SECTION H
SYNTHESIS

INTRODUCTION

The synthesis module presents a compilation of results with an attempt to summarize the most significant hillslope hazards and aquatic resource conditions for improvement. The information compiled will be a summary of sediment inputs, presentation of aquatic habitat condition ratings (on target, marginal, deficient), and any water quality information available. The synthesis module presented here differs from the protocols presented in the Washington state watershed analysis manual (Version 4.0, Washington Forest Practices).

Sediment Inputs

The estimated sediment inputs for the Cottaneva Creek WAU have been summarized and are presented. The purpose of this summary is to demonstrate the relative amount of different sediment sources, indicate priorities for erosion control, and assist with interpretation of stream channel conditions in relation to sediment deposition and transport. A sediment budget provides quantification of sediment inputs, transport, and storage in a watershed (Reid and Dunne, 1996). In this case we are not doing a true sediment budget, only an estimation of the sediment inputs. Care must be used when interpreting these estimated values; by no means can the estimates be considered absolute. Rather, the sediment input estimates are best interpreted for relative comparisons between processes and planning watersheds.

This section combines and summarizes the sediment input results from the Mass Wasting and Surface and Point Source Erosion modules of the watershed analysis. Sediment input for the Cottaneva Creek WAU is estimated from hillslope mass wasting, road associated mass wasting, road surface and point source erosion, and skid trail erosion. The sediment inputs are shown as an average rate for past conditions (1943-2000).

The average estimated sediment input for the time period 1943-2000 for the Cottaneva Creek WAU is 321 tons/square mile/year. The inputs in the Cottaneva Creek WAU over this time frame have come from mass wasting (26%) and surface and point source erosion (74%), including skid trails in the latter. The breakdown of total sediment input is presented by planning watershed for the Cottaneva Creek WAU (Table H-1 and Figure H-1).

Road associated sediment delivery is the major contributor in the Cottaneva Creek WAU. By adding the contribution of road surface, point source, skid trails and road-associated mass wasting sediment delivery, roads represented 87% of the sediment inputs in the Cottaneva Creek WAU.

Roughly 27,000 cubic yards of controllable erosion is currently associated with the road network in Cottaneva Creek. Since 1998, when the company was formed, approximately 4,330 cubic yards of erosion from the road network has been treated. This erosion control work, however, was completed prior to the road inventory in Cottaneva Creek, so credit for treating controllable erosion cannot be taken at this time.

Figure H-1. Estimated Percentage of Sediment Inputs by Source for the Cottaneva Creek WAU, 1943-2000.

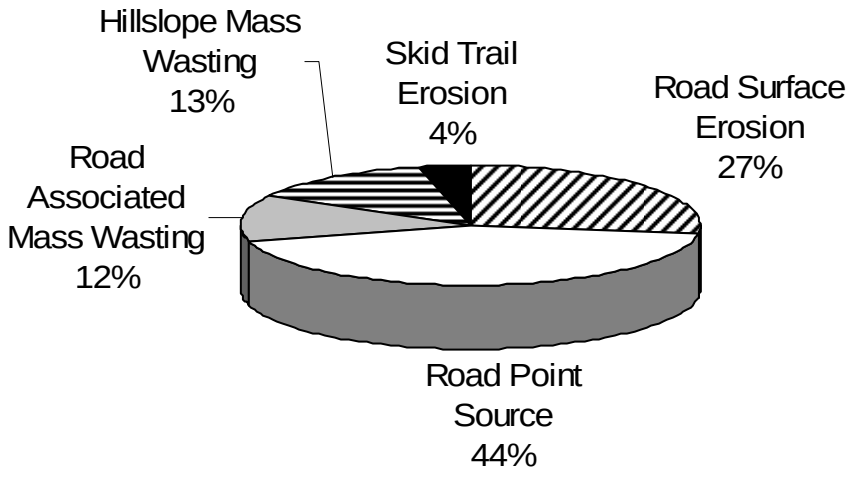

Table H-1. Estimated Sediment Inputs by Input Type the Cottaneva Creek WAU 1943-2000.

Planning Watershed	Road Surface Erosion (tons/mi^2/yr)	Road Point Source Erosion (tons/mi^2/yr)	Road Associated Mass Wasting (tons/mi^2/yr)	Hillslope Mass Wasting (tons/mi^2/yr)	Skid Trail Erosion (tons/mi^2/yr)	Total (tons/mi^2/yr)
Cottaneva Creek	341	546	153	168	45	1253

HABITAT QUALITY RATINGS

The habitat quality ratings for LWD, stream temperature, stream shade, stream gravel permeability, and fine sediment are presented here. Some of the ratings were previously presented in this watershed analysis.

LWD Quality Ratings (as reported in Section D, Riparian Function)

Table H-2 shows the instream LWD quality rating for the major streams of the Cottaneva Creek WAU. This quality rating will provide a tool to monitor the quality of the LWD in major streams over time. Currently the stream segments in South Fork and Upper Creek have a marginal LWD quality rating, while the remaining streams are all rated deficient.

Table H-2. In-stream LWD Quality Ratings for the Major Streams of the Cottaneva Creek WAU.

