

*Coastal Watershed Planning and Assessment Program
and
North Coast Watershed Assessment Program*

Redwood Creek Basin Assessment

May 2006



State of California
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California Resources Agency
Secretary, Mike Christman

California Environmental Protection Agency
Secretary, Alan Lloyd

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NCWAP Products

- Salmonid Fishery Status Review
- Analysis of Aquatic Habitat Conditions
- Geologic Evaluation
 - Landslide and Relative Landslide Potential Maps
- Descriptions of Historic and Current
 - Vegetation
 - Water Quality
 - Land Use
- Integrated Analysis
- Recommendations to Improve Stream Habitat Conditions



Redwood Creek Salmonids

Key Issues and Summary Findings

- **Redwood Creek's salmonid stocks are critically important resources**
- **Salmonid populations are less abundant and less widely distributed compared to their historic presence in the basin.**
- **Impairments to freshwater and estuarine habitat needed to complete freshwater life cycles have been identified as a leading factors in the decline of Redwood Creek's anadromous salmonids.**

Key Issues and Summary Findings

- **There are patches (refugia) of good quality salmonid habitat throughout the basin!!!**

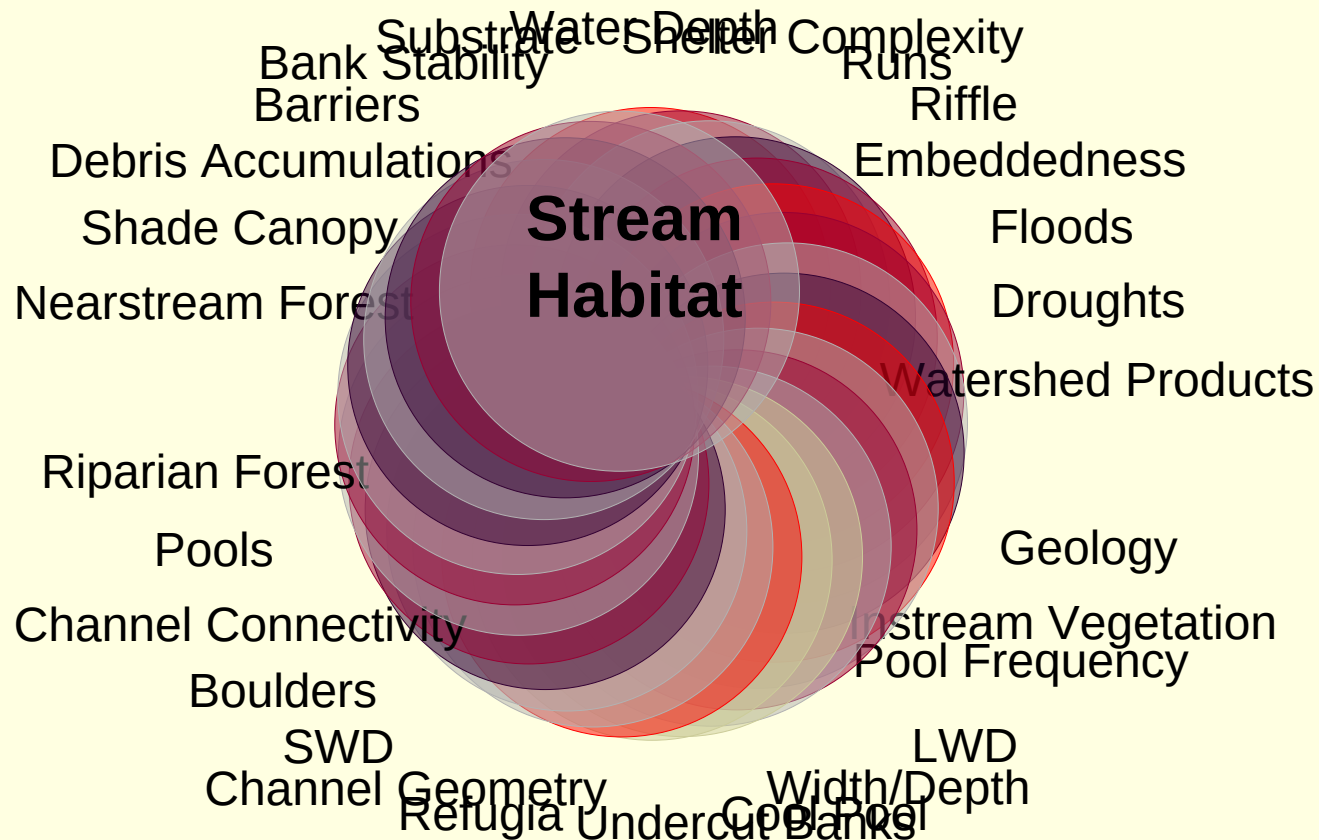
Basin Scale Supporting Factors

- Refugia Habitat in all Subbasins
- Core Salmonid Populations
- RNSP Management of 1/3 the Basin
- Watershed Restoration Efforts Basin Wide

