Geomorphic Processes and Steelhead Habitat of the Santa Ynez River

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Processes and functions of river ecosystems are based on five components:

- Hydrology
- Biology
- Geomorphology
- Water Quality
- Connectivity

Alluvial stream channels achieve balance between;

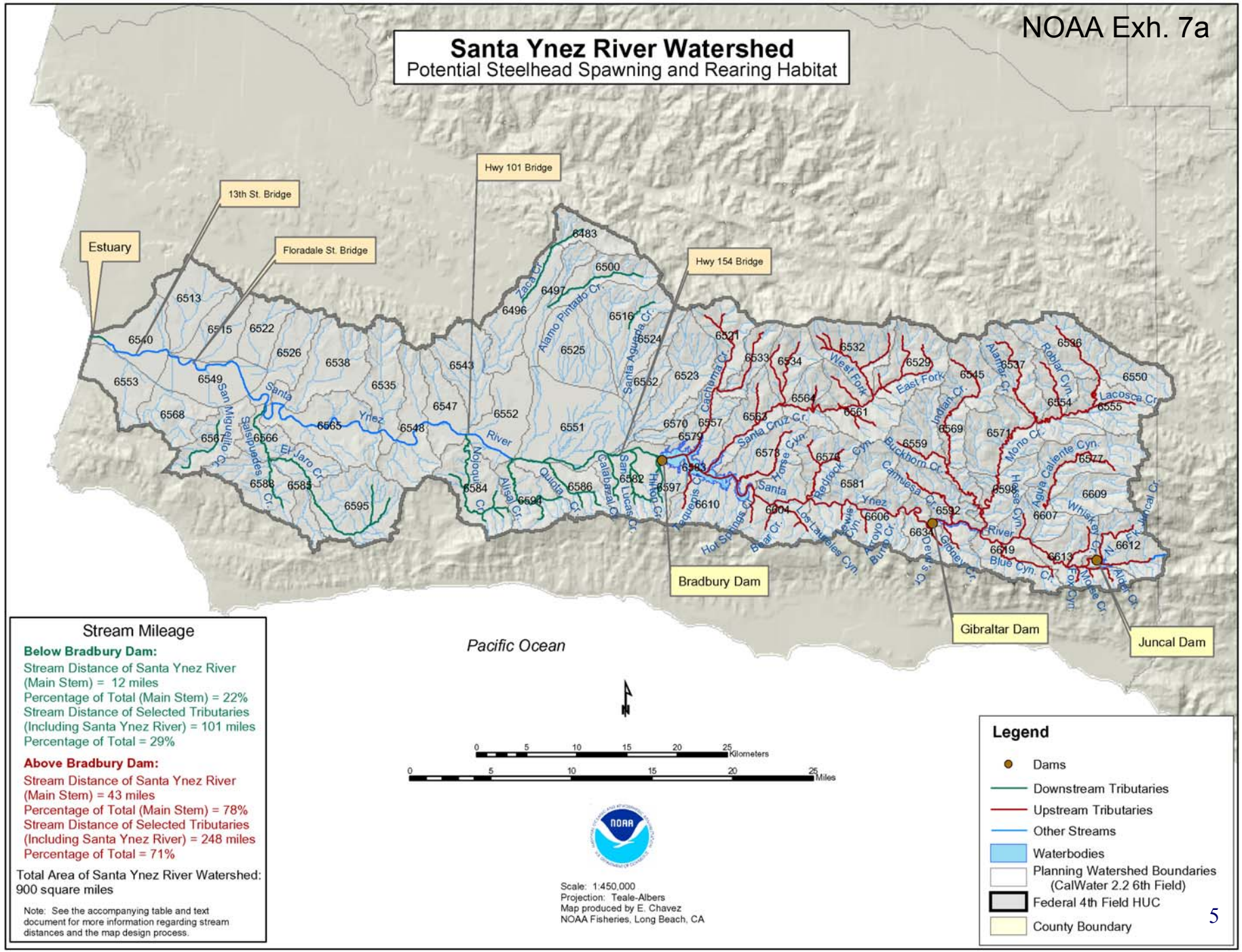
- flow (frequent flood flows, 1-5 year return interval events)
- sediment load (grain size distribution and quantity)
- nature of bed and banks

