

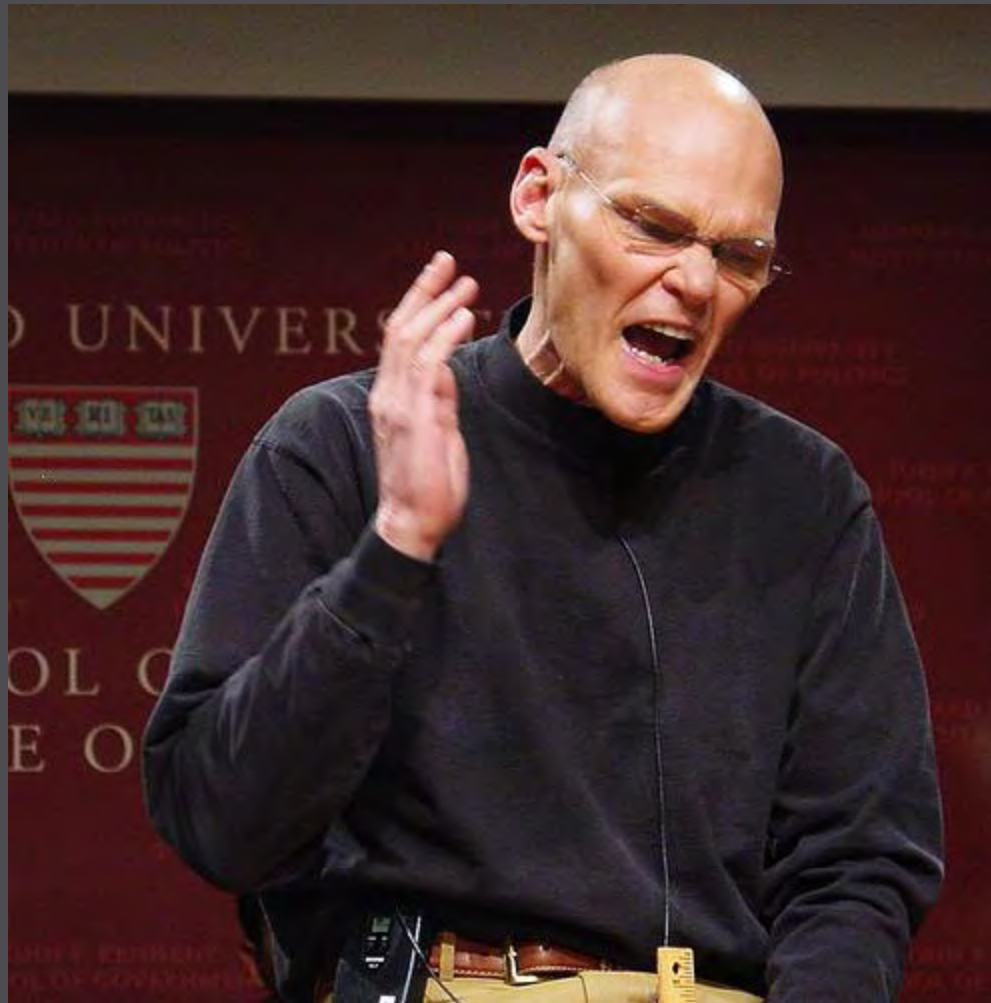
Napa River  
Resilience through Complexity

North Bay Watershed Association

April 13, 2012

Meredith Williams









## Napa River Sediment TMDL and Habitat Enhancement Plan



### Staff Report

Michael Napolitano  
Sandia Potter  
Dyan Whyte  
September 2009

# Attributes of an alluvial river and their relation to water policy and management

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Contributed by Luna B. Leopold, August 15, 2000

Rivers around the world are being regulated by dams to accommodate the needs of a rapidly growing global population. These regulatory efforts usually oppose the natural tendency of rivers to flood, move sediment, and migrate. Although an economic benefit, river regulation has come at unforeseen and unevaluated cumulative ecological costs. Historic and contemporary approaches to remedy environmental losses have largely ignored hydrologic, geomorphic, and biotic processes that form and maintain healthy alluvial river ecosystems. Several commonly known concepts that govern how alluvial channels work have been compiled into a set of "attributes" for alluvial river integrity. These attributes provide a minimum checklist of critical geomorphic and ecological processes derived from field observation and experimentation, a set of hypotheses to chart and evaluate strategies for restoring and preserving alluvial river ecosystems. They can guide how to (i) restore alluvial processes below an existing dam without necessarily resorting to extreme measures such as demolishing one, and (ii) preserve alluvial river integrity below proposed dams. Once altered by dam construction, a regulated alluvial river will never function as before. But a scaled-down morphology could retain much of a river's original integrity if key processes addressed in the attributes are explicitly provided. Although such a restoration strategy is an experiment, it may be the most practical solution for recovering regulated alluvial river ecosystems and the species that inhabit them. Preservation or restoration of the alluvial river attributes is a logical policy direction for river management in the future.

Since the 1990s, the physical and environmental consequences of river alteration and management have been openly questioned. Continued increases in flood losses, both financial and human, and the unanticipated and unwanted results of dams and channel straightening, invite reevaluation of river management. Reevaluation has even led to removing existing dams (e.g., Butte and Clear creeks in California, Elwha River in Washington), as well as implementing experimental releases of high flows (1, 2).

Historically, river policymakers and resource managers have

imposed on the river ecosystem (e.g., a recommended flow release), we should expect a response (e.g., scouring sand from a pool). The significance of an impetus will depend on an appropriate threshold beyond which a specific response is expected. A process, therefore, is comprised of an impetus and an expected response. To use the alluvial river attributes as guidelines for recovering or preserving critical processes, one must consider how the magnitude, duration, frequency, and timing of an impetus will exceed a threshold to produce a desired response. Rarely, however, is a single impetus imposed on a river ecosystem associated with a single response.

Floods are primary impetuses for all alluvial river morphology. An increase in discharge may initiate bed surface movement and bank erosion, once the force exerted by the flood event (the impetus) has passed some threshold for movement or erosion. This threshold may require a specific flow magnitude and duration before producing a significant morphological response. The timing and frequency of the flood also may have profound effects on a species or a population. Mobilizing sand from a pool in January may smother salmon eggs incubating in the downstream riffle. The impetus, therefore, cannot be prescribed as a simple measure of force, nor can the total reaction be as succinctly quantified or even fully anticipated. It is with this backdrop of uncertainty that the attributes were compiled.

