

H51A CA:416 FRI 0830h

Cumulative Watershed Effects

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Cumulative Watershed Effects: A Research Perspective

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A cumulative watershed effect (CWE) is any response to multiple land-use activities that is caused by, or results in, altered watershed function. The CWE issue is politically defined, as is the significance of particular impacts. But the processes generating CWEs are the traditional focus of geomorphology and ecology, and have thus been studied for decades. The CWE issue is complicated by the variety of land-use activities which cause impacts, and by the multitude of philosophical and economic values impacted. Using empirical methods to understand the effects of all combinations of land uses on all combinations of values is thus intractable. However, land-use activities can directly change only a few watershed characteristics: vegetation, topography, soil properties, water distribution, and chemical inputs. These changes usually have secondary effects. Clearcutting, for example, alters soil temperature and stand composition, and soil compaction may permit overland flow. If changes are persistent, on-site effects may accumulate from a series of land-use activities.

Off-site CWEs accrue if effects of multiple activities are transported through a basin. This generally occurs as changes in the rate, mode, or timing of transport of water, sediment, organic matter, chemicals, or heat. Any offsite impact must result directly or indirectly from changes in transport. For example, increased sediment loads may degrade water quality or decrease fish (survival, and altered peak flows may widen channels, destroying in-stream and riparian habitat. Analysis and understanding of CWEs may thus be approached through fundamental geomorphological and ecological questions: show does a particular land-use activity affect watershed characteristics? how do changes in watershed characteristics affect transport mechanisms? and how do changes in transport affect particular values?