NATURAL RESTORATION OF NORMAL BED CONDITIONS FOR STEELHEAD SPAWNING AND REARING: CORRALITOS AND BROWNS CREEKS, SANTA CRUZ COUNTY, CALIFORNIA

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Natural episodic events cause massive temporary bed sedimentation and loss of aquatic habitat values. Habitat values can be naturally restored once delivery of sediment is curtailed.

The processes of bed sedimentation and the rates at which prior bed conditions are restored may differ from basin to basin. Understanding these dynamics can help in selecting methods for enhancement and restoration of specific reaches, projecting recovery from natural or induced sedimentation events, and in assessing cumulative effects of management practices which generate coarse, habitat-impairing sediment.

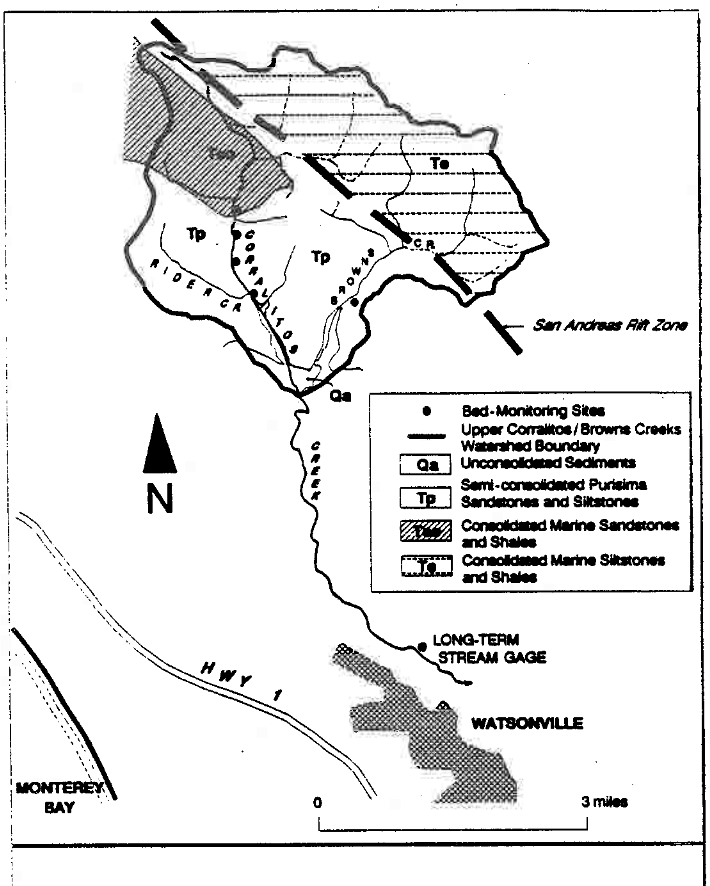

Figure 1. Location and geologic influences, Corralitos and Browns Creeks.

The storm of January 4 and 5, 1982 resulted in massive bed sedimentation in Corralitos and Browns Creeks, tributaries of the lower Pajaro River. Peak runoff from the storm was measured at 5,600 cfs by the Corralitos Creek gauge near Freedom, approximating a 50-year flood. This storm generated an extreme number of landslides and debris flows because of the long duration of intense rainfall. The storm had a high estimated recurrence as a sediment supplying event, perhaps well in excess of 100 years. We believe that the extent of sedimentation and channel disturbance in the two streams approached a system maximum.

The two creeks support important but declining steelhead runs. We measured bed conditions shortly after the storm. Identical observations were made during the fall of 1982, and then again during the fall of 1983. A wide range of variables was measured to describe the extent which the channel filled, changes in the composition of the bed, and the rate at which embedding sand was washed away from boulders providing habitat for the steelhead. Visual estimates were made of the same sites in the fall of 1984 and 1985.

Bed conditions were naturally restored to apparent normal levels by the end of the second year. Most of the recovery took place during the 1982 season. It should be recognized that 1982 and 1983 were unusually wet years, ranking first and third in total rainfall amounts recorded in the Pajaro Valley during the preceding century. Two runoff crests exceeding bankfull stage occurred during the 1982 season following the January event. Seven to nine such events were recorded in 1983. Generally speaking, channel sedimentation following a storm was more extensive in pools, and lasted longer in pools than in riffles.

No discernible recovery was observed at one study site, located downstream from the mouth of Rider Creek, a major right-bank tributary. Rider Creek continued to deliver large quantities of sand to Corralitos Creek throughout the two years of study. The sustained high sediment delivery rates from Rider Creek appeared to be the result of continuing landsliding and downslope movement which originated in the January 1982 storm. Land-use practices seemed to be responsible for an equal or larger proportion of the continued accelerated sediment transport rates in Rider Creek. Major contributing factors included problems with the location and construction of roads, the extent of disturbed ground in the watershed (primarily in areas of new construction and agriculture), and limited erosion-control measures along roads and in areas of new construction. Rider Creek is typical of a particular class of streams which have cut deeply into the Purisima Formation along a zone of weaker beds; these consequent streams are affected by a unique set of geomorphic processes, and merit special management approaches.

APPLICATIONS TO RESTORATION PLANNING

Efforts to actively restore coastal stream habitats should incorporate planning for episodic sedimentation events, including anticipated rates of natural recovery. Among the key elements which restoration planners should consider are:

1. Streambeds draining wildland watersheds in coastal California will likely show sedimentation following natural episodic events in approximately 10 to 20 percent of all years. The incidence may be lower in certain watersheds underlain by crystaline rocks with steep channels; more frequent and persistent sedimentation may be anticipated in other basins, such as those developed in Franciscan melange.

2. Once the delivery of impairing sediment to the stream channel is appreciably curtailed, recovery of bed conditions begin. Normal restoration trends do not develop unless sediment delivery is curtailed.

3. The nature of the events which induce episodic sedimentation, the frequencies of these events, and the effects and persistence of sedimentation vary markedly with soil and geologic units and other influences specific to a given watershed. Approaches used to provide a temporary refuge habitat or to speed restoration following such events should consider these influences.

4. Our experience shows that the recovery in pool depth and in the size distribution of material on the bed occurs during the first significant sediment-moving events after the major event and stabilization of the sediment sources. In Corralitos and Browns Creeks, 70 to 85 percent of the recovery was observed after the first two or three events with flows exceeding bankfull stage.

5. Restoration of the bed conditions in pools is proportionately slower than in riffles and runs. One of the more sensitive and conservative indices for describing the rate of restoration is the percent of the bed of pools covered with boulders or cobbles.