## The Alluvial River Attributes

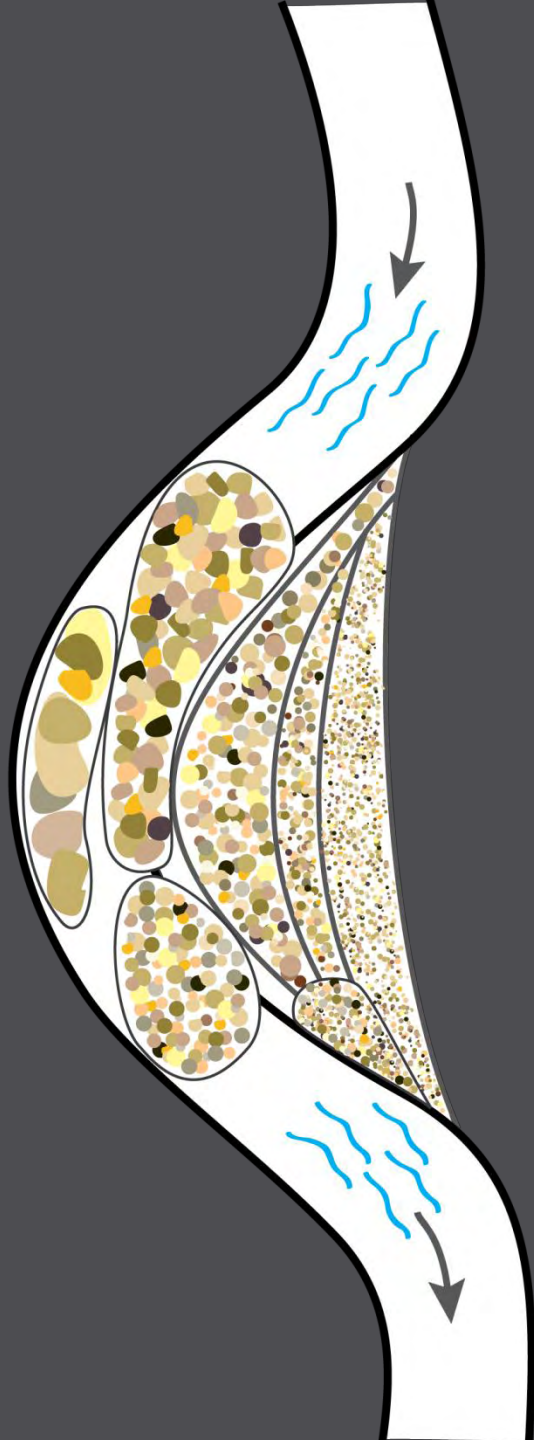
The alluvial river attributes (3) can help river managers identify desired processes, then help prescribe necessary impetuses based on useful empirical relationships and thresholds developed by river geomorphologists and ecologists. All of the concepts deriving the alluvial attributes have been described among a wide range of professional journals, technical books, and agency reports (reviewed in ref. 2), but their compilation has not been previously published. They may not apply equally to all alluvial river ecosystems. Some rivers may not be capable of achieving certain attributes because of overriding constraints, e.g., a river passing through an urbanized corridor often is not free to