The balance is the equilibrium condition….but it is dynamic

The alluvial components of confined stream channels also achieve balance between;

- flow, sediment load, nature of bed and banks
- RESULTING IN: overall channel morphology recording rare flow events combined with streambed sediment features recording more frequent flow events

NOAA Exh. 7a


Santa Ynez River Watershed
Potential Steelhead Spawning and Rearing Habitat
Estuary
13th St. Bridge
Floradale St. Bridge
Hwy 101 Bridge
Hwy 154 Bridge
Bradbury Dam
Gibraltar Dam
Juncal Dam
Pacific Ocean
Santa Ynez River
San Miguelito Cr.
Salsipuedes Cr.
El Jaro Cr.
Mojoqui Cr.
Alisal Cr.
Quiota Cr.
Alamo Pintado Cr.
Zaca Cr.
Santa Agueda Cr.
Cachuma Cr.
Hilton Cr.
Santa Cruz Cr.
Horse Cyn.
Redrock Cyn.
Carneuesa Cr.
Buckhorn Cr.
Indian Cr.
West Fork
East Fork
Alamar Cr.
Robiar Cyn.
Lacosca Cr.
Agua Caliente Cyn.
Mono Cr.
Whiskey Cr.
Juncal Cr.
Alder Cr.
Moose Cr.
Blue Cyn. Cr.
Gidney Cr.
Bear Cr.
Hot Springs Cr.
Los Laureles Cyn.
Lewis Cyn.
Arroyo Burro Cr.
Dew of the Sea Cr.
Stream Mileage
Below Bradbury Dam:
Stream Distance of Santa Ynez River (Main Stem) = 12 miles
Percentage of Total (Main Stem) = 22%
Stream Distance of Selected Tributaries (Including Santa Ynez River) = 101 miles
Percentage of Total = 29%
Above Bradbury Dam:
Stream Distance of Santa Ynez River (Main Stem) = 43 miles
Percentage of Total (Main Stem) = 78%
Stream Distance of Selected Tributaries (Including Santa Ynez River) = 248 miles
Percentage of Total = 71%
Total Area of Santa Ynez River Watershed: 900 square miles
Note: See the accompanying table and text document for more information regarding stream distances and the map design process.
0 5 10 15 20 25 Kilometers
0 5 10 15 20 25 Miles
NOAA
Scale: 1:450,000
Projection: Teale-Albers
Map produced by E. Chavez
NOAA Fisheries, Long Beach, CA
Legend
Dams
Downstream Tributaries
Upstream Tributaries
Other Streams
Waterbodies
Planning Watershed Boundaries (CalWater 2.2 6th Field)
Federal 4th Field HUC
County Boundary

