exceeded 50% shade canopy density levels. Shade canopy density below 50% is considered unsuitable (CDFG Appendix F).
- Historic timber harvest has reduced canopy closure in near stream areas (CDF Appendix B).
- Summer maximum high temperatures exceed the suitable range for salmonid rearing in the lower reaches of Bear, Squaw, and Honeydew creeks. Maximum temperatures are within fully suitable conditions in upstream reaches of larger and smaller tributaries sampled (NCRWQCB Appendix E).
- During nearly all available sample years MWATs exceeded the fully suitable range of 50-60°F in all Western Subbasin streams except Mill Creek-Mile 2.8, Clear Creek, Big Finley Creek, and Nooning Creek (NCRWQCB Appendix E).
- Nine of 18 tributaries surveyed by CDFG in this subbasin were found to provide spawning reaches with favorable cobble embeddedness values in at least half of the stream reach lengths surveyed (CDFG Appendix F).
- Out of 17 stream reaches examined for the presence of sensitive amphibian species, torrent salamanders were found in seven reaches and tailed frogs were found in seven reaches (Welsh et al. 2002).

- Artificial fish passage barriers block 12.9% of the estimated historic coho salmon habitat in this subbasin. Additionally, 0.3% of surveyed stream channel in this subbasin was dry (IA Tables, CDFG Appendix F).
- The NCWAP analysis of tributary recommendations given in the Western Subbasin showed that the most important recommendation category was Instream Habitat, followed by Erosion/Sediment, Riparian/Water Temperature, Gravel/Substrate, and Other.

Hypothesis 1 Evaluation:

Based upon current supportive and contrary findings, the hypothesis is not supported. Although several stream reaches are in good condition, there are others that have improvement potential.

Working Hypothesis 2:

Summer stream temperatures in some subbasin tributaries are not within the range of temperatures that provide suitable conditions for healthy anadromous salmonid populations.

Supporting Evidence:

- Summer maximum high temperatures exceed the suitable range for salmonid rearing in the lower reaches of Bear, Squaw, and Honeydew creeks. Maximum temperatures are within fully suitable conditions in upstream reaches of larger and smaller tributaries sampled (NCRWQCB Appendix E).
- During nearly all available sample years MWATs exceeded the fully suitable range of 50-60°F in all Western Subbasin streams except Mill Creek-Mile 2.8, Clear Creek, Big Finley Creek and Nooning Creek (NCRWQCB Appendix E).
- Seven of 18 tributaries surveyed by CDFG in this subbasin exceeded the recommended shade canopy density levels of 80% for North Coast streams. Additionally, 16 surveyed tributaries exceeded 50% shade canopy density levels. Shade canopy density below 50% is considered unsuitable (CDFG Appendix F).
- Historic timber harvest has reduced canopy closure in near stream areas (CDF Appendix B).

Contrary Evidence:

No contrary evidence at this time.

Hypothesis 2 Evaluation:

Based upon current supportive and contrary findings, the hypothesis is supported.

Working Hypothesis 3:

Aggradation from fine sediment in some stream channels of this subbasin has reduced channel diversity needed to provide suitable conditions for anadromous salmonid populations and has compromised salmonid health.

Supporting Evidence:

- Based on limited sampling, instream conditions indicate moderate sediment levels. The limited data available suggests that there is a degradation of habitat due to instream sediment accumulation in the lower gradient reaches of the larger tributaries (CGS).
- Air photos and field observations show that the Mattole River bordering the Western Subbasin downstream of Honeydew Creek is highly aggraded with sediment (CGS).
- Air photos after the 1955 and 1964 floods indicate significant changes in the stream channel in the Western Subbasin (CGS).

Contrary Evidence:

- V* of 0.26 for Mill Creek, 0.24 for Squaw Creek and 0.22 for Honeydew Creek in 2000 indicating low to moderate residual pool filling (NCRWQCB Appendix E).

Hypothesis 3 Evaluation:

Based upon current supportive and contrary findings, the hypothesis is supported.

Working Hypothesis 4:

A lack of large woody debris in some stream reaches of this subbasin has reduced channel diversity needed to provide suitable conditions for anadromous salmonid populations and has compromised salmonid health.