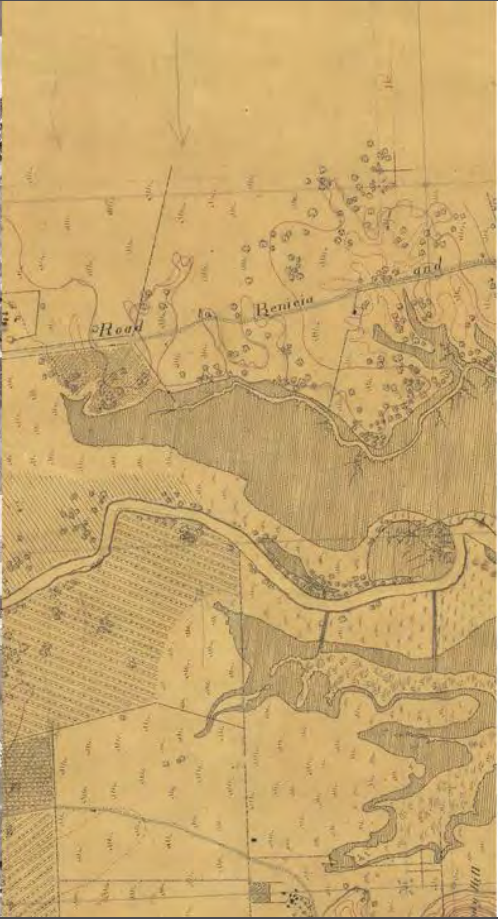
# PROJECT FRAMEWORK



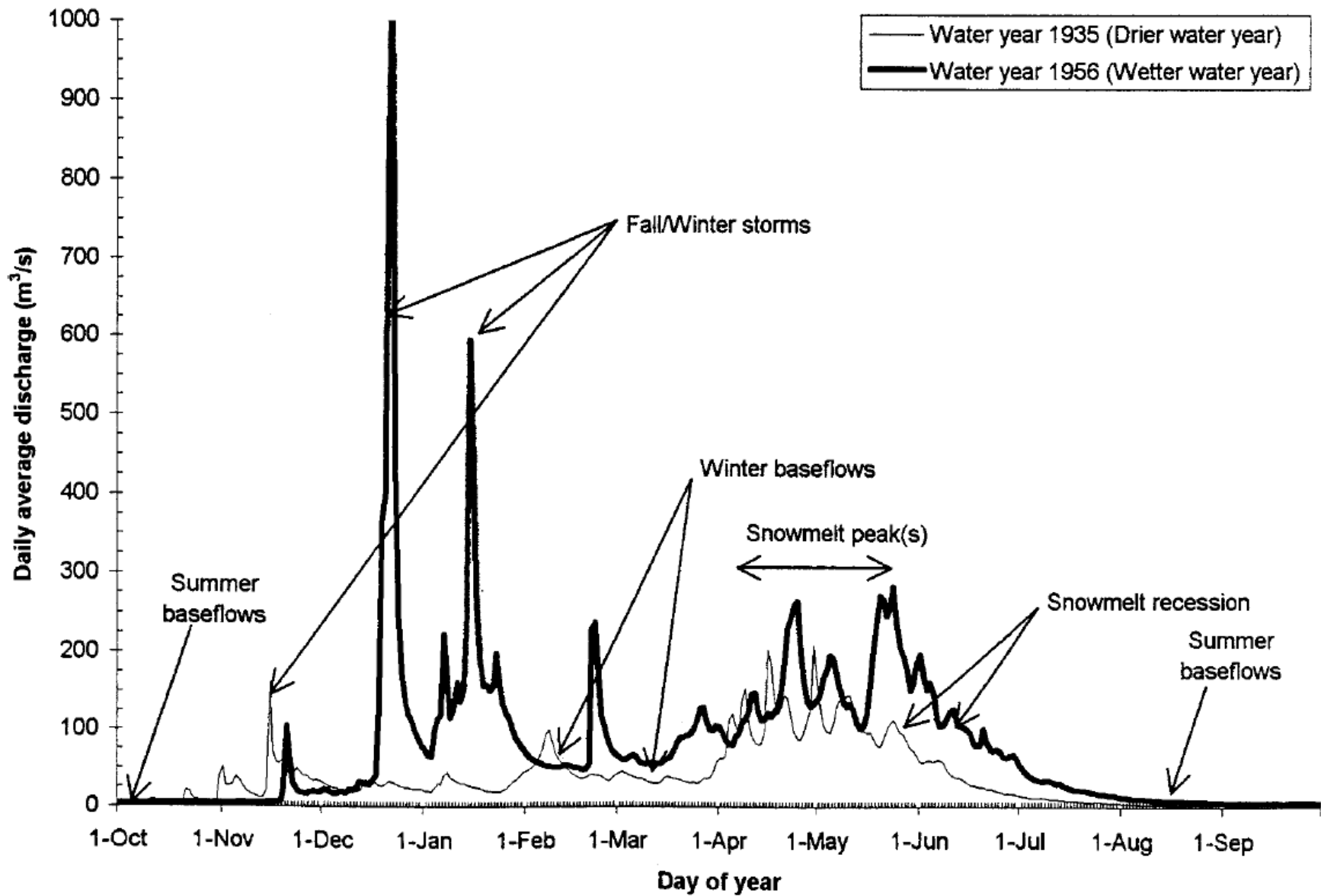




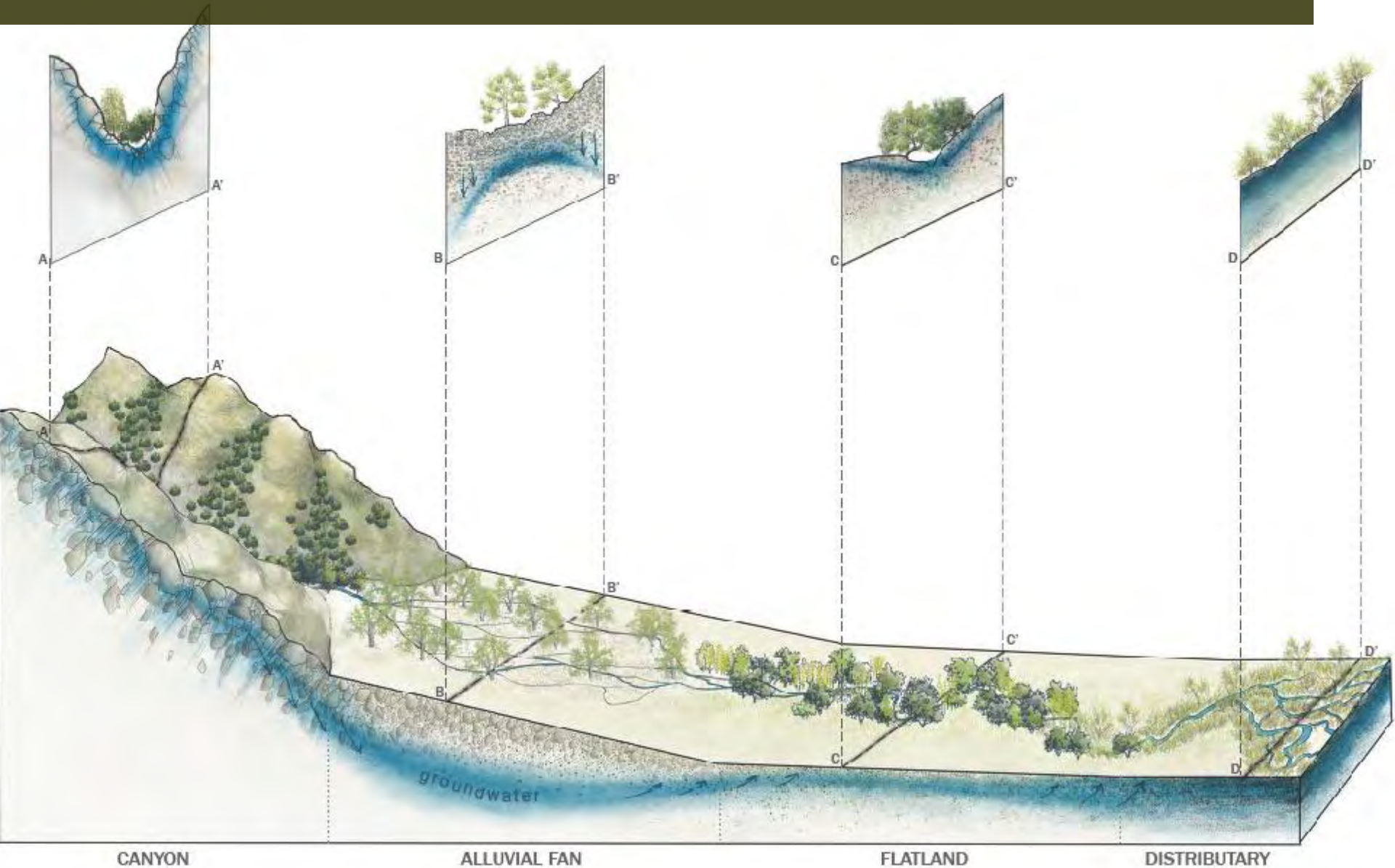