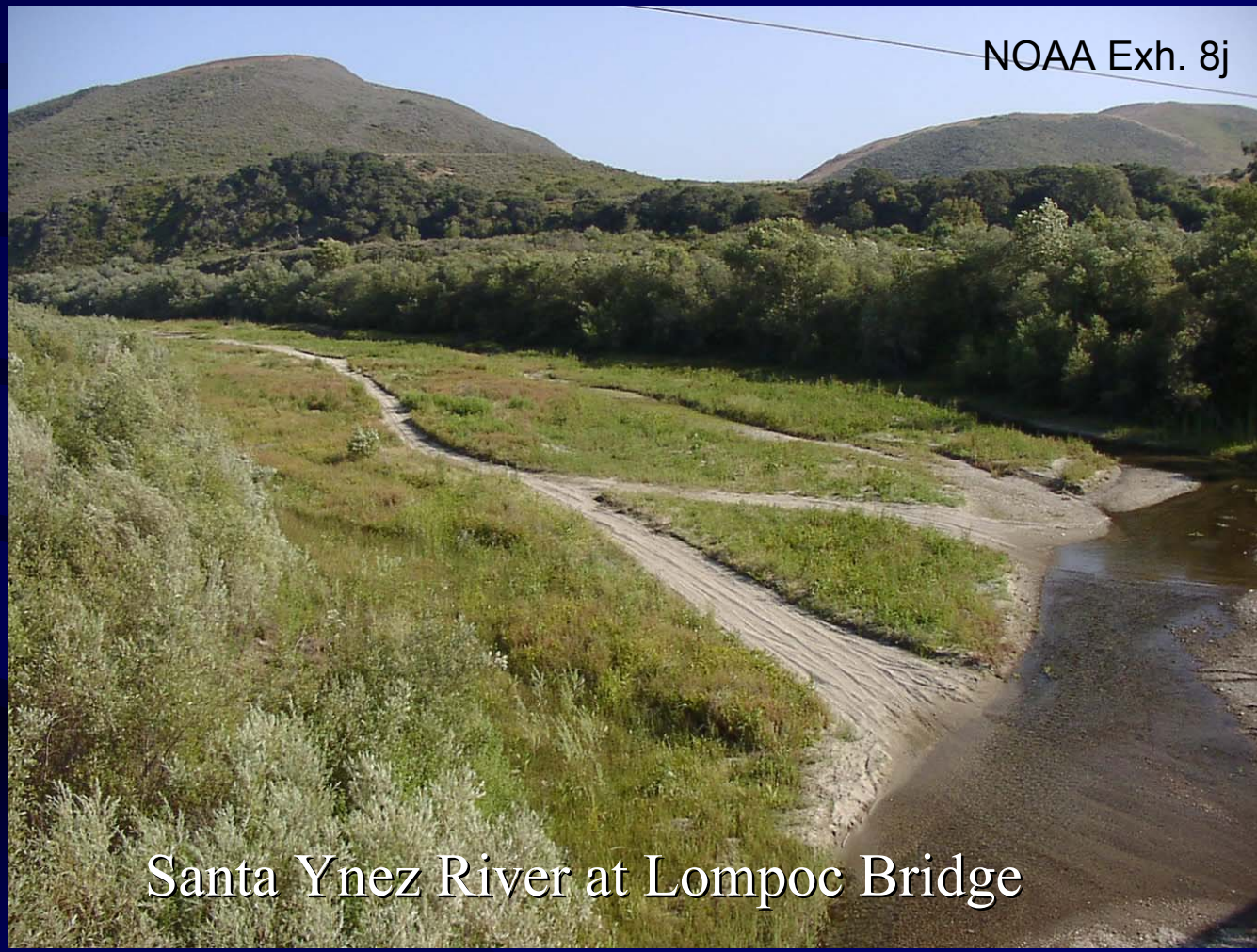
Geomorphic Setting of the Upper Santa Ynez River

- Confined cobble bedded channel ~upstream Bradbury
  - pool riffle, step pool, and boulder steps
  - bedrock influences