Supporting Evidence:

- Two of 18 tributaries surveyed by CDFG in this subbasin were found to have a mean pool shelter rating exceeding 80. This indicates that woody debris elements affecting scour are not present. Thirteen surveyed tributaries had shelter rating scores between 30 and 80. Pool shelter ratings of 80 or more are considered suitable, and ratings less than 30 are unsuitable for contributing to shelter that supports salmonids (CDFG Appendix F).
- Boulders provided the primary form of shelter for salmonids in 14 of the 18 surveyed streams in this subbasin, while bedrock ledges, whitewater, and bubble curtains provided the primary form of shelter for salmonids in three streams and one stream had a mixture of boulders, terrestrial vegetation, and small woody debris as primary shelter (CDFG Appendix F)
- Field observations indicate that amounts of instream large woody debris in the mainstem Mattole River and its tributaries in the Western Subbasin are low.
- Historic timber harvest throughout the Western Subbasin tributaries frequently removed large conifer vegetation down to the stream bank, severely reducing the available recruitment supply of large woody debris (CDF Appendix B).
- Removal of instream large woody debris under direction of CDFG occurred in about 49 stream miles in this subbasin during the 1980s. A total of 19,136 cubic feet of wood was removed. This is equivalent to 153 logs 2 feet x 40 feet. This activity likely had adverse local impacts on salmonid habitat conditions (CDFG Appendix F).
- Riparian vegetation is in size classes that are not expected to contribute large woody debris in significant quantities in the near future (CDF Appendix B).

Contrary Evidence:

- Large woody debris recruitment is expected to improve over time as a result of the BLM management policies within the King Range National Conservation Area (CDF Appendix B).

Hypothesis 4 Evaluation:

Based upon current supportive and contrary findings, the hypothesis is supported at this time.

Working Hypothesis 5:

Anadromous salmonid populations in the Western Subbasin have declined since the 1950s.

Supporting Evidence:

- Interviews with local residents indicate that the Western Subbasin historically supported Chinook salmon, coho salmon, and steelhead trout; and that coho salmon and steelhead trout have been found in the Lower Bear Creek, Stansberry Creek, Clear Creek, Indian Creek, Squaw Creek, and Woods Creek; and Chinook salmon have been found in Stansberry Creek, Indian Creek, Squaw Creek, and Woods Creek (CDFG Appendix F).
- Coho salmon were detected in five of the 24 tributaries surveyed in the Western Subbasin by CDFG in the 1960s, Mill Creek (RM 2.8), Clear Creek, Woods Creek, Bear Trap Creek, and Bear Creek. 1960s surveys also detected steelhead trout in 15 tributaries (CDFG Appendix F).
- Stream surveys throughout the 1970s, 1980s, and 1990s by CDFG, BLM, Coastal Headwaters Association, and the Redwood Sciences Laboratory continued to document the presence of steelhead trout throughout the Western Subbasin (CDFG Appendix F).
- Coho salmon were detected by Redwood Sciences Laboratory studies in Big Finley Creek and the South Fork of Bear Creek in the late 1990s (CDFG Appendix F).

- Ten of the 18 tributaries surveyed by CDFG in the Western Subbasin from 1990-2000 included a biological survey. Steelhead trout were found in these ten streams, and coho salmon were found in Mill Creek (RM 2.8) and Bear Creek (CDFG Appendix F).
- Eleven tributaries in this subbasin were also surveyed as a part of the CDFG 2001 Coho Inventory. Steelhead trout were found in these eleven streams, but coho salmon were only found in Mill Creek (RM 2.8), Woods Creek, and Honeydew Creek (CDFG Appendix F).
- Three salmon rearing facilities are located within this subbasin and have been operated by the Mattole Salmon Group since the mid 1980s (MSG 2000).
- Estimated populations of Chinook salmon or coho salmon in the entire Mattole Basin have not exceeded 1000 since the 1987-88 season. Mattole Basin Chinook salmon and coho salmon population estimates for the 1999-2000 season were 700 and 300, respectively (MSG 2000).

Contrary Evidence:

No contrary evidence at this time.