# Hydrological diversity



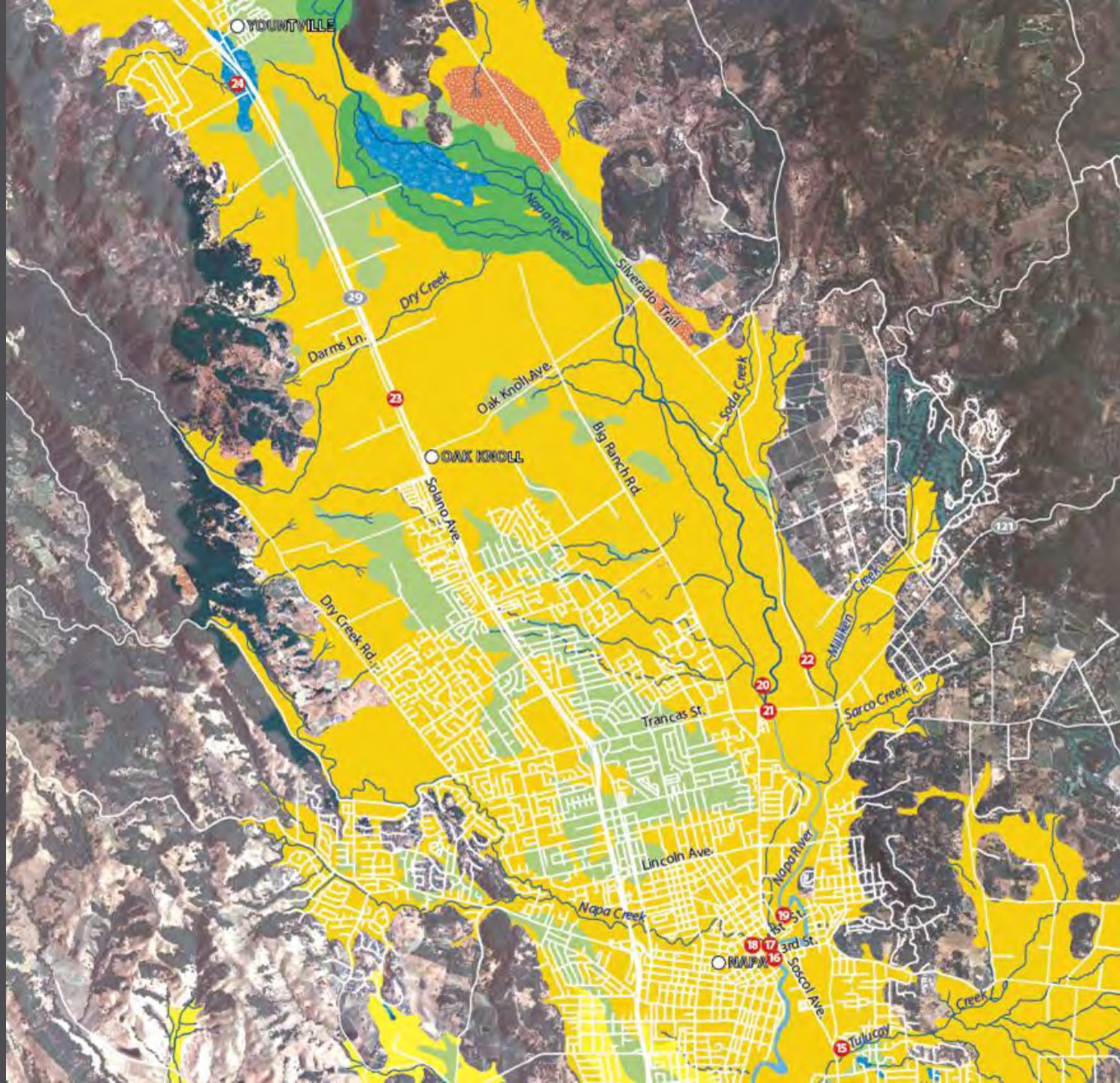


NO. 396 N. UPPER PORTION NAPA RIVER.

TERRILL & MILLER, PHOTOGRAPHERS, S.F.







