

Salmon & Sediment in California North Coast Watersheds

Learning together to
understand and manage
water quality

David J. Lewis
Watershed Management Advisor



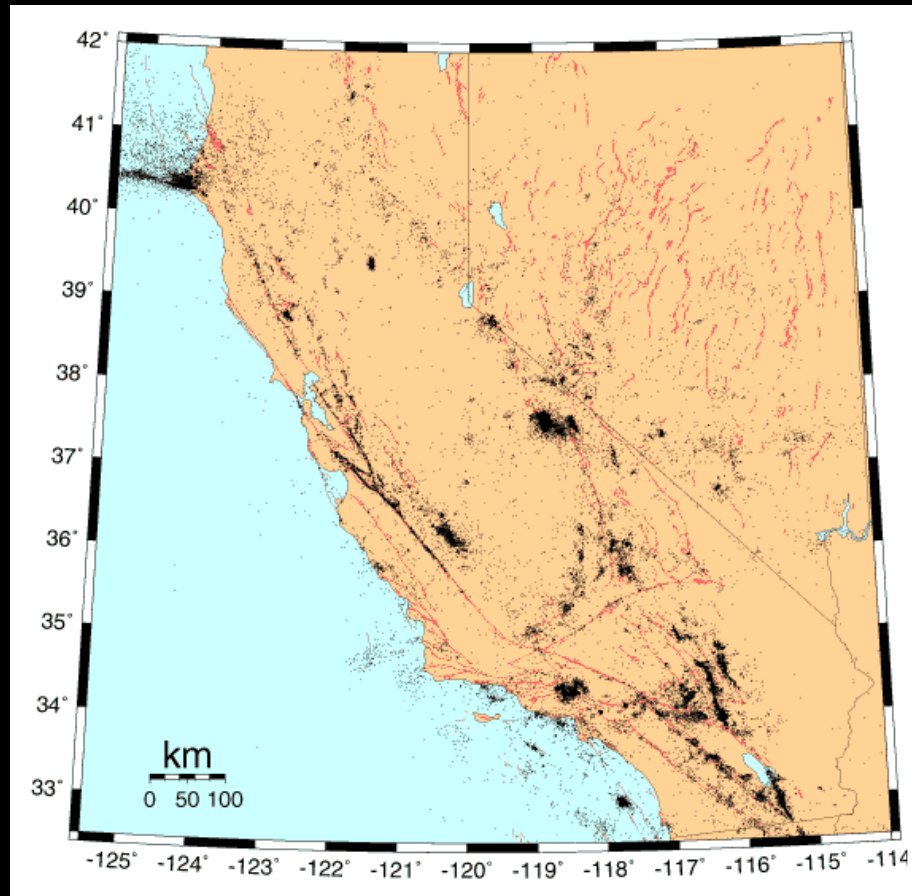
Acknowledgments

- Co-authors – John Harper, Julie Price, Ken Tate, Gary Markegard
- Slides and information – Matt O'Connor, John Harper, Noah Snyder, Mary Ann Madej, Jon Gustafson, Holly Lundborg, Chris Heppe, Garcia River Landowners Group, Yager/Van Duzen Environmental Stewards

A close-up photograph of a silver car's rear section. On the left is a red taillight with a clear lens at the top. To the right is a silver door handle. The car's body is a metallic silver color. A light blue rectangular box is overlaid on the right side of the image, containing the text "Erosion Happens" in bold black font.

**Erosion
Happens**

San Andreas Fault: growing to the north, pushing up mountains



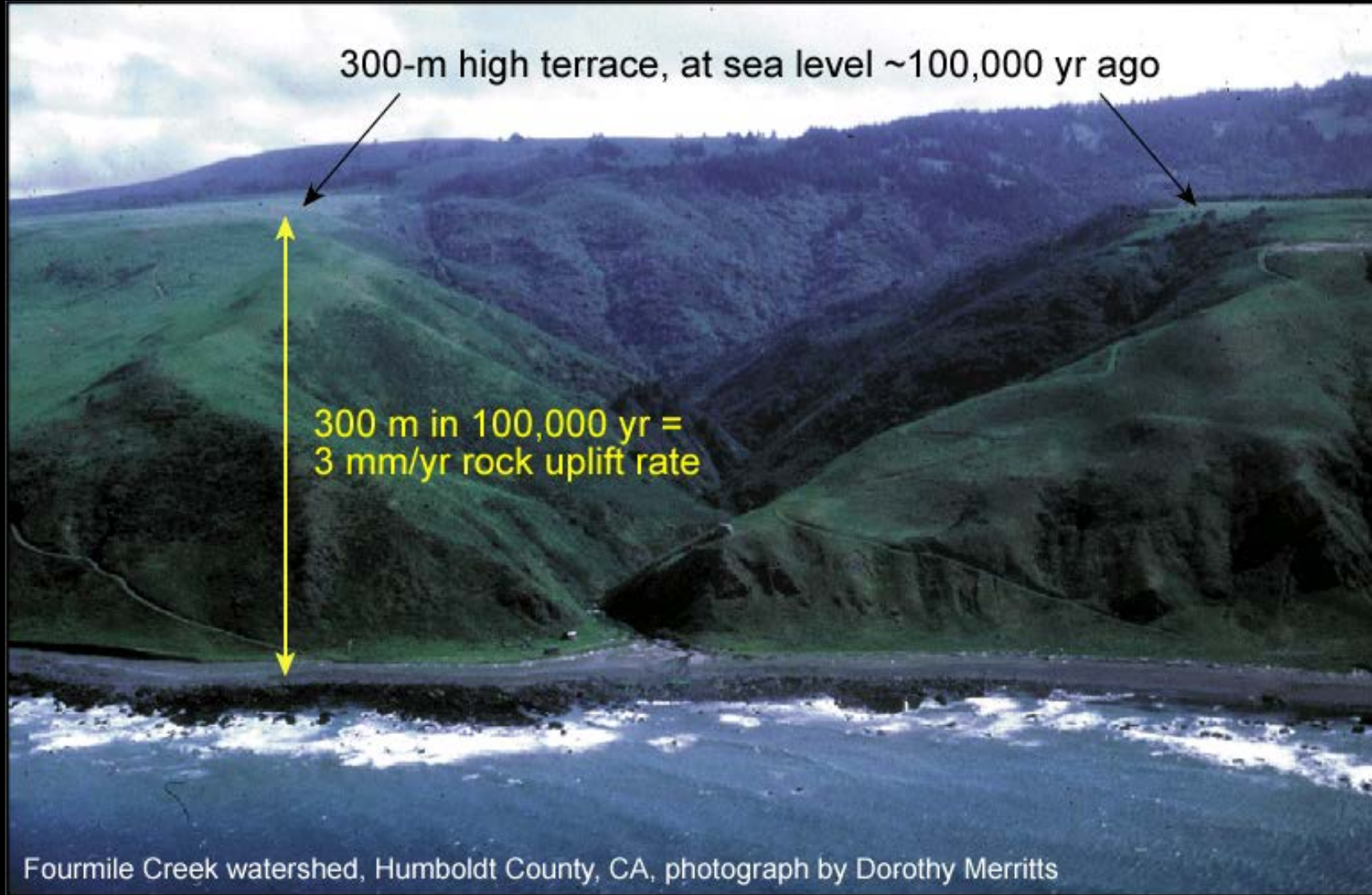
California/Nevada
earthquakes,
(magnitude > 2.5)
1969-2000