Santa Ynez River, at Redrock

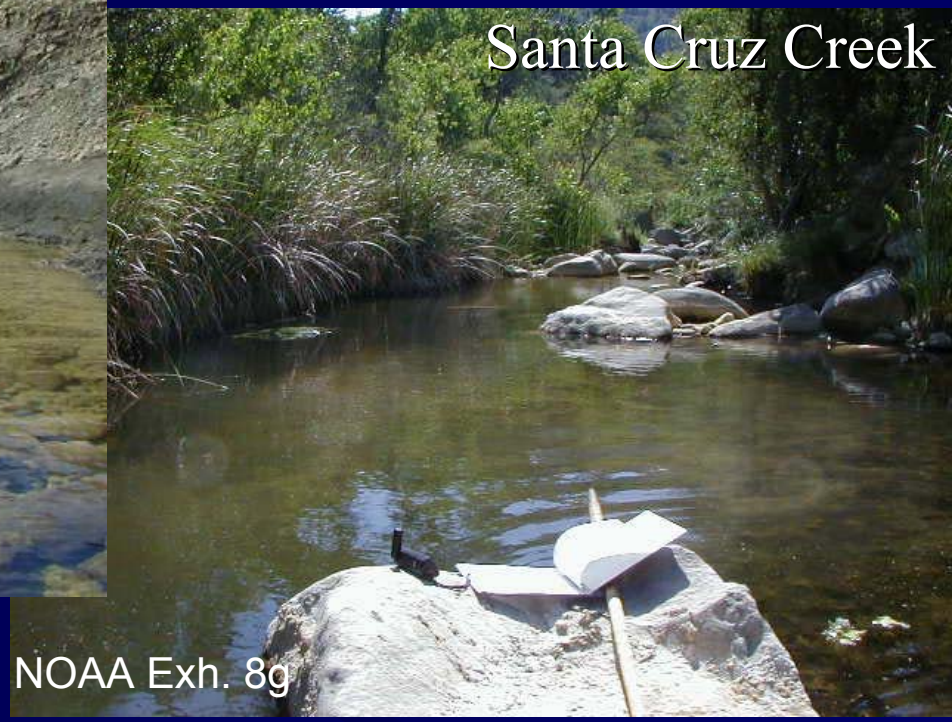
Geomorphic Setting of the Lower Santa Ynez River

Unconfined sand
- gravel
bedded
~downstream
narrows
  – meanders, alternate bars, riffle pool complexes



alluvial channel versus alluvial components of confined channels

Tributaries of the Santa Ynez River



- Steep and confined
  - step pool, boulder and bedrock influenced
- with slope transitions in unconfined mainstem reach
  - meandering, alternate bar riffle-pool complexes

Dams Regulate:

Flow of Water

- Reservoir size relative to watershed yield
- Operational scheme

& Flow of Sediment

- Sediment yield and trap efficiency

thus upsetting the balance between effective flows and sediment supply

The responses of stream channels to flow and sediment regulation are complex.

Management of regulated systems requires site specific knowledge.

Information is needed on how fish habitat changes followed channel changes caused by flow regulation and sediment trapping in the reservoirs.

This information is fundamental !

Santa Ynez River downstream from Bradbury Dam

- Investigate channel changes since completion of Bradbury Dam: riparian, geomorphology, etc.
- Relate channel changes to fish migration habitat.
- Mimic historic channel forming flow regime to determine how channel and fish habitat may improve.

….downstream from Bradbury (continued)….

- Determine where tributary sediment inputs ‘balance’ with transport capacity.

- Assess potential to improve migratory habitat by managing releases to shift ‘balance’ point upstream or downstream.

….downstream from Bradbury (continued)….

Reduced flood flows can cause tributary mouths to accumulate coarse sediment.

- Investigate the tributary mouths for evidence of accumulation.

- Relate to fish passage success.