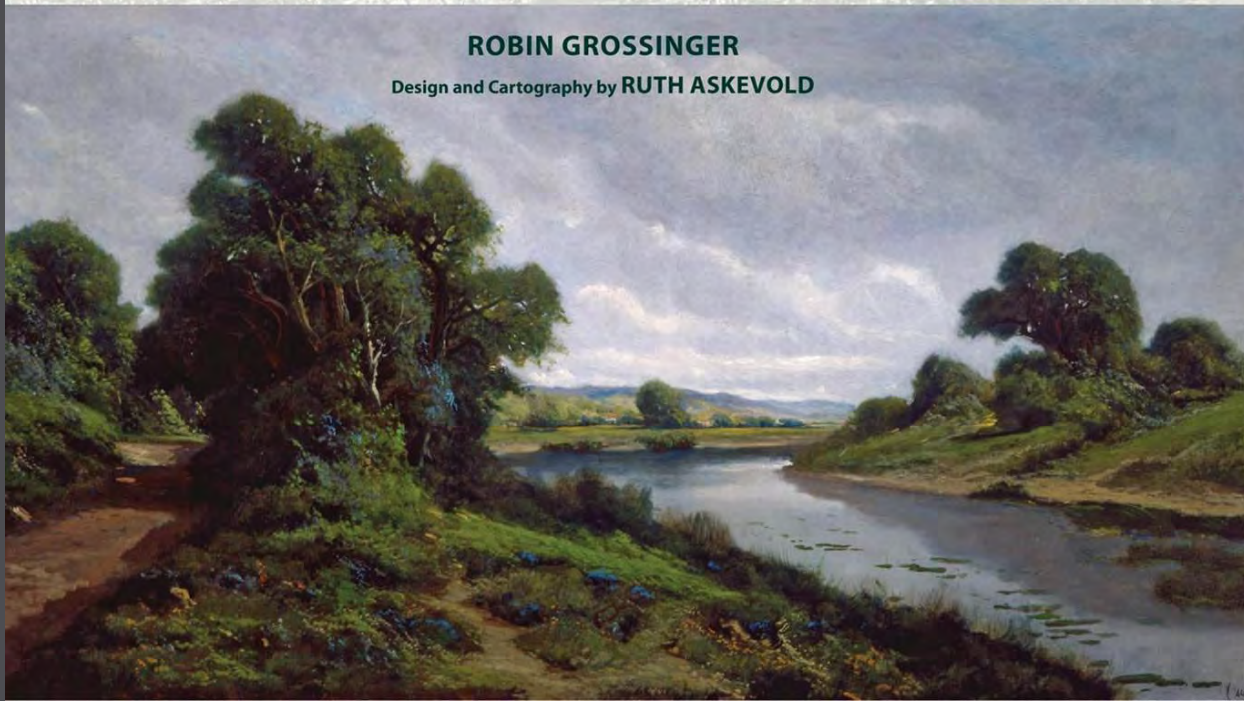


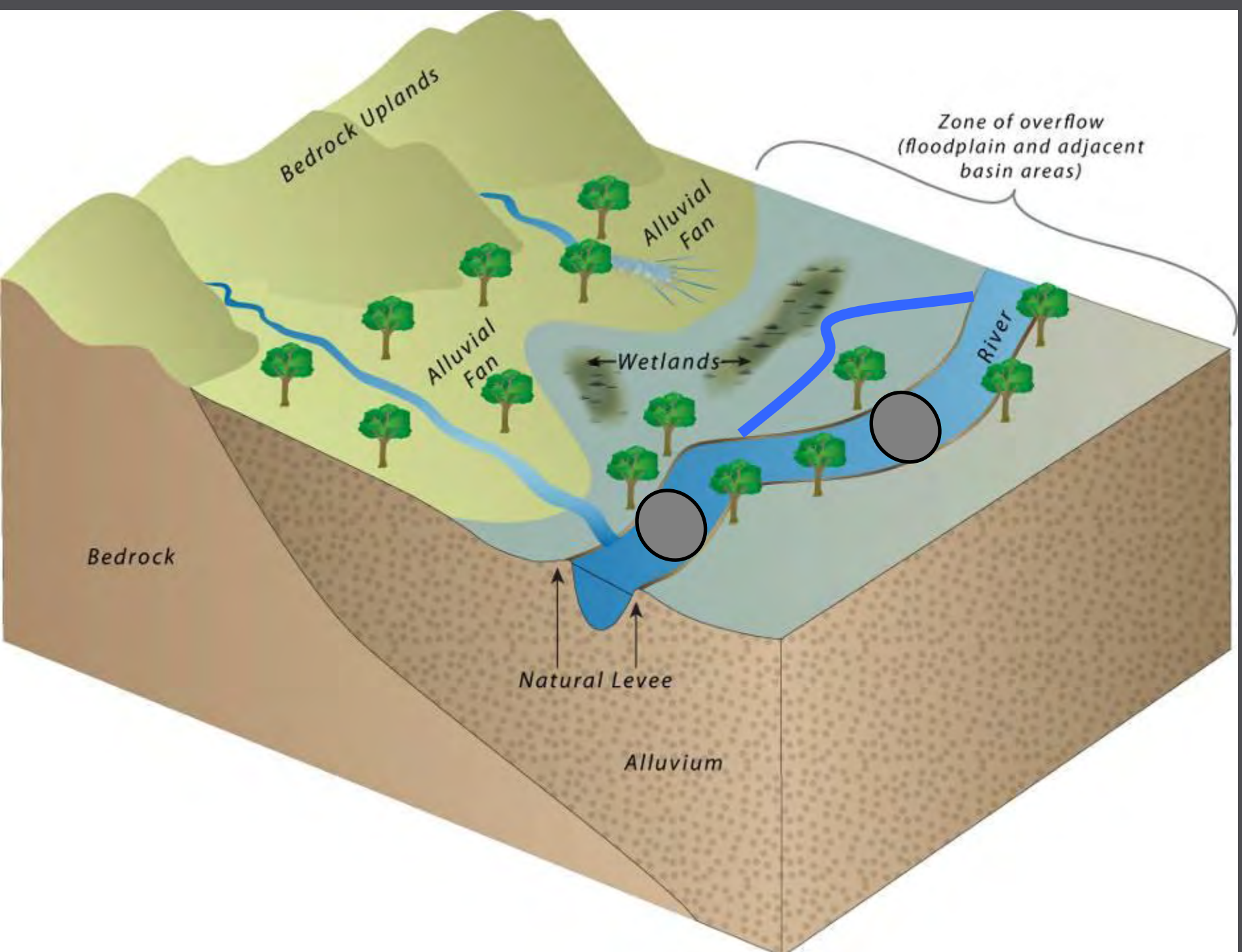
# NAPA VALLEY HISTORICAL ECOLOGY ATLAS

EXPLORING A HIDDEN LANDSCAPE OF TRANSFORMATION AND RESILIENCE

ROBIN GROSSINGER

Design and Cartography by RUTH ASKEVOLD





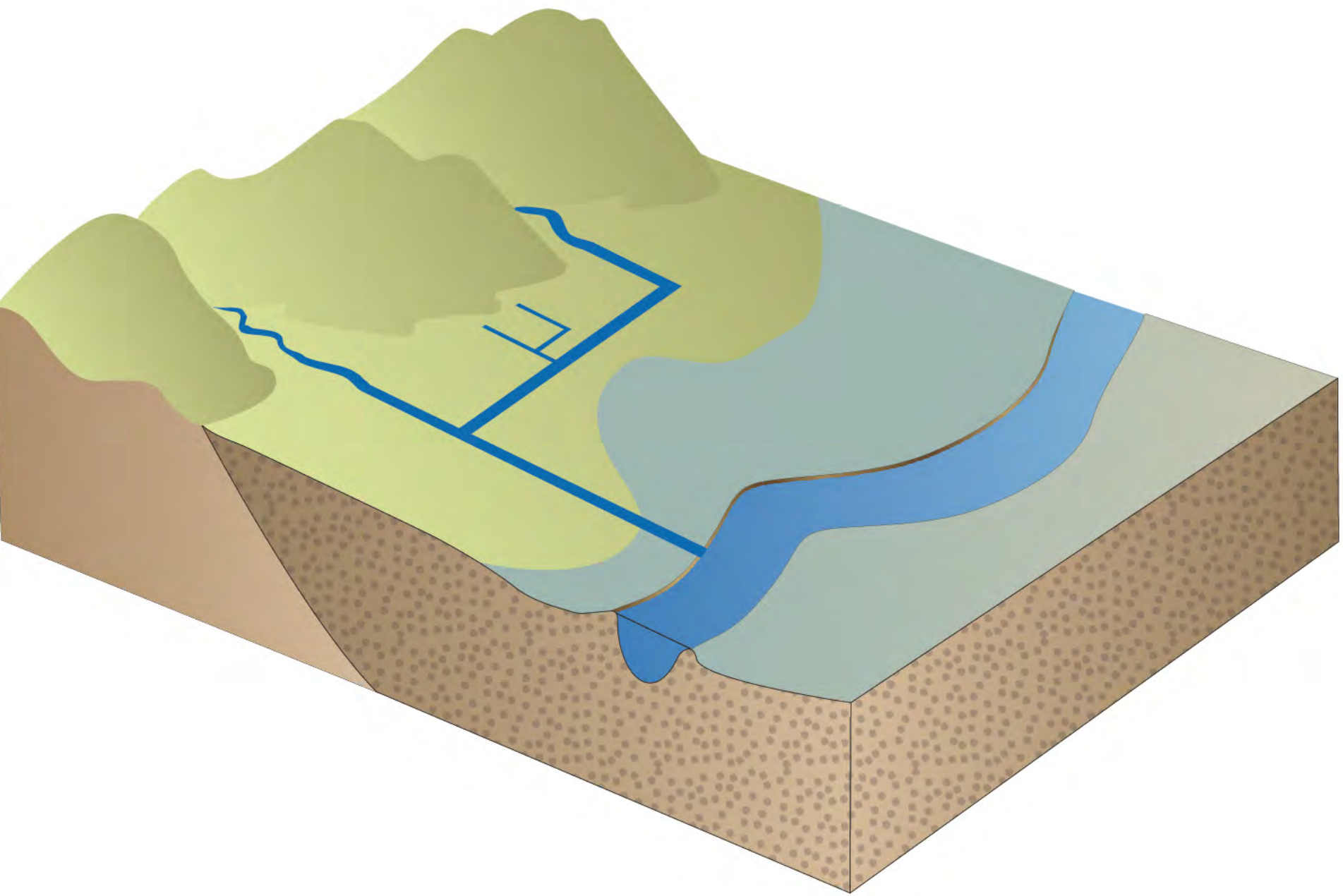