**Mendocino triple junction region,
northern California**

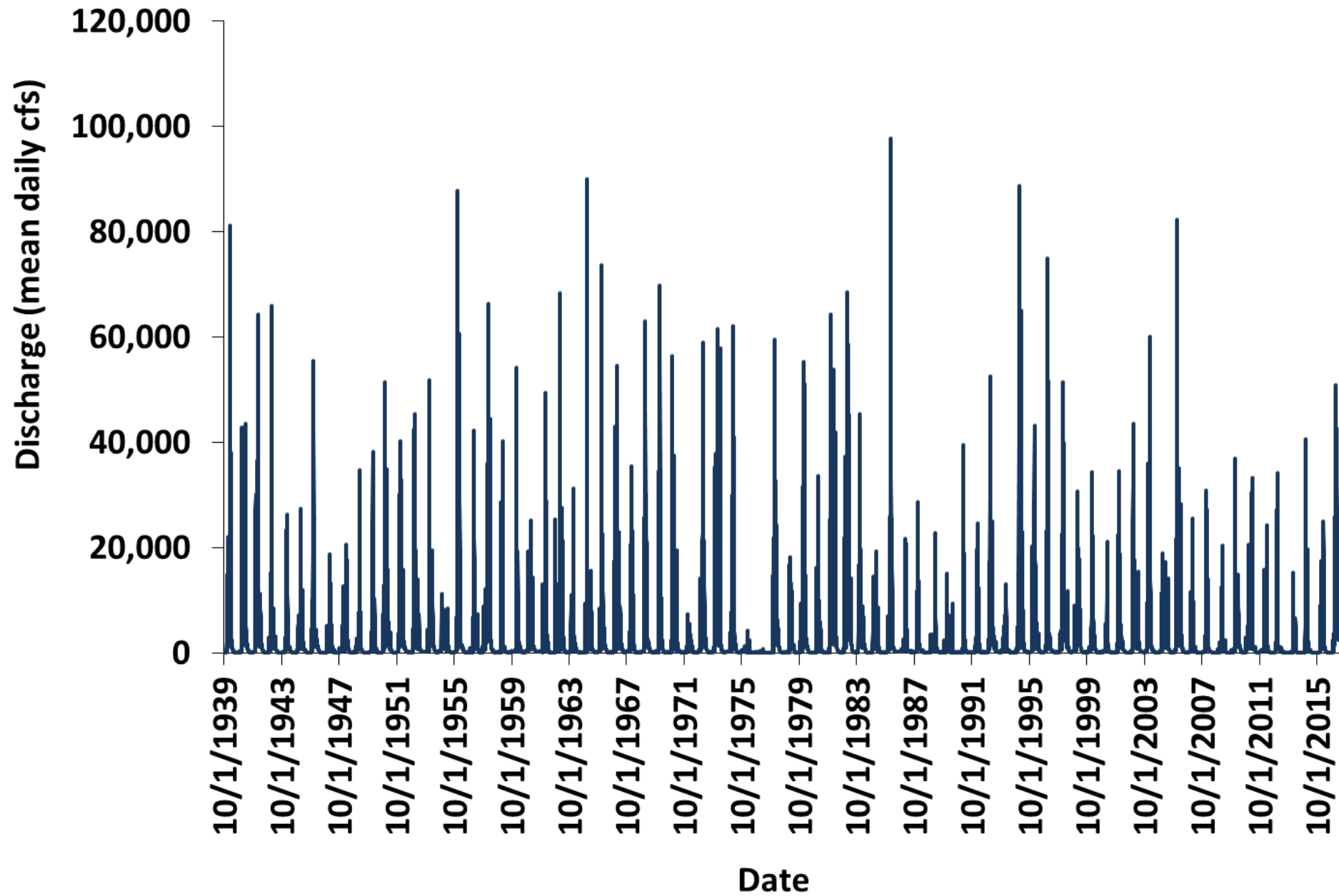
Uplift of rocks: building mountains

(see Merritts & Vincent, 1989; Merritts & Bull, 1989; Merritts, 1996)





Russian River near Guerneville















Definitions

Soil Erosion – The detachment or removal of soil by wind, rain drop impact, or fluvial processes.

Sediment Yield – Quantity of sediment passing a particular point in a watershed per unit of time.

Sediment Delivery – Portion of transported sediment to a particular location or part of a landscape.

Sediment Delivery Problem

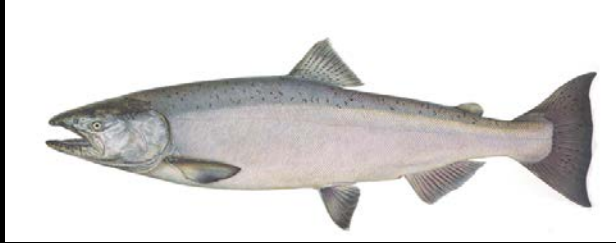
“The linking of on-site rates of erosion and soil loss within a drainage basin to the sediment yield at the basin outlet, and improved knowledge and representation of the associated processes of sediment delivery, represent a major research need within the field of erosion and sedimentation and also an important scale problem in drainage basin studies.”