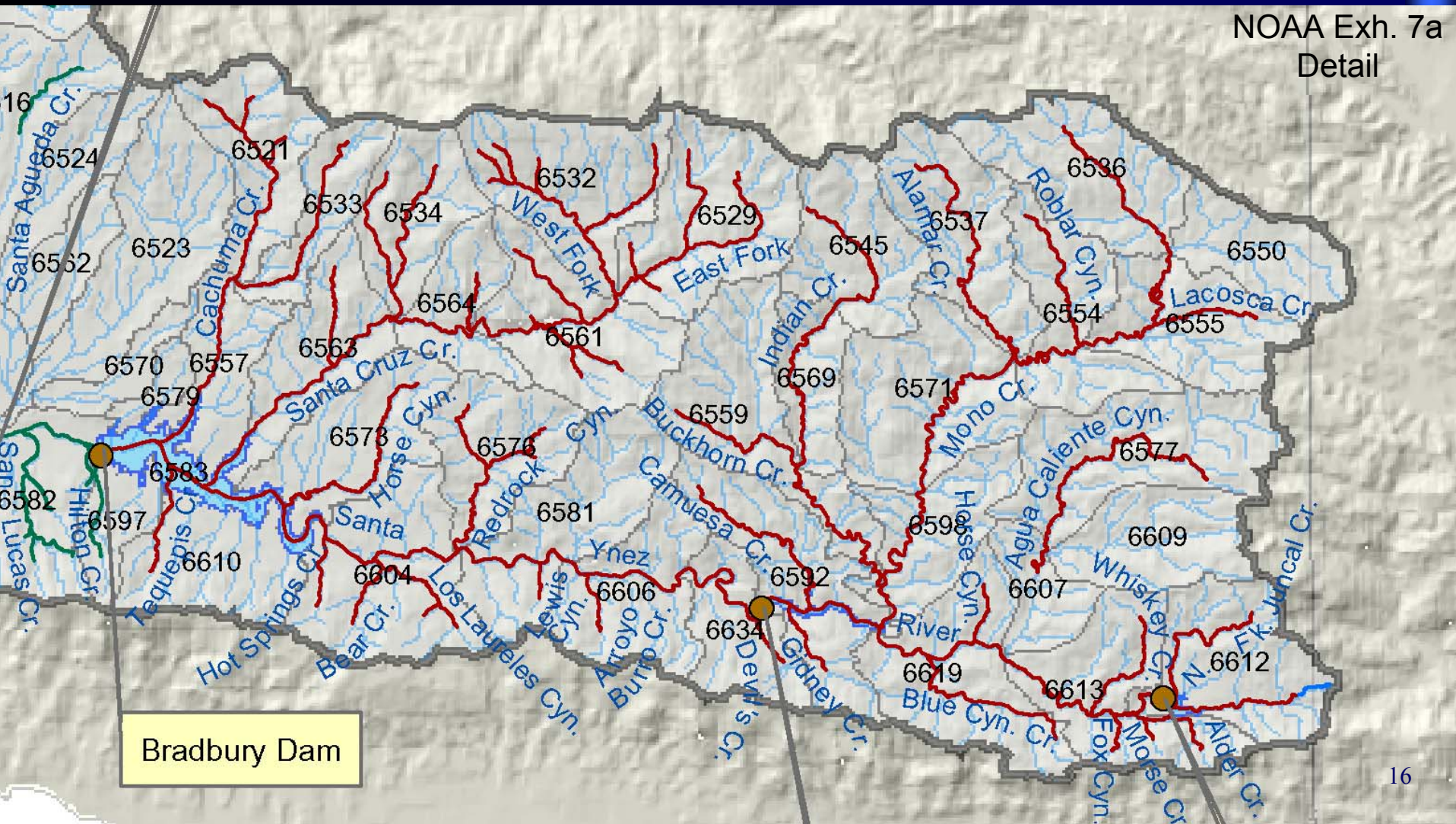
Santa Ynez River upstream from Bradbury Dam

Juncal and Gibraltar dams trap coarse sediment.

They have little flood flow regulation effect.

Result: sediment starvation leads to armoring and / or bed degradation, effecting fish habitat.

Upper Santa Ynez River



….upstream from Bradbury (continued)….

- Investigate the sediment trap efficiency of both reservoirs for the stored sediment size ranges.
- Determine the reduction in downstream sediment supply.
- Compare pre- and post-dam channel morphology, substrate, and habitat conditions.