# Past close-up

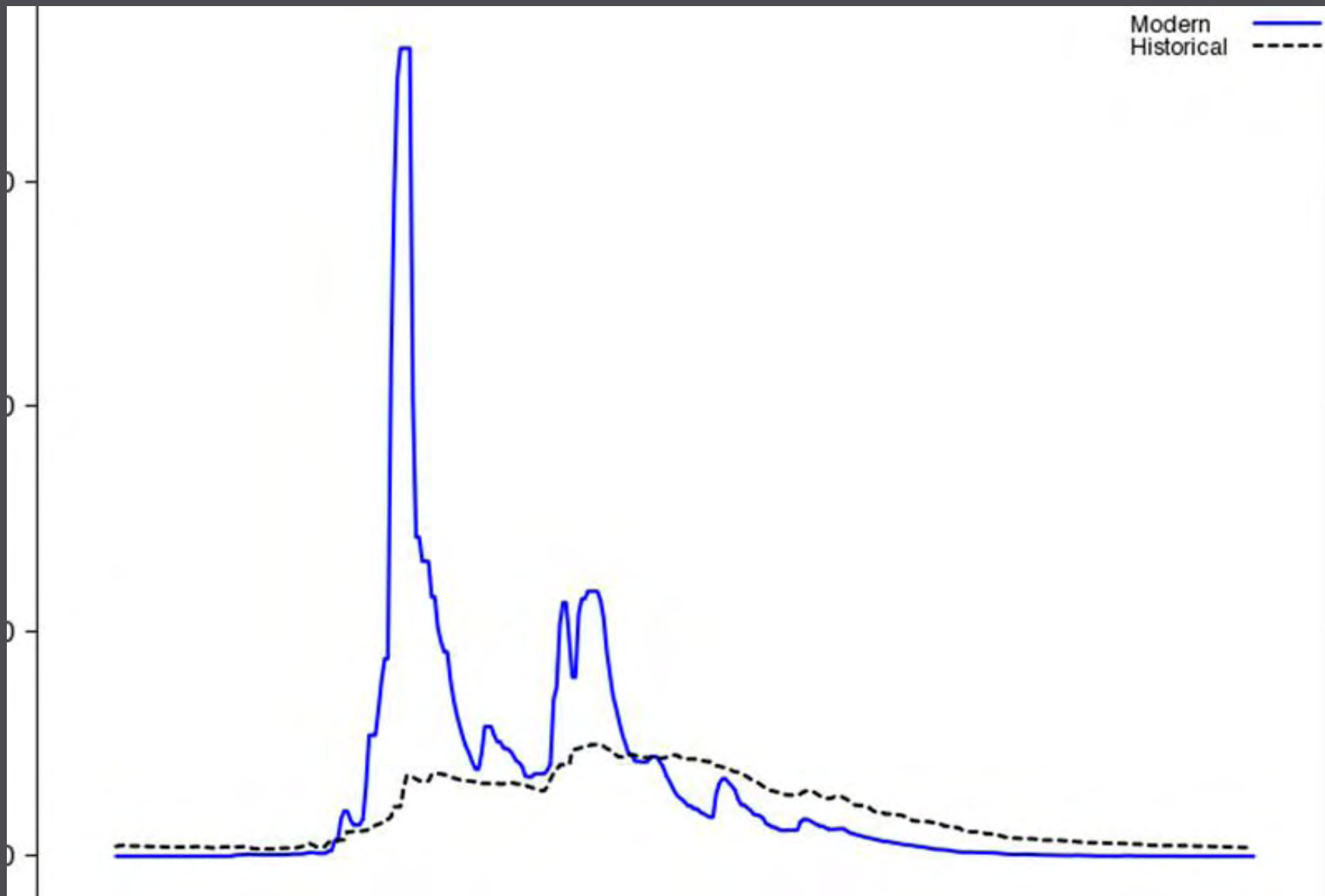
river distributaries  
ending on fans



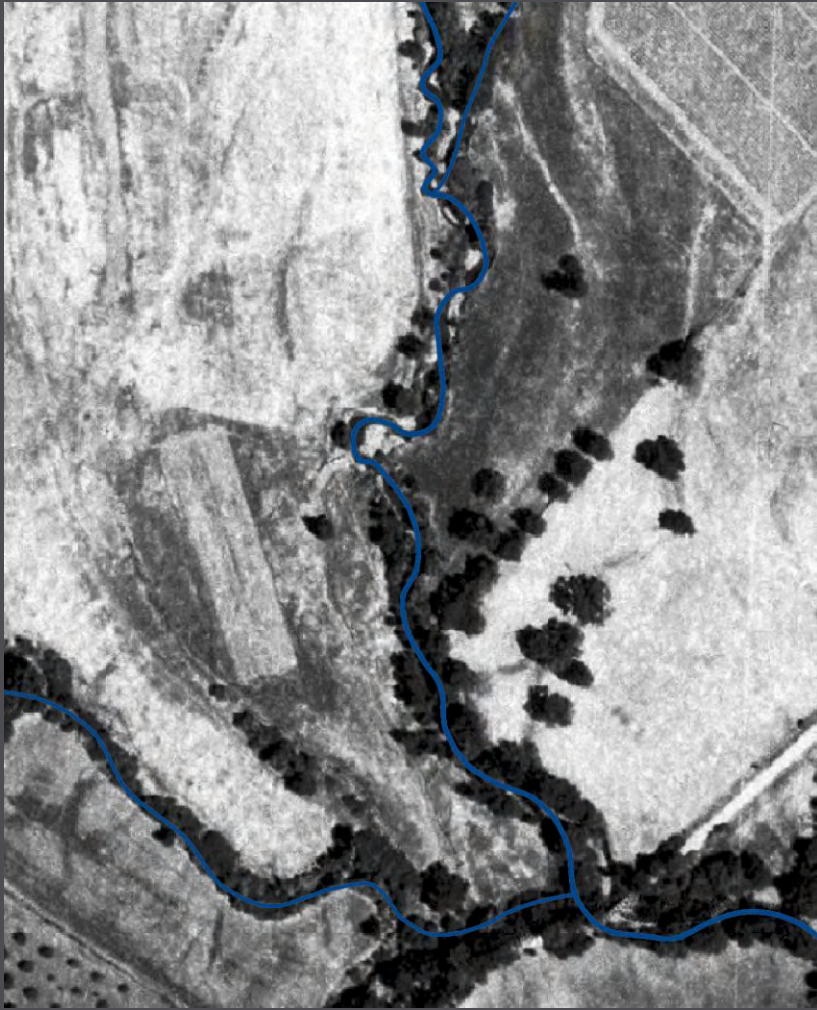
# Present-day close-up







Historical and modern annual hydrographs

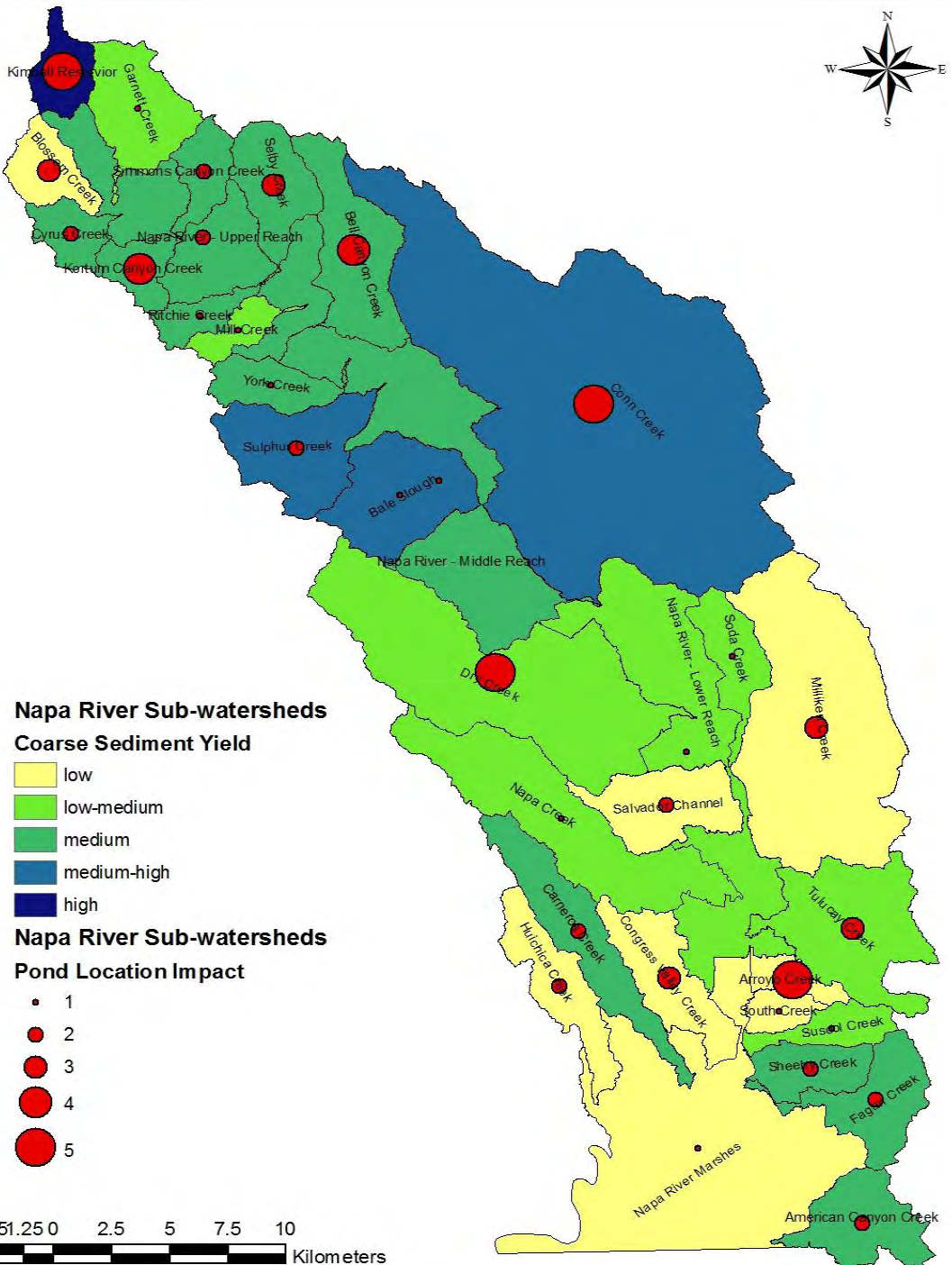




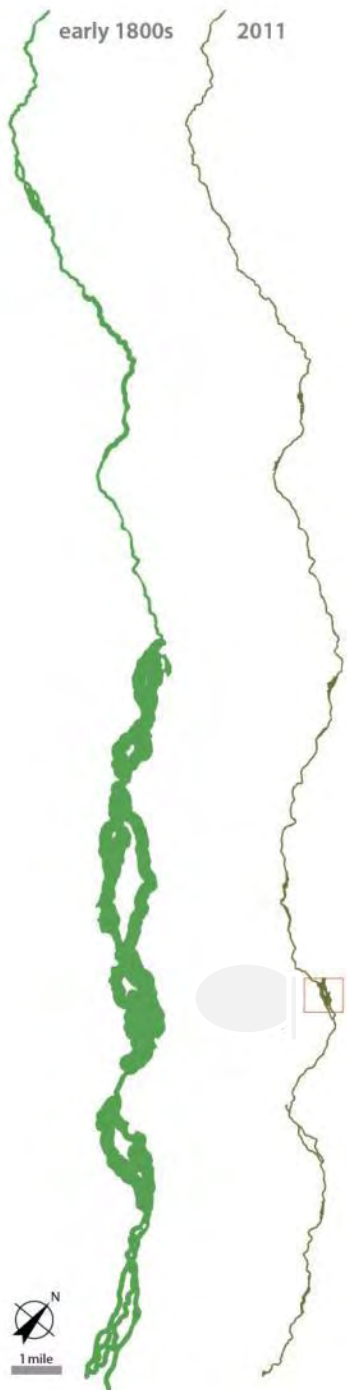