Hypothesis 5 Evaluation:

Based upon current supportive and contrary findings for the streams surveyed, the hypothesis is supported.

Responses to Assessment Questions

What are the history and trends of the sizes, distribution, and relative health and diversity of salmonid populations within this subbasin?

- No systematic, scientific studies have examined the size or health of salmonid populations in the Western Subbasin. However, historical accounts and stream surveys conducted in the 1960s by CDFG indicate that the subbasin supported populations of Chinook salmon, coho salmon, and steelhead trout. Recent biological stream surveys indicate the presence of steelhead trout throughout the subbasin and coho salmon in a few tributaries. Low salmonid populations throughout the Mattole Basin indicate that salmonid populations in the Western Subbasin are also likely to be depressed at this time. However, populations have a good chance to recover due to public land stewardship that is actively engaged in improving watershed and stream conditions. In addition, salmonid rearing activities within the subbasin are working to supplement native stocks as habitat conditions improve.

What are the current salmonid habitat conditions in this subbasin? How do these conditions compare to desired conditions?

- Erosion/Sediment
  - Instream sediment in several stream reaches in this subbasin may be approaching or exceeding levels considered unsuitable for salmonid populations. Macroinvertebrates data indicate good conditions. Additionally, amphibians sensitive to fine sediment were present in most stream reaches surveyed in this subbasin;
- Riparian Water Temperature
  - Available data suggest high summer temperatures are deleterious to summer rearing salmonid populations in some streams in this subbasin; in others it is good;
- Instream Habitat
  - In-stream habitat diversity and complexity, based on available survey data (i.e. pool depths, cover, and large woody debris) may be adequate for salmonid production. Additionally, recent surveys indicate instream habitat appears to be improving. Large woody debris recruitment potential is poor in this subbasin;
- Gravel Substrate
  - Available data from sampled streams suggest that suitable amounts and distribution of high quality spawning gravel for salmonids is lacking in some reaches in this subbasin;

- The upper reaches of Bear, Mill (RM 2.8), North Fork Bear, South Fork Bear, Big Finley, and South Fork Big Finley creeks, and the tributary to North Fork Bear Creek, are considered good refugia, and this will continue due to BLM and cooperative private land owners and current management policies in key headwater reaches. In fact, Bear Creek was the only creek in the Mattole Basin determined to provide high quality refugia.

What are the relationships of geologic, vegetative, and fluvial processes to natural events and land use history?

- Although the Western Subbasin encompasses the dramatic relief of the King Range, with the highest proportion of steep slopes in the basin, approximately half of the subbasin is underlain by hard terrain and it is second only to the Southern Subbasin in terms of stable areas. Slope instability is focused primarily in the abundant areas with steep to very steep slopes and the limited area of soft terrain;
- Based on features indicative of excess sediment production, transport and storage, the pattern of impacts to stream conditions is similar to that observed in the Eastern Subbasin, and is highly variable throughout the subbasin. Considering the low degree of impact by features indicative of excess sediment production, transport and storage observed in the adjacent upstream Southern Subbasin, it appears that the stream features observed in the Western Subbasin must be derived either internally within the subbasin or from the adjacent Eastern Subbasin;
- As a result of past timber harvest and conversion activities, almost 60% of the Western Subbasin is occupied by small diameter (twelve to twenty-four inches diameter at breast height) forest stands. Another 20% is in forest stands greater than twenty-four inches.

How has land use affected these natural processes?

- Forty square miles, or nearly half of this subbasin are in public ownership managed by the Bureau of Land Management as part of the King Range National Conservation Area, designated as late seral reserve. Timber harvesting has occurred on less than one percent of the area in the last ten years and has been at low levels for decades. Privately owned acres carrying grassland are grazed while smaller, residential parcels are concentrated along the main county roads. Old roads, many abandoned, are common across the landscape.

Based upon these conditions trends, and relationships, are there elements that could be considered to be limiting factors for salmon and steelhead production?

- Based on information available for this subbasin, the NCWAP team believes that salmonid populations are currently being limited by reduced habitat complexity, high sediment levels, high water temperatures, and embedded spawning gravels.

