Examining the Relative Influence of Riparian and Upland Landcover and Landuse on Instream Habitat: Improved Methods for the Russian River Basin

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Executive Summary:
The upland drainage basins of the Russian River have an established history of livestock grazing, timber harvesting, and, more recently, vineyard development. These activities directly and indirectly influence instream habitat of tributaries by altering the timing and magnitude of flows of runoff and sediment and by modifying characteristics of riparian corridors. Because these streams provide spawning and rearing habitat for Federally listed populations of Coho salmon (*Oncorhychus kisutch*) and Steelhead trout (*Oncorhynchus mykiss*), their protection is a focus of federal, state, and local resource agencies. Agencies frequently recommend or require the maintenance of riparian buffer strips as a primary strategy for protecting instream habitat from degradation caused by upland landuse activities.

The advantage of maintaining riparian areas has been demonstrated in numerous studies conducted at the site or small watershed scale. However, studies focused at the scale of large watersheds or landscapes have reported equivocal benefits of riparian buffers. Discrepancies between studies at different scales may be artifacts of their considerable differences in methods and data resolution. However, these discrepancies may also be caused by hydrologic and geomorphic processes operating within large watersheds that small-scale studies cannot detect. For example, small, dispersed, upland channels that drain directly into main-stem streams and bypass riparian corridors may, in aggregate, strongly influence water quality and sediment delivery.

Because riparian buffers are an integral component of the strategy for protecting and recovering salmonid populations, it is critical to understand how they function at a watershed scale. Failure to consider processes operating at large scales will diminish the effectiveness of restoration activities implemented at a specific site or reach. Therefore, hydrologists and fisheries biologists are currently emphasizing the importance of planning restoration at the watershed scale. For instance, much of the debate surrounding riparian buffers centers on their width and vegetative composition, however the spatial arrangement of riparian buffers (e.g. extent and connectivity) throughout a watershed may also exert a strong influence on stream conditions.

Our study will build on previous landscape-scale analyses of riparian buffer strips and will further elucidate the relationship between riparian corridors and flows of sediment and water from the uplands to the stream. This work will help maximize the benefits of riparian buffers to salmonid habitat and may guide resource agencies in their attempts to restore salmonid populations within the Russian River basin.