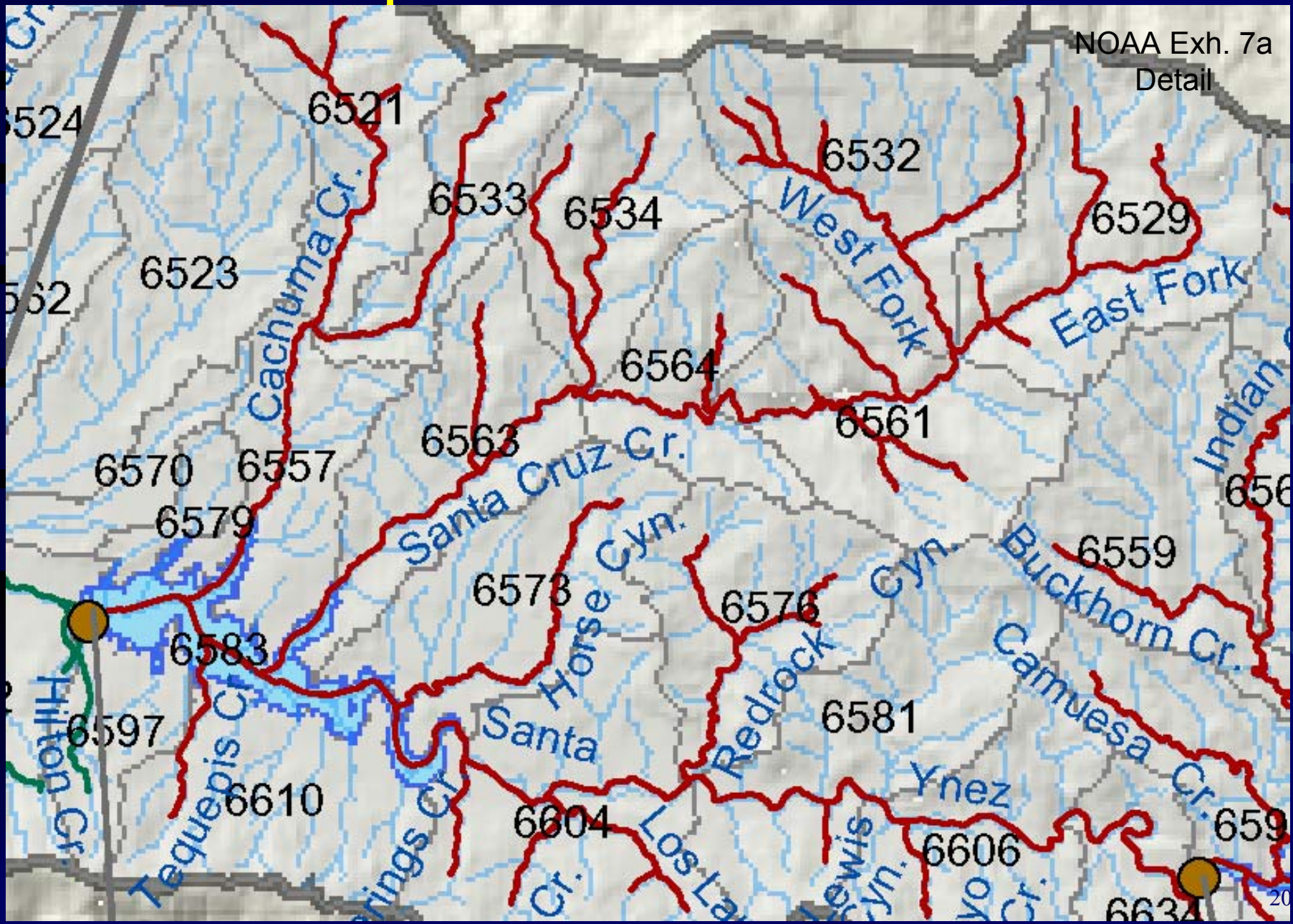
Tributaries upstream from Bradbury Dam

- Assess tributary confluences for evidence of headcutting or channel armoring.
- Relate to fish passage and habitat modification.

Tributaries within the Cachuma impoundment

- Assess tributary confluences for evidence of headcutting, channel degradation, or accumulation of sediment deltas.
- Relate to reservoir levels and operations.
- Relate to fish passage difficulties.

Impounded Tributaries



The Santa Ynez River system provides a complex of physical habitats which are most pronounced below and above Bradbury Dam.

These physical differences are reflected in the distribution of steelhead habitats of the Santa Ynez River steelhead runs.

Recognizing these distinct physical habitats and managing them is essential for the effective restoration and maintenance of the Santa Ynez River steelhead runs.