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Gully Development in Tributaries to
Caspar Creek, Northern California
Coast Range

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Incision of tributaries to Caspar Creek, a gaged Coast Range watershed in Northern California, appears to be an ongoing process that may account for a significant sediment output. Gullied reaches with fresh headcuts and steep banks, indicative of incision, are documented in environments ranging from zero-order swales through third-order channels draining over 50 hectares. Gully size ranges from 0.25 to 25 m² in cross-sectional area. Gully volume per watershed ranges from 10 to 60 m³ per hectare. Multiple gully headcuts migrate up each channel; typically there are 2 to 5 headcuts taller than 0.8 meters and 3 to 10 smaller headcuts present per 100 m of gullied channel.

A variety of processes appear to be responsible for the initiation and propagation of gullies. In the higher reaches of each tributary, gullies are closely associated with pipe-collapse and landslide features. Typically these high slope gullies are separated by unchanneled reaches. Once discontinuous gullies are established at these sites, headcut migration allows them to expand upslope. Lower in the system, plunge pool erosion appears to play a larger role and gullies are part of a continuous channel. A transition from discontinuous gullies to a continuous channel typically occurs at a drainage area of 3 to 10 hectares. Recent disturbance and road runoff allow formation of continuous channels at lower drainage areas.

At least two episodes of post-logging gully development occurred. The largest gullies undercut old-growth stumps and old roots in areas which were not subsequently disturbed. These gullies appear to have been activated after an initial logging entry in the late 1800's and early 1900's; some of these older gullies appear to be partially stabilizing. Other gullies clearly postdate logging and skid-trail building in the early 1970's. Incised channels were filled during 1970's logging in the South Fork, and are now being reincised. The most active gullies occur in the locations logged in the 1970's. Though some gullies cut into colluvium and fill from roads and skid trails, some cut into saprolite and down to bedrock.