



STREAM NOTES

To Aid in Securing Favorable Conditions of Water Flows

January 1997

California Rivers and Streams

The Conflict Between Fluvial Process and Land Use

In the book *California Rivers and Streams: The Conflict Between Fluvial Process and Land Use*, Jeffery Mount guides the reader on a tour that illustrates how rivers work and then discusses how failure to understand these processes often conflicts with traditional land uses. Describing himself as “an opinionated geologist,” Mount’s perspective is that rivers are long-lived geomorphic systems that have evolved over thousands of years in response to geologic and climatic forces. Any attempts by humans to ignore the variables that control river behavior are seen as inevitably futile which will lead to land use problems. Mount is well aware that this view is not universally shared by the general public who often see rivers as natural resources and hazards that need to be controlled.

The first part of the book, called “How Rivers Work,” provides an overview of the physical and biological processes that shape rivers and watersheds including basic principles of hydraulics, fluvial geomorphology and plate tectonics. In part two, called “Learning the Lessons,” he uses case studies to demonstrates the consequences of not paying attention to basic principles.

With the flowing narrative of a story teller and his experience as a river rafter, Mount helps the reader gain a feel for hydraulics and geomorphic processes. For example in the chapter, “Water in Motion,” the Froude Number (Fr) evolves from a nondimensional ratio of hydraulic forces to the rush of water at the tongue of a rapid ($Fr > 1$) and then to the hydraulic jump ($Fr < 1$). Entrainment of sediment is visually represented by asking the reader to call to mind the sounds of pebbles and cobbles as they move along the bed of a river in flood and the turbidity that blocks their view.

Additional chapters on sediment supply, river networks, climate and rivers, tectonic, and geology present and integrate topics that provide a comprehensive perspective of how rivers work. The book has numerous excellent illustrations of the basic processes pertaining to river function. While the treatment is not as technical as some might hope, for example, hydraulics is refreshingly explained without the usual array of integral and differential equations. Nevertheless, at the end of part one, readers with dissimilar backgrounds will have gained a common sense of how rivers work.

STREAM NOTES is produced quarterly by the Stream Systems Technology Center, Fort Collins, Colorado.

The PRIMARY AIM is to exchange technical ideas and transfer technology among scientists working with wildland stream systems.

CONTRIBUTIONS are voluntary and will be accepted at any time. They should be typewritten, single-spaced, limited to two pages in length. Graphics and tables are encouraged.

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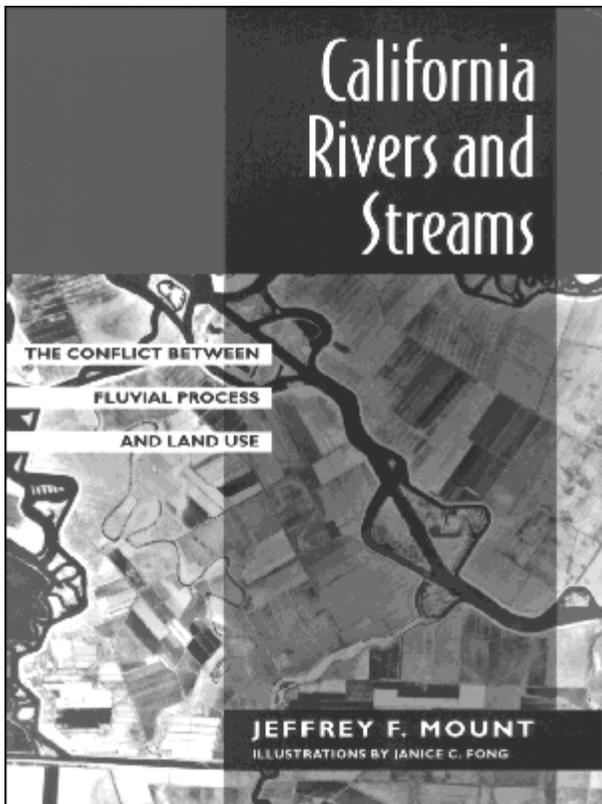
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California Rivers and Streams: The Conflict Between Fluvial Process and Land Use
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What’s a Mine’ Inch?



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The development of the disruption of rivers due to booms in mining, logging, farming, urbanization and dam building is treated in Part II, “Learning the Lessons: Land Use and the Rivers of California.” Mount’s intent is to help the reader understand how rivers worked prior to the arrival of Europeans as contrasted with how California’s rivers work today. Given this foundation, readers will be more readily able to confront the daily barrage of river-related land use planning issues that confront not only California, but all western states.