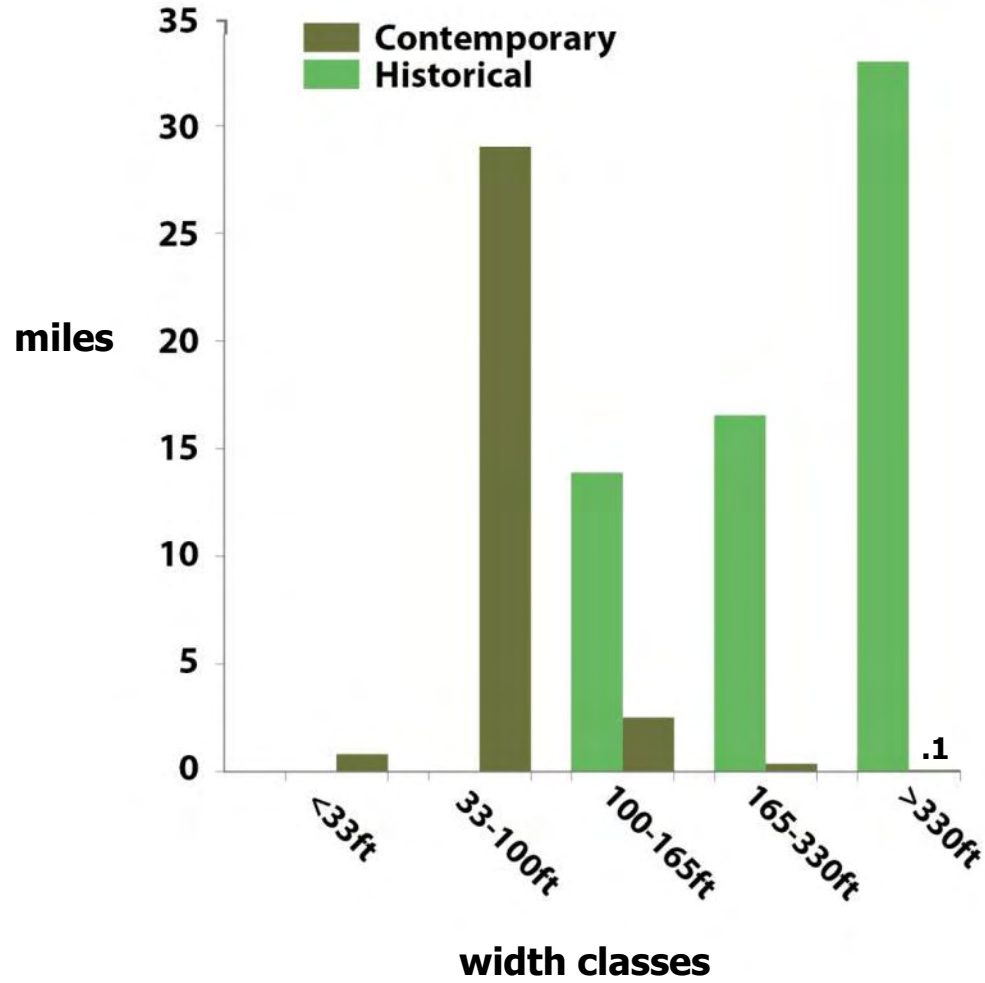








# Napa River's Riparian Forest









1852









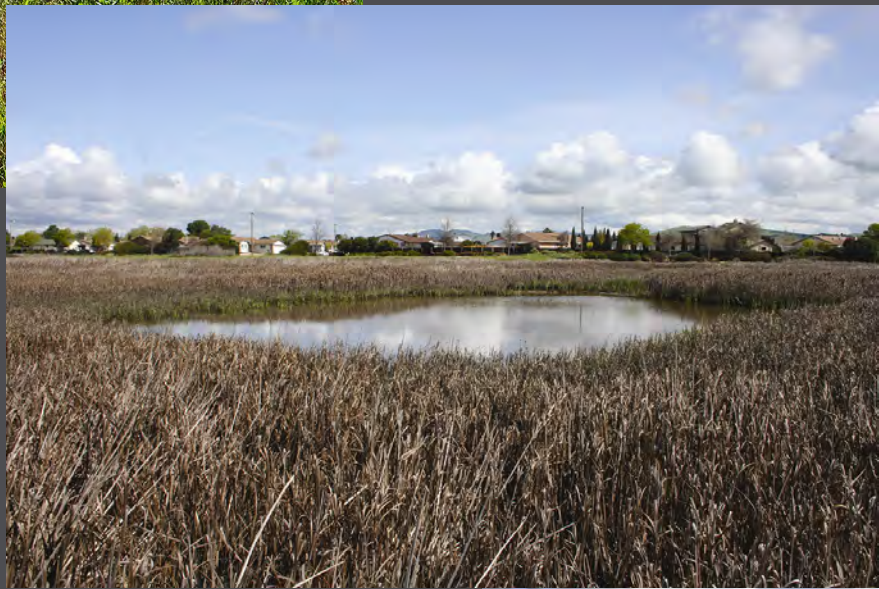






















Ted Mull







# Widening and Restoration



# Thank you

Mike Napolitano

Andy Collison

Jonathan Koehler

Gretchen Hayes

Photo Credits

Sandy Elles

Jonathan Koehler

Gretchen Hayes

Sarah Pearce









**Stag's Leap vineyard**  
**Photo courtesy of Sandy Elles**



**Juvenile steelhead and chinook salmon**  
**Photo courtesy of Jonathan Koehler**











**Monitoring at Redwood Creek**  
Photo Courtesy of Jonathan Koehler



# Paesterno stayip close-up