Walling, 1983

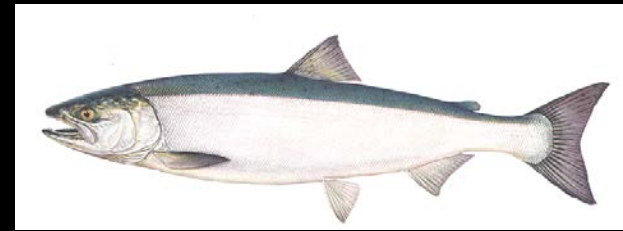
Steelhead



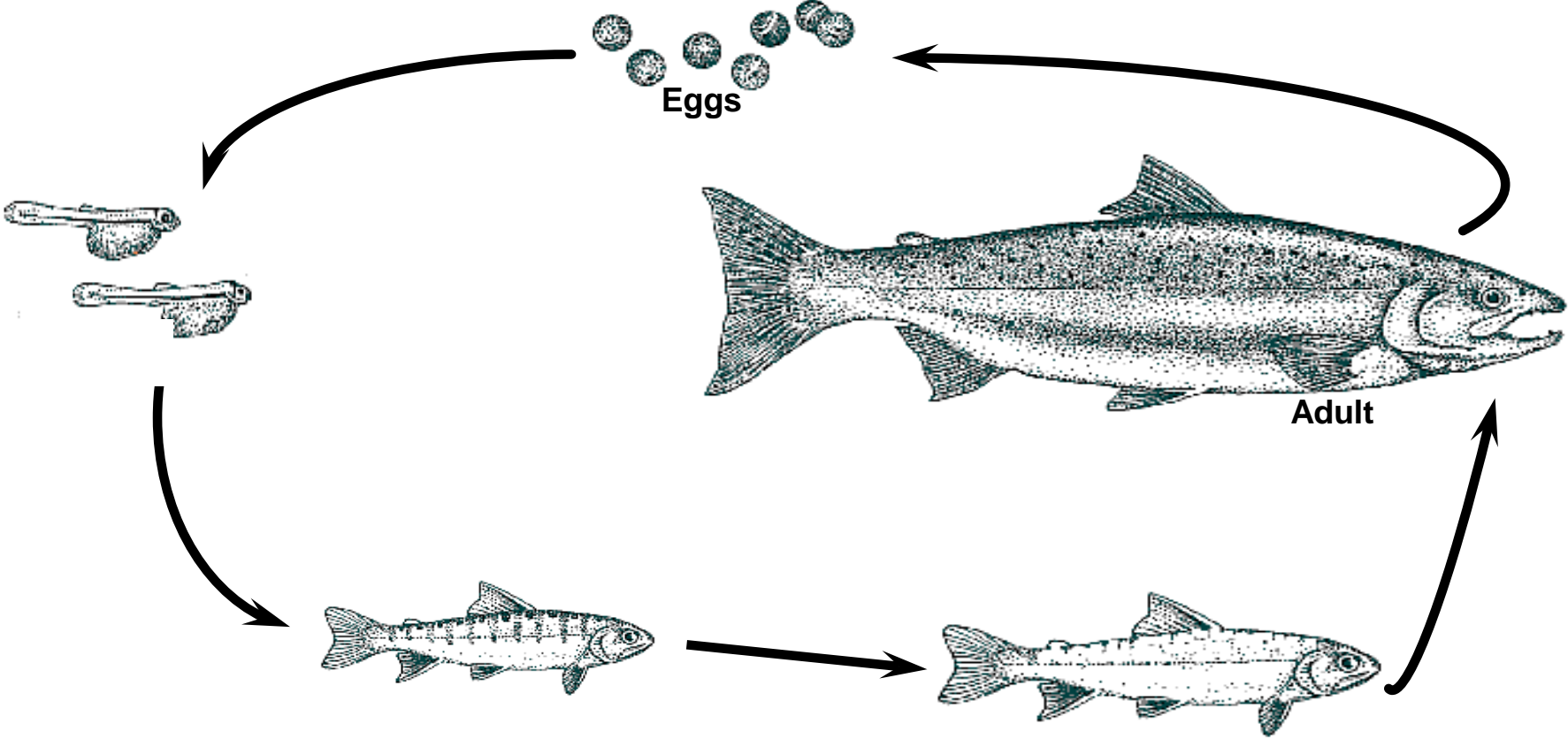
Chinook



Coho

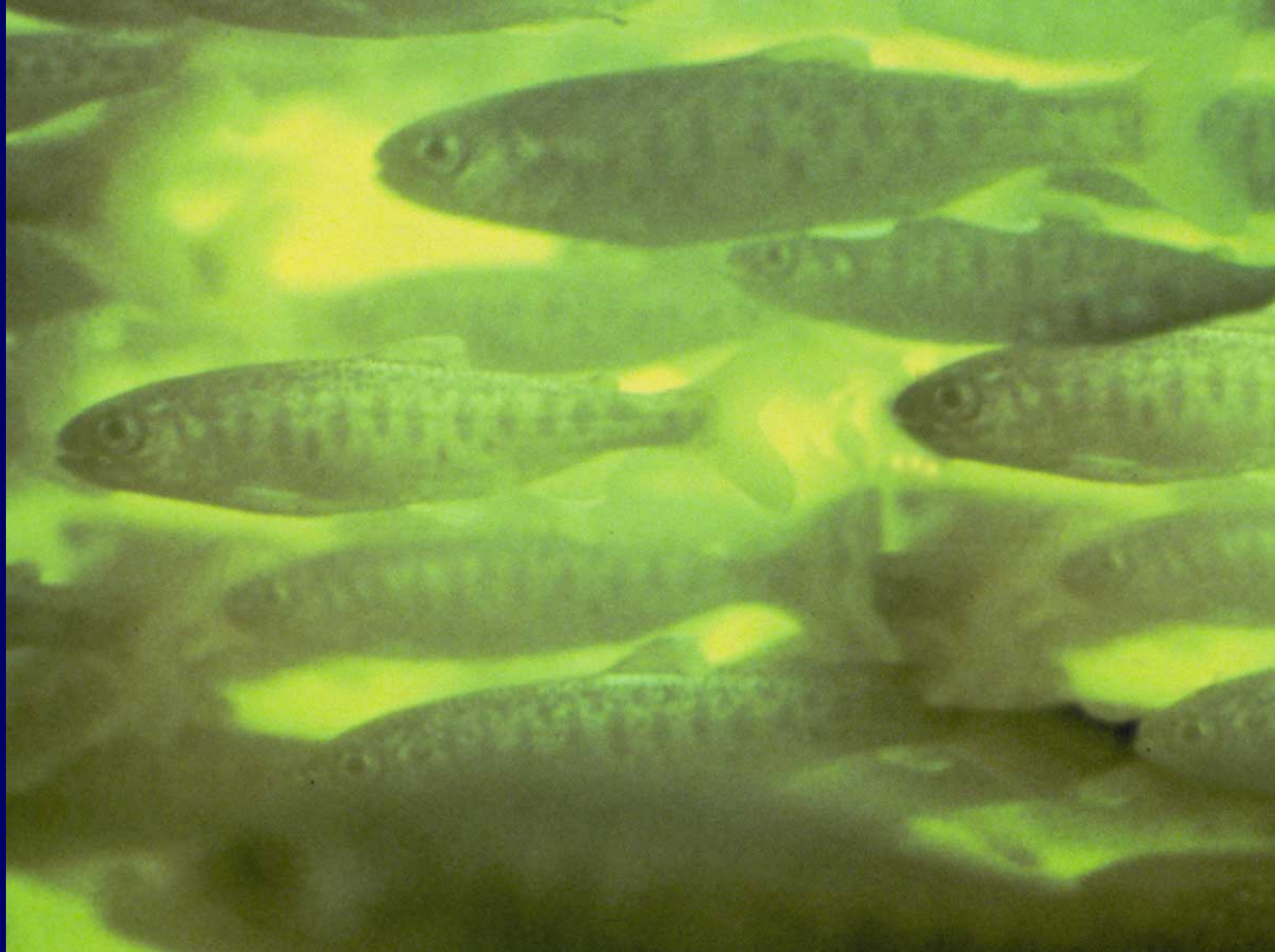


Generalized Life Cycle













CRB



CALIFORNIA
STATE LIBRARY
FOUNDED 1850

California Research Bureau
900 N Street, Suite 200
P.O. Box 942837
Sacramento, CA 94237-0001
(916) 653-7843 phone
(916) 654-5829 fax