What habitat improvement activities would most likely lead toward more desirable conditions in a timely, cost effective manner?

- Based upon the latest science on placement of large woody debris in stream channels, managers in the Western Subbasin should work to improve channel structure and function for salmonids. Pool shelter has the lowest suitability for salmonids in Mill Creek (RM 2.8) Tributary #1 and South Fork Big Finley Creek;
- Establish monitoring stations and train local personnel to track in-channel sediment and aggraded reaches throughout the subbasin and especially in the lower reaches of major tributaries and Squaw, Honeydew, Finley, Big Finley, Woods and Bear creeks;
- Continue efforts such as road improvements and decommissioning throughout the basin to reduce sediment delivery to the Mattole River and its tributaries. Road inventories have been completed for much of this planning basin, and it is recommended that this effort be continued until a complete inventory is compiled. CDFG stream surveys indicated Mill Creek (RM 2.8) and Bear Trap Creek have road sediment inventory and control as a top tier tributary improvement recommendation;

- Monitor summer water and air temperatures to detect trends using continuous 24 hour monitoring thermographs. Continue temperature monitoring efforts in Stansberry, Mill (RM 2.8) Clear, Squaw, Woods, Honeydew, Bear, North Fork Bear, South Fork Bear, Little Finley, Big Finley, and Nooning creeks, and expand efforts into other subbasin tributaries;
- Ensure that near stream forest projects retain and recruit high canopy densities in riparian areas to reduce solar radiation and moderate air temperatures;
- Where current canopy is inadequate and site conditions, including geology, are appropriate, use tree planting and other vegetation management techniques to hasten the development of denser and more extensive riparian canopy. Canopy density has the lowest suitability for salmonids in Squaw Creek. Use cost share programs and conservation easements as appropriate;
- The three cooperative salmon rearing facilities in this subbasin should be continued as needed to supplement wild populations while the improvements from long-term watershed and stream restoration efforts develop;
- Initiate a systematic program to monitor the effectiveness of these fish rescue and rearing activities, and determine the need for the continuance of cooperative, supplemental fish rearing efforts on an ongoing, adaptive basis using the best available science;
- The nature and extent of naturally occurring unstable geologic terrain, landslides and landslide potential (especially Categories 4 and 5, page 89) must be considered when planning potential projects in the subbasin;
- Encourage the use of appropriate Best Management Practices for all land use and development to minimize erosion and sediment delivery to streams;
- In order to protect privacy on private lands in this subbasin while developing data, the possibility of training local landowners to survey streams and conduct salmonid population status surveys is advisable;
- Ensure that high quality habitat within this subbasin is protected from degradation. The highest stream reach condition as evaluated by the stream reach EMDS and refugia analysis were found in Bear, Mill (RM 2.8), North Fork Bear, South Fork Bear, Big Finley, and South Fork Big Finley creeks and the tributary to North Fork Bear Creek.

Subbasin Conclusions

Although having some of the steepest slopes in the Mattole Basin, the Western Subbasin is underlain by predominately hard terrain and is second only to the Southern Subbasin in terms of stable areas. Conversely, there is a preponderance of instream and near-stream features impacting subbasin streams that are very similar to the Eastern Subbasin. High sedimentation level, high summer water temperatures, and a lack of suitable spawning gravel may be limiting salmonid populations in many streams. Available data suggest instream habitat complexity may be adequate or recovering but that LWD recruitment potential from riparian sources is limited. However, historical accounts indicate that salmonid populations and stream complexity were much more favorable in the past. The continuation of present salmonid rearing activities to supplement wild populations is further encouraged. The management by BLM of publicly owned lands in the King Range National Conservation Area, particularly in the headwater reaches of larger streams such as Honeydew, Bear, and Squaw creeks as late seral reserve, should help further the recover process in this subbasin. The enlistment of cooperative landowners in key headwater reaches to further implement beneficial land use practices will also assist watershed recovery efforts. Conditions beneficial to salmonids may be further enhanced in this subbasin through encouraging all motivated subbasin landowners to use good land stewardship practices and enlisting the aid and support of agency technology, experience, and funding opportunities is encouraged.