California has a diverse landscape, the widest range of climate, landforms and rivers in the United States as well as a long history of both extensive and intensive settlement. Mount describes typical land use patterns in California that are repeated across the West. Irrigation diversions began in the 1760’s at the Franciscan missions from San Diego to San Francisco. Spanish, Russian, and American exploration and settlement of Central Valley rivers and wetlands began in the 1800’s and boomed with the Gold Rush in the 1850’s. California’s water ways were rearranged with widespread dredging, clearing of riparian vegetation, the arrival of

hydraulic mining debris in Central Valley rivers, and the construction of levees and irrigation ditches. The hydraulic mining debris filled the streams and rivers which led to extensive floods in the 1880’s. Large scale dams came with the New Deal, yet did not abate in the 1950’s. The post World War II urban boom across the floodplains created a demand for flood control dams as well as instream aggregate mining. Similar land use patterns are seen across the West from the hydraulic mining in southwest Oregon to the New Deal dam blocking the Missouri River at Fort Peck.

In describing land use issues, Mount catches the reader with his detective story lines, such as, “The course mixture of debris that make it into the Central Valley were an initial clue that something was amiss in the Sierra watersheds.” With curiosity stirred, Mount helps us to recall the relevant theory and guides us to understand how they apply to land use practices and how to blend the designs of man and rivers.

Anyone with an interest in natural history, public policy, or economics should find *California Rivers and Streams* readable and useful. Water resources engineers and scientists will enjoy the simple descriptive review of relevant hydraulic theory and the examples that show who and where theory applies to water resource practices.

This review was submitted by:

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California Rivers and Streams: The Conflict Between Fluvial Process and Land Use, by Jeffrey F. Mount is published by the University of California Press, Berkeley, CA; 359 page, \$19.95 soft-cover, \$50.00 hard-cover.



STREAM SYSTEMS TECHNOLOGY CENTER

Ask DOCTOR Hydro

Dear Doc Hydro: I periodically run across the miner's inch as a unit of water measurement, usually associated with measures of water diversion at a headgate. My question is: An inch of what? I can go to my water measurements conversion manual and find that 38 miner's inches equals 1 cfs (in Colorado, it varies from state to state), but I surmise that there was some measurement device that was designed so that a depth of flow of one inch produced a flow rate of one miner's inch. If so, what was the device?

As you point out, the miner's inch does not represent a fixed and definite quantity of water, being measured generally by the arbitrary standard of the various ditch companies. For this reason, a miner's inch is 0.020 cfs (1/50th of a cfs) in Idaho, Kansas, Nebraska, South and North Dakota, New Mexico, Utah, Washington, and southern California, while it equals 0.025 cfs (1/40th of a cfs) in northern California, Nevada, Arizona, Oregon, and Montana, while Colorado maintains that a miner's inch equals 0.026 cfs (1/38th of a cfs) and our neighbors to the north in British Columbia insist that a miner's inch equals 0.028 cfs (1/36th of a cfs). Since the value of a miner's inch varies by locality, most western states have established the value by statute.

The miner's inch was primarily intended for measuring small quantities of flow and it eventually gave way to the "second foot" or cubic foot per second (cfs) unit that is commonly used today in the United States to measure flow.

To determine the amount of water, early miners used a miner's inch box, a special type of free flowing orifice. A miner's inch is the quantity of water which discharges through a square inch of opening under a prescribed head. The number of miner's inches is equal to the area of the opening in square inches. One source describes this in more detail as "the quantity of water that will escape from an aperture one inch square through a two-inch plank, with a steady flow of water standing six inches above the top of the escape aperture, the quantity so discharged amounting to 2274 cubic feet in twenty-four hours."

This amounts to a flow of about 1.5 cubic feet per minute. That's 11.25 gallons per minute (1/40th of a cfs) if you are in northern California, Nevada, Arizona, Oregon, or Montana but only 9.0 gallons per minute (1/50th of a cfs) if you're from Idaho, Kansas, Nebraska, South and North Dakota, New Mexico, Utah, Washington, or southern California. Doc Hydro says, let's bring on the metric system and end all of this confusion.



Editorial Policy

To make this newsletter a success, we need voluntary contributions of relevant articles or items of general interest. YOU can help by taking the time to share innovative approaches to problem solving that you may have developed.

Please submit typed, single-spaced contributions limited to two pages. Include graphics and photos that help explain ideas.

We reserve editorial judgments regarding appropriate relevance, style, and content to meet our objectives of improving scientific knowledge. Send all contributions to: Stream Systems Technology Center, Attention: STREAM NOTES Editor.

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