TMDLs The Revolution in Water Quality Regulation

By Jennifer Ruffolo

APRIL 1999

CRB-99-005

C A L I F O R N I A R E S E A R C H B U R E A U

Sediment Listing in the North Coast Region, 2006

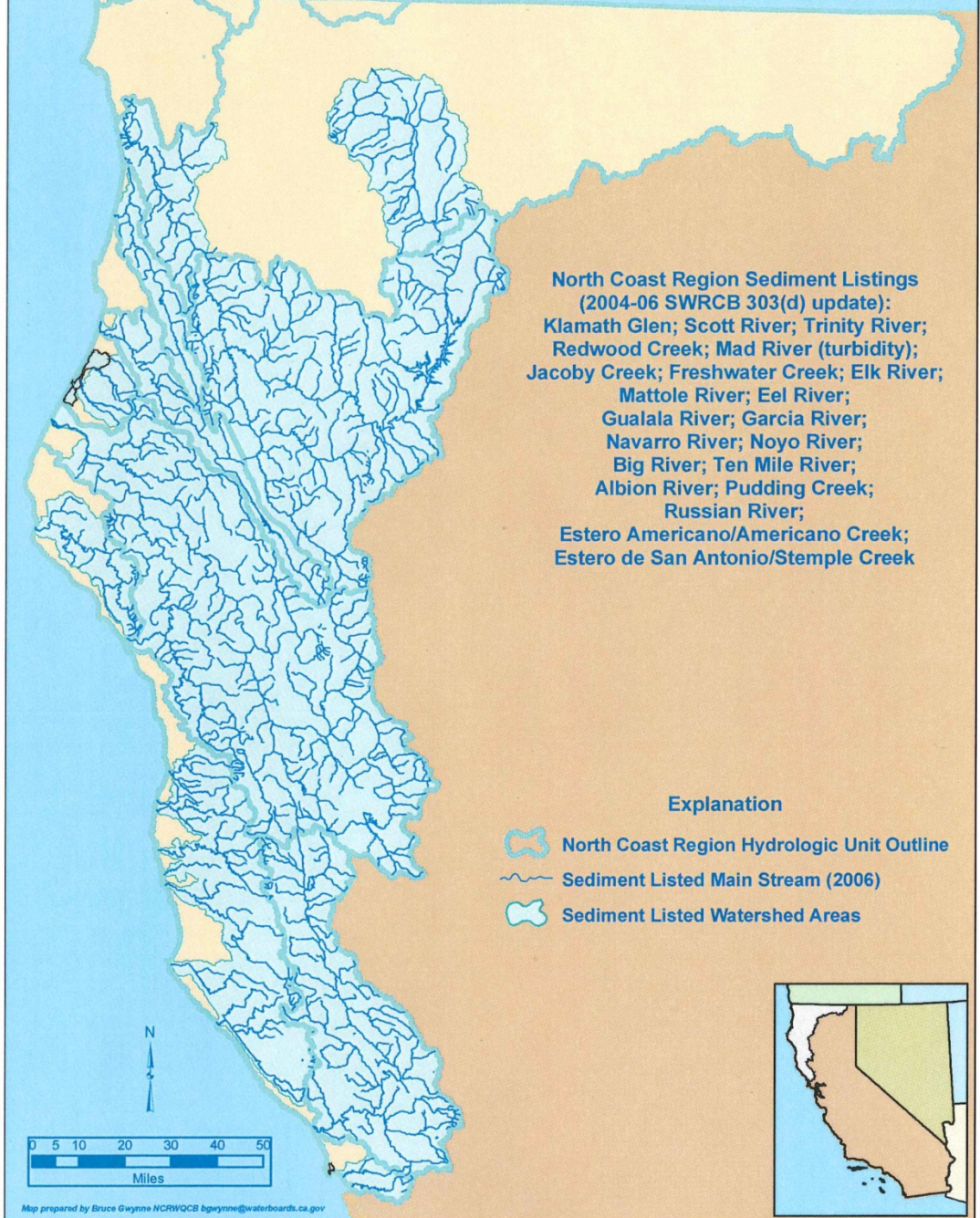
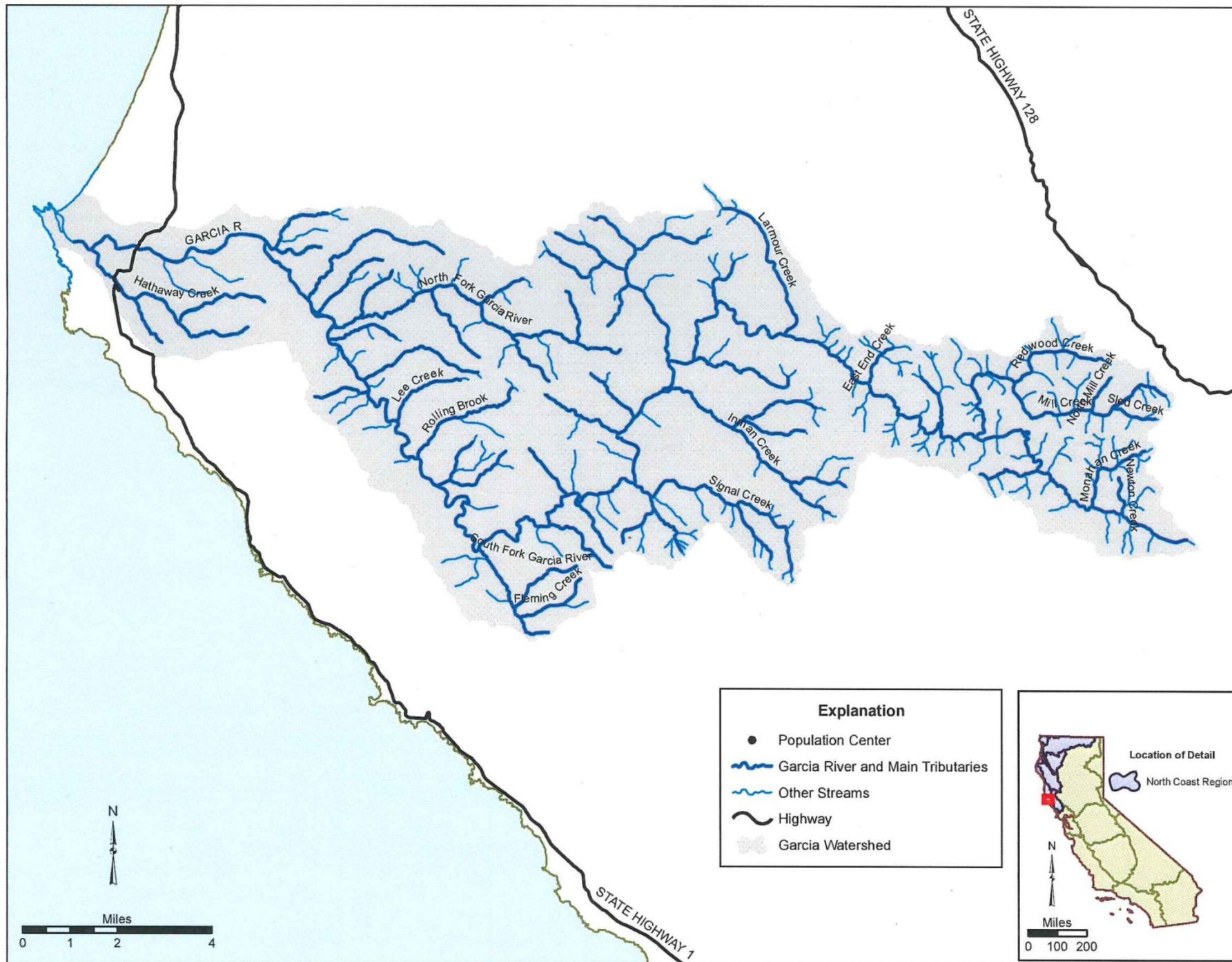


Figure 1. Sediment Impaired Watersheds in the North Coast Region.