Stream	Calwater Planning Watershed	Instream LWD Quality Rating*
Mainstem Cottaneva	Cottaneva Creek	Deficient
Rockport Creek	Cottaneva Creek	Deficient
South Fork Cottaneva	Cottaneva Creek	Marginal
Middle Fork Cottaneva	Cottaneva Creek	Deficient
Upper Cottaneva	Cottaneva Creek	Marginal

* – includes debris jams

Stream Temperature and Shade Quality Ratings (as reported in Section D, Riparian Function)
MRC uses two sequential sets of criteria to determine if a watershed has "on-target" effective shade and temperature quality. The first is based on most recent three year average maximum weekly average temperature (MWAT), the second on canopy cover. The Cottaneva Creek WAU has marginal stream shade and temperature conditions as demonstrated by the stream shade ratings (Table H-3). It is anticipated that these ratings will improve over time with policies promoting stream shade. There are no "deficient" stream shade quality ratings in the Cottaneva Creek WAU. Stream temperatures in Cottaneva Creek are at desirable levels for both coho and steelhead.

Table H-3. Stream Shade and Temperature Quality Ratings for Streams in the Cottaneva Creek WAU.

Stream	Temperature monitoring location at outlet	Most recent three year average MWAT (°C)	Percent of segments with on-target shade	Stream Shade Quality Rating
Mainstem Cottaneva	47-1	14.9	80%	MARGINAL
Middle Fork Cottaneva	47-8	13.7	14%	MARGINAL*
Rockport Creek	47-23	11.8	80%	MARGINAL
South Fork Cottaneva	47-2	13.8	56%	MARGINAL*
Upper Cottaneva	47-3	14.5	33%	MARGINAL*

*Marginal due to the fact that greater than 70% of the stream segments surveyed had canopy values that were greater than 70%

Stream Gravel Quality
Stream gravel quality has been monitored in one long term stream monitoring segment in the Cottaneva Creek WAU (stream segment RC09). Both permeability and bulk gravel samples were collected in the summer of 2004. The percent fine sediment from bulk gravel samples and permeability quality ratings are defined below in Table H-4.

Permeability Ratings	
ON TARGET (OT)	>10,000 cm/hr permeability = >55% survival index.
MARGINAL (M)	>2000 cm/hr permeability = >30% survival index.
DEFICIENT (D)	<2000 cm/hr permeability = <30% survival index.

Fine Sediment Ratings	
ON TARGET (OT)	<7% in the size class 0.85 mm using dry sieve techniques.[1]
MARGINAL (M)	7-14% in the size class 0.85 mm using dry sieve techniques.
DEFICIENT (D)	>14% in the size class 0.85 mm using dry sieve techniques.

Table H-4. Stream Gravel Quality Ratings for Permeability and Fine Sediment for Cottaneva Creek WAU Long Term Monitoring Segment, 2004.

Segment ID	Stream Name	Geometric Mean Permeability for Segment (cm/hr)	Standard Error Permeability (cm/hr)	Range of Permeability Observations (cm/hr)	Permeability Survival Index (Taggart/ McCuddin)	Percent Particles <0.85 mm	Bulk Gravel Survival Index (Tappel/ Bjorn)
RC09	South Fork Cottaneva Creek	1,593	403	6 -10,905	27%	8-11%	51-68%

[1] MRC used information from the Noyo TMDL for sediment (EPA 1999) to develop the target for fine sediment from dry-sieve techniques; the target is less than 7% of the gravel composition in the size class 0.85 mm. In the TMDL for the Garcia River (NCRWQCB 1997), where dry sieving is not specified, the target for gravel composition in the size class 0.85 mm is less than 14%.

Table H-5. V-star data for Cottaneva Creek WAU Long Term Monitoring Segment, 2004.

Pool number	**V***
1	0.17
3	0.1
7	0.1
9	0.08
10	0.13
12	0.22
13	0.18
High	**0.22**
Low	**0.08**
Mean	**0.14**
Variance	**0.0026**

Fine sediment quality is observed to be "marginal" within the long term monitoring segment in the Cottaneva Creek WAU whereas permeability levels are deficient. V-star observations (Table H-5) indicate that this long term monitoring segment exhibits fine sediment deposition characteristic of regional index streams with little to no prior disturbance.

Aquatic Habitat and Water Quality Summary

The habitat quality ratings and sediment input summaries show that large woody debris recruitment, canopy, and road associated sediment have the greatest need for improvement. Currently MRC has made good improvements in its efforts to controlling road sediment, but information on the amount of controllable erosion that has been treated cannot be determined since the road inventory was finished in 2004. Permeability levels in the long term monitoring segment are deficient, but long-term conclusions on stream channel conditions cannot be assessed since this was the first year of this type of monitoring in Cottaneva.

LITERATURE CITED

NCRWQCB (North Coast Regional Water Quality Control Board). 1997. Garcia River water quality attainment strategy. Santa Rosa, CA.

Reid, L. and T. Dunne. 1996. Rapid evaluation of sediment budgets. Catena Verlag GMBH. Reiskirchen, Germany.

USEPA. 1999. Noyo River Total Maximum Daily Load for sediment. Region IX, San Francisco.