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Algae vs. riparian vegetation – it goes with the flow

Boom or bust cycles don't just affect the California economy, they dominate the vegetation of streams and rivers in our area. Major winter storms, such as occur during severe El Nino years, begin the cycle by completely scouring the channel of vegetation and fine sediment. This happens, on average, once every 10 to 12 years (the interval has varied from 3 to 30 years within the last century). With the removal of riparian vegetation from winter floods, the channel provides a perfect environment for the growth of algae. Absence of shade increases the amount of sunlight and warms the water. Combined with high nutrient concentrations – nitrogen and phosphorus – from urban and agricultural runoff, it's an open invitation for filamentous algae, the kind that looks like long, green hair in the water. Even in pristine streams, high phosphorus concentrations from eroding mountain bedrock provide a hospitable environment; some algae even produce their own nitrogen.

As long as winter rains are severe enough to keep the channel clean and sediment moving to the ocean, the algae thrive. But sooner or later there comes a low runoff year – mostly sooner, since two out of three years have less than half the average runoff. In the absence of winter floods, sediment is deposited in the channel and seedlings, having gained a toe hold the previous summer, become more deeply rooted. It's time for vascular plants to rule. Perennial aquatic plants become established (ludwigia, speedwell, water cress), over shadowing the water surface and narrowing the channel by trapping fine sediment. The algae are confined to open, deeper water. Where rapid growth of riparian vegetation, like willows and giant reed, provide increased shade to a narrowed waterway, algae may disappear entirely.

Rooted aquatic plants and riparian trees increasingly stabilize the channel and its banks, and as the years go by the size of the storm needed to scour the stream increases: the big storm of March 2003, following the 2002 drought, produced less drastic changes than a similar-sized storm in March 2001. We have cycles within cycles: years of high rainfall and years of low sediment removal and sediment deposition, algae growing and algae disappearing, and the plants that come and go. Each winter there is usually one major storm that controls the process, one cycle may end but not another. This continues until a big El Nino year – when the clock is cleaned and everything set back to zero. Is it boom . . . or bust?

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Oct. 31, 2003

Figure
caption:

The Ventura River below Foster Park in (from left to right) July 2001, August 2002 and July 2003. In 2001 the river, still recovering from the scouring of the river bed during the El Nino storms of 1998, was open and relatively free of vegetation. Algae were abundant in the open water with little competition from plants. By the summer of 2002, after a winter of low flows (the lowest flows since 1990) and no storms large enough to uproot them, plants came to dominate the entire river. Winter storms in 2003 scoured the center of the channel and re-established deeper flows, allowing algae to reappear. But plants still dominate the river edge, poised for a comeback.