Garcia River TMDL Requirements

“...as the first phase, landowners are directed to identify and control all existing and future controllable discharges of sediment.”

“Controllable discharges are those discharges resulting from human activities that can influence the quality of waters of the State and that can be reasonably controlled by prevention or mitigation.”

Sediment Delivery Sites

- Deliverable
- Management Induced
- Responsive to mitigation
- $> 10 \text{ yards}^3$





Unstable Areas

- $> 10 \text{ yards}^3$
- Fails other criteria



Sediment Delivery Inventory and Monitoring

- Developed in collaboration with agricultural landowners, RWQCB, NRCS, and UCCE
 - Ease of use
 - Compliance with water quality regulations
 - Integration with UCCE Rangeland Watershed Program
 - Incorporation of NRCS terminology



UNIVERSITY OF
CALIFORNIA
Division of Agriculture
and Natural Resources
<http://anrcatalog.ucdavis.edu>



California Rangelands
Research and
Information Center
[http://agronomy.ucdavis.edu/
calrng/range1.htm](http://agronomy.ucdavis.edu/calrng/range1.htm)

Sediment Delivery Inventory and Monitoring

A Method for Water Quality Management in Rangeland Watersheds

D. J. LEWIS, Postgraduate Researcher, Department of Agronomy and Range Science, University of California, Davis. **K. W. TATE**, Extension Rangeland Watershed Specialist, Department of Agronomy and Range Science, University of California, Davis. **J. M. HARPER**, Livestock and Natural Resources Advisor, University of California Cooperative Extension, Ukiah

For most landowners, production incentives and the economics of soil loss require accurate assessment and control not only of soil erosion but also of the amount and nature of sediment delivered to watercourses. In addition, protecting the beneficial uses of water has become a principal goal of resource management, requiring landowners to adapt their management to comply with water quality regulations. An example is the ongoing development and implementation of water quality standards for sediment developed by the U. S. Environmental Protection Agency (U.S. EPA) and the California Regional Water Quality Control Board (CRWQCB) in the form of the total maximum daily load (TMDL).

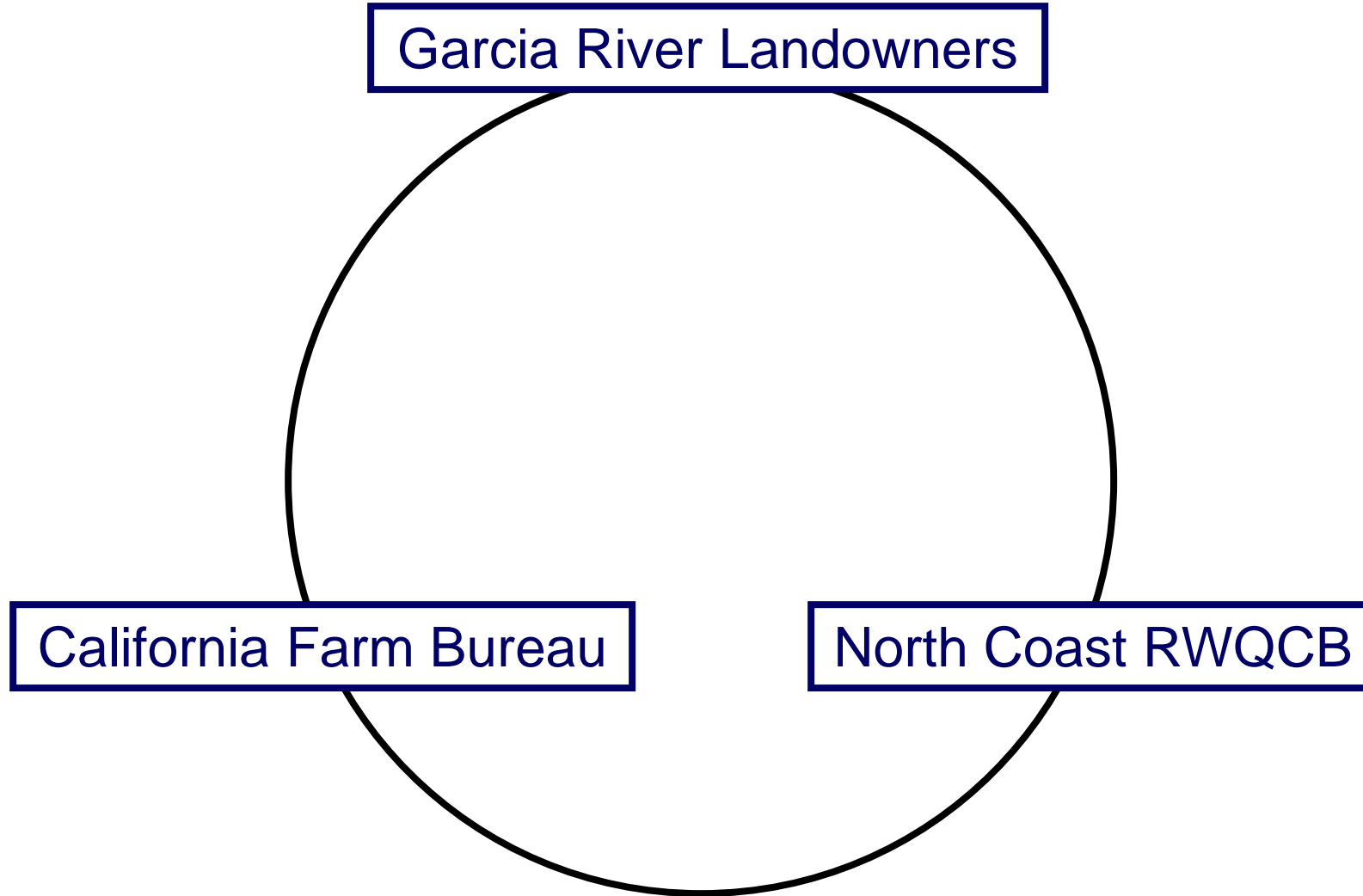
The sediment delivery inventory and monitoring worksheet and the photograph record presented in this publication (appendix A) are responses to these management and regulatory needs. The worksheet and record provide landowners with the necessary tools—including prioritization, planning, and documentation of control measures—to inventory and monitor sites that have potentially deliverable sediment. Using the worksheet and record also assists landowners in documenting the effects of climate, soil conditions, and off-property factors that cause sediment delivery beyond their control. This publication also contains a glossary of terms to assist in using the worksheet and record and in understanding water quality standards and regulations.

The monitoring objectives for using the worksheet and photograph record:

- Ease of use by private agricultural landowners. The worksheet and photograph record method assumes that landowners are the most knowledgeable people regarding their property and the sites of potential sediment delivery. For this reason, the worksheet and record are designed to be effective and efficient for landowner use.
- Water quality regulation compliance, including baseline, implementation, and effectiveness monitoring.
- Incorporation of terminology from the Natural Resource Conservation Service's (NRCS) *Field Office Technical Guide, Section 4: Conservation Practices*. The NRCS is an important technical resource for the design and implementation of sediment delivery control measures. Familiarity with their terminology makes it easier for the landowner to interact with the NRCS.

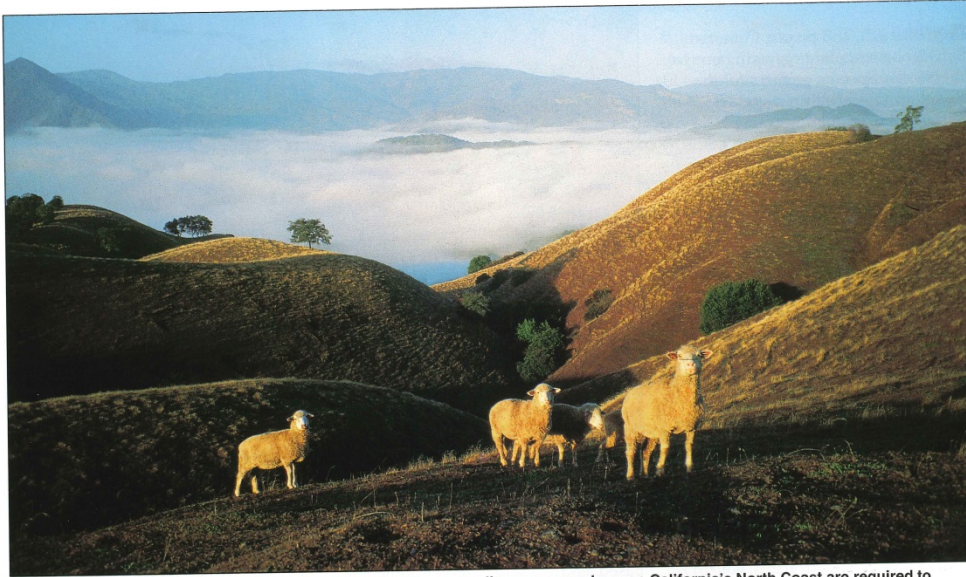
The worksheet and photograph record were developed in collaboration with agricultural landowners, CRWQCB staff, NRCS staff, and University of California Cooperative Extension (UCCE) advisors and specialists. These groups tested and

Iterative Process





- **Compliant with TMDL requirements**
- **Over 500 North Coast landowners trained**
- **Component in ranch water quality plans**
- **Conduct North Coast sediment source survey**



To protect water quality, many ranchers on California's North Coast are required to evaluate and mitigate the potential for delivery of sediment to streams on their property. Sheep graze on an oak woodland slope in the Russian River watershed.

Survey identifies sediment sources in North Coast rangelands

David J. Lewis □ Kenneth W. Tate □ John M. Harper □ Julie Price

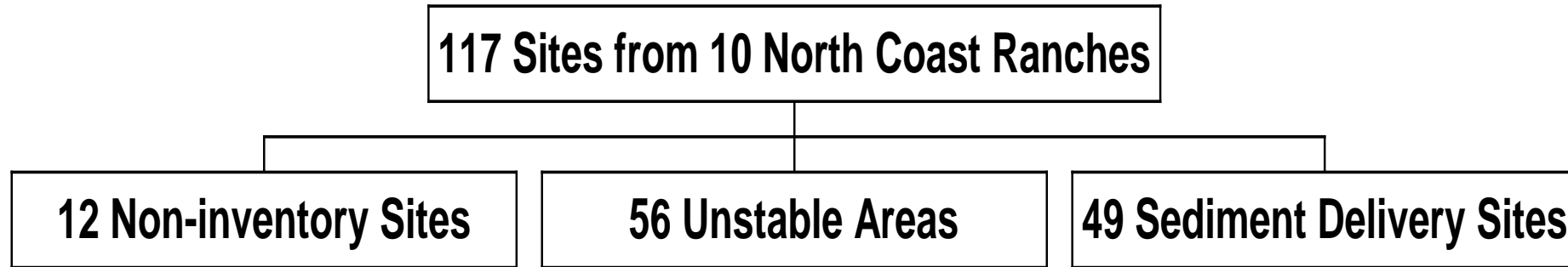
We conducted a sediment source survey to gain insight into soil erosion on Northern California rangeland watersheds and to provide information to facilitate informed land-use management, conservation prioritization and water-quality regulation decisions. The results indicate that by focusing on erosion associated with natural and historical influences, inventory and assessment efforts on these watersheds can characterize the majority of sediment deliverable to streams. While this volume of sediment does not require mitigation under current water-quality regulations, it none-

theless prohibits the ability of in-stream sediment monitoring to detect water-quality changes. Water-quality regulations require managers to create inventories for all sources with 10 cubic yards or more of potentially deliverable sediment. If a monitoring threshold of 100 cubic yards was used, more than 99% of the deliverable sediment identified in this survey would be inventoried. This would require developing inventories for only 82 of the 117 sites in this study. Overall, we determined that rangeland managers can achieve the greatest reductions in sediment generation by focusing on erosion from roads.

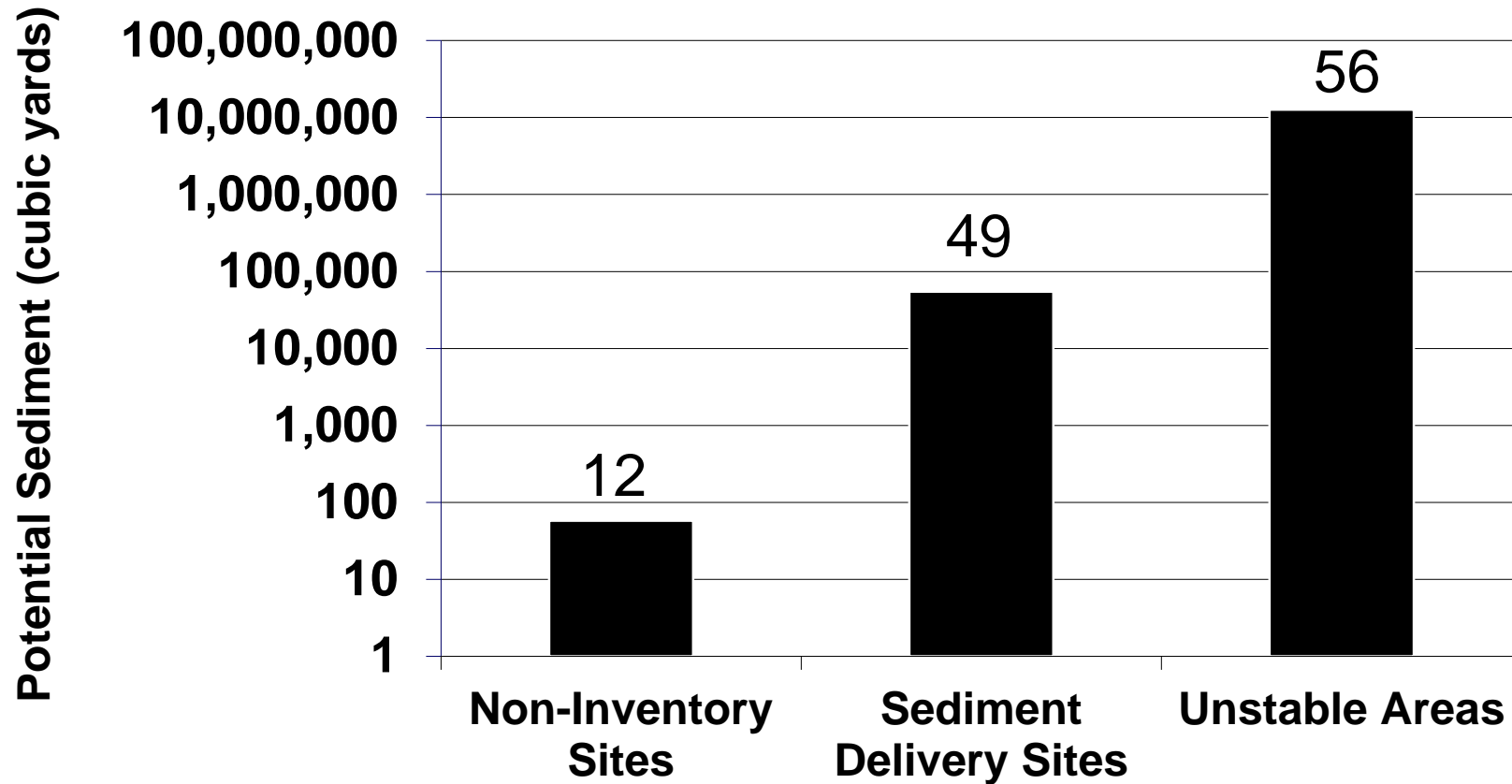
Total maximum daily loads (TMDLs) for sediment are being established for Northern California watersheds. These water-quality standards will require agricultural landowners to inventory, monitor and control management-caused erosion on their properties (EPA 1998; SWRCB 2001).

Twenty-four Northern California rivers are on the federal Clean Water Act (CWA) Section 303(d) list of impaired water bodies because of excessive sediment from erosion, which results in impacts for salmon habitat. Land-use management, including silviculture, development and agriculture, has been identified as a source of sediment in these watersheds

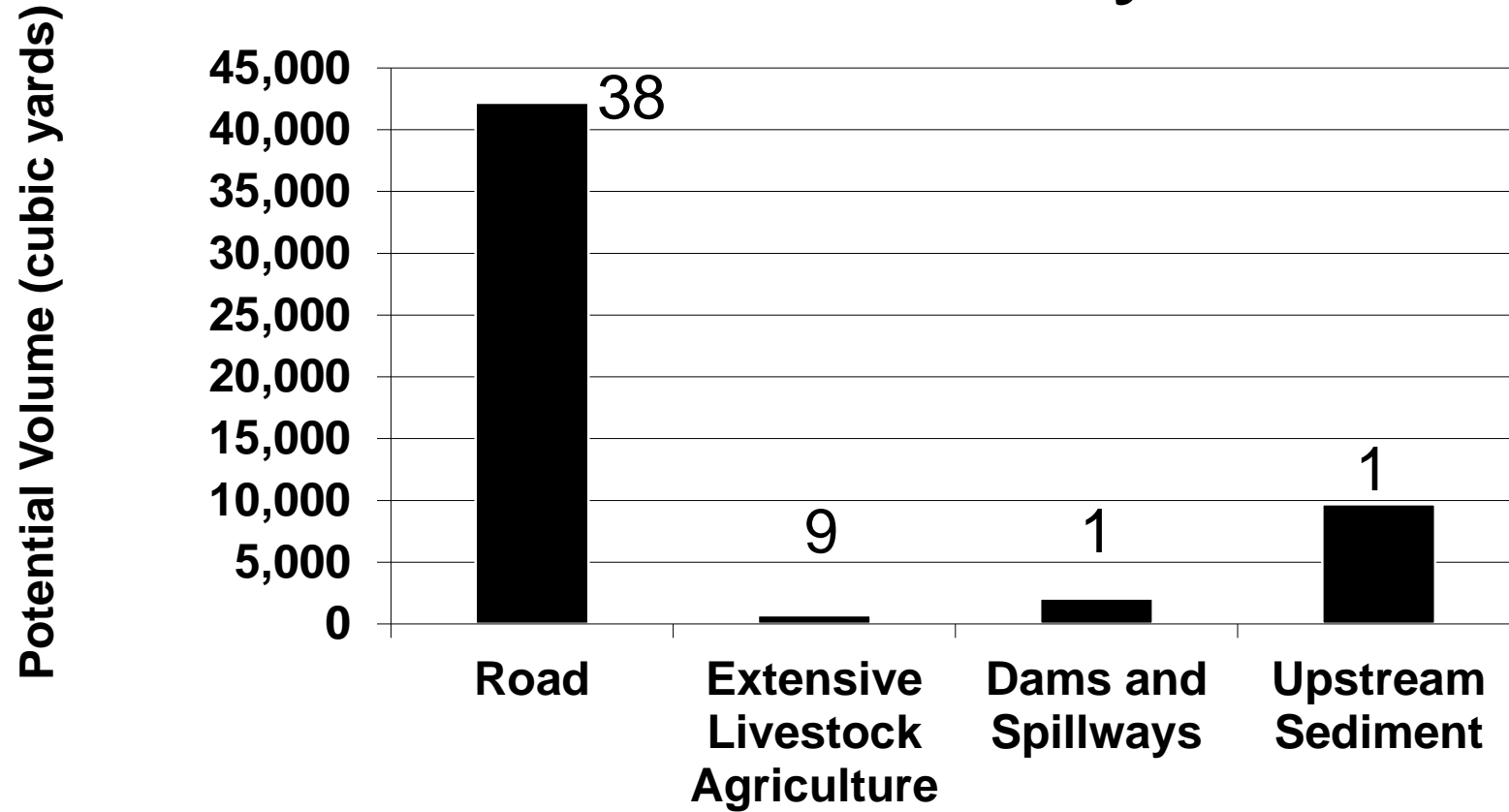
Site Breakdown



Sediment Volume by Inventory Designation



Sediment Volume by Influence for Sediment Delivery Sites

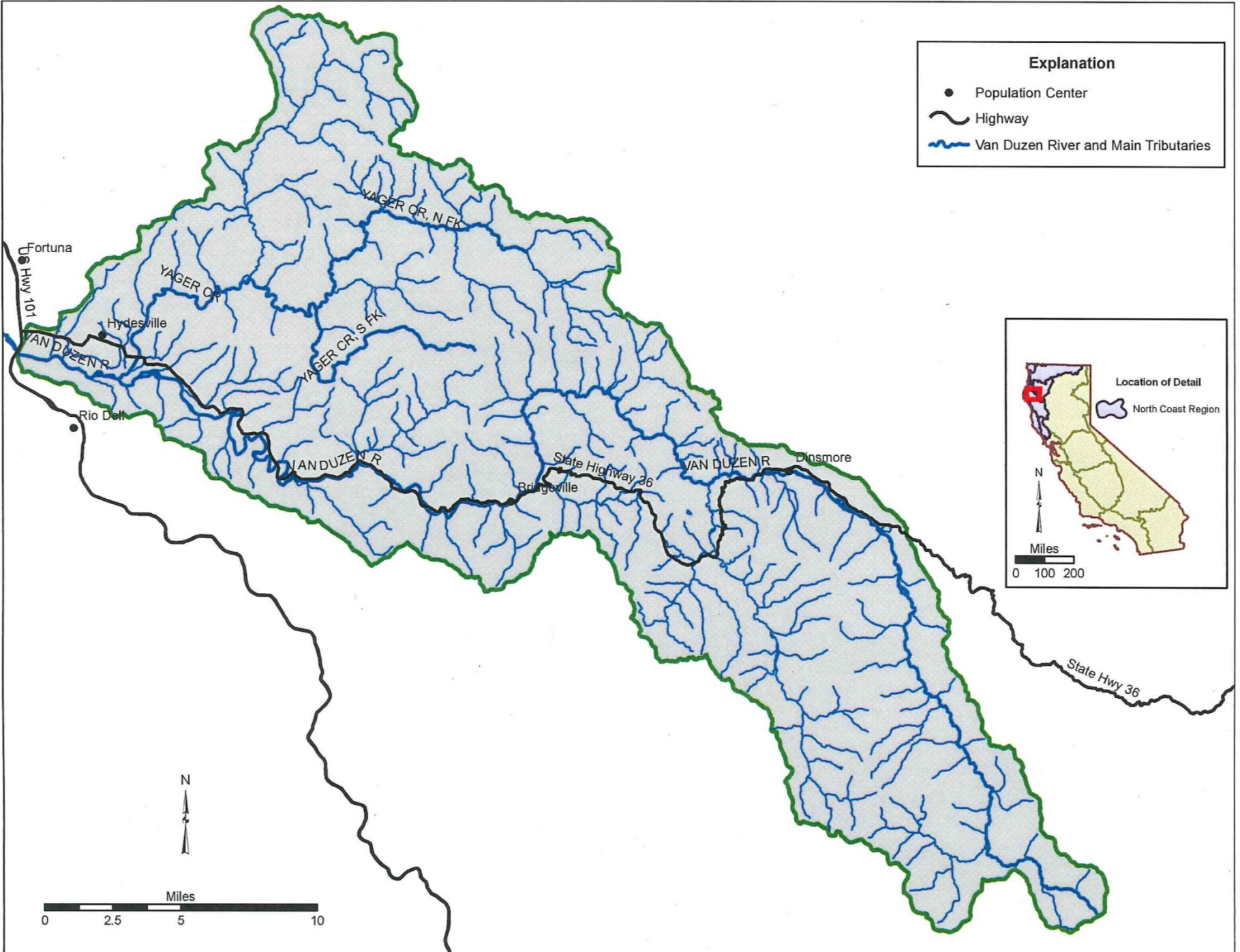


- Total potential sediment from Unstable Areas is 1,000 times greater than Sediment Delivery Sites



- Majority of Sediment Delivery Site sediment is associated with roads and gully erosion





Van Duzen River Watershed Sediment Sources

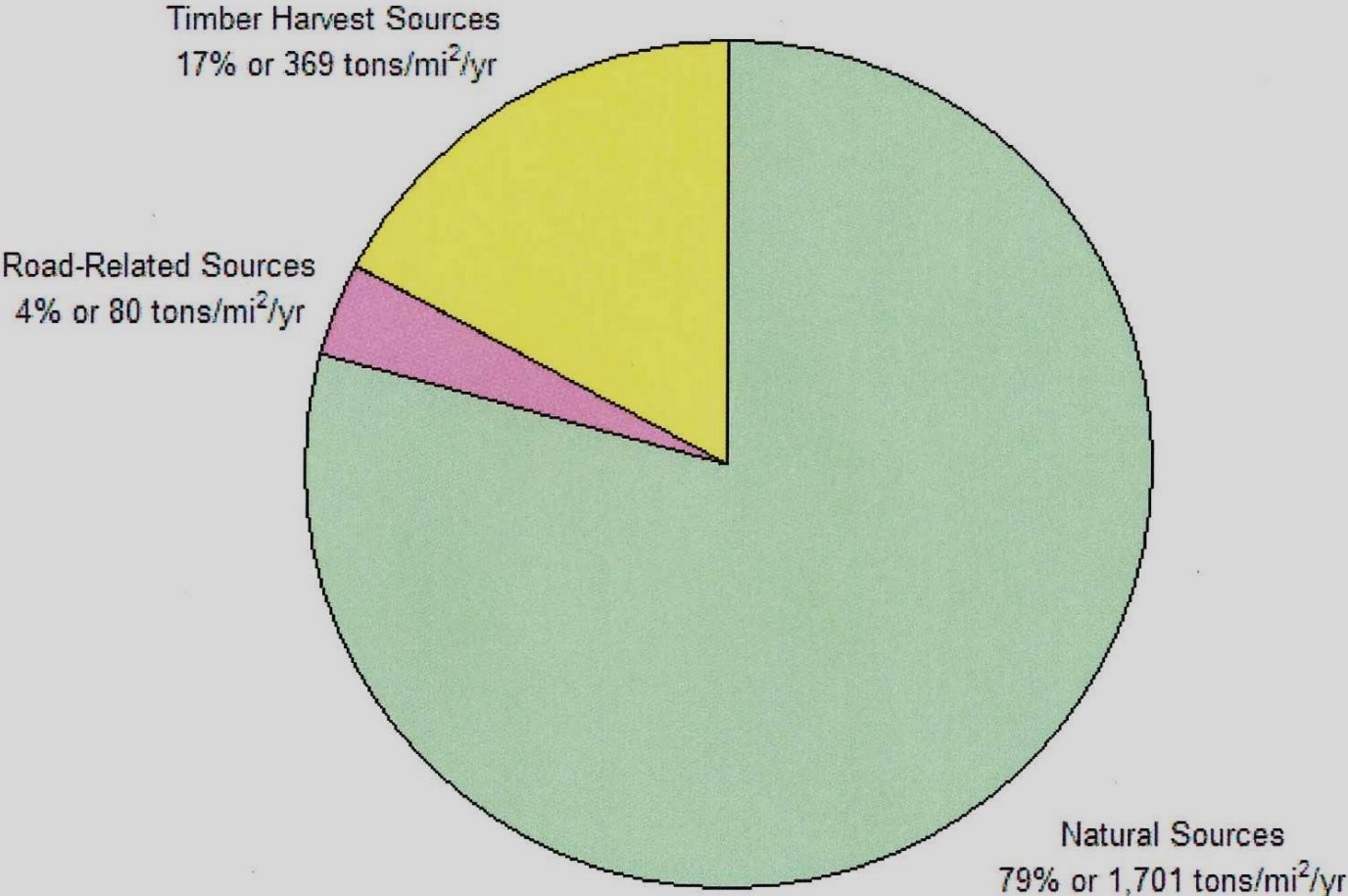


Figure 20. Van Duzen River Sediment Sources. Data from: Van Duzen River TMDL (U.S. EPA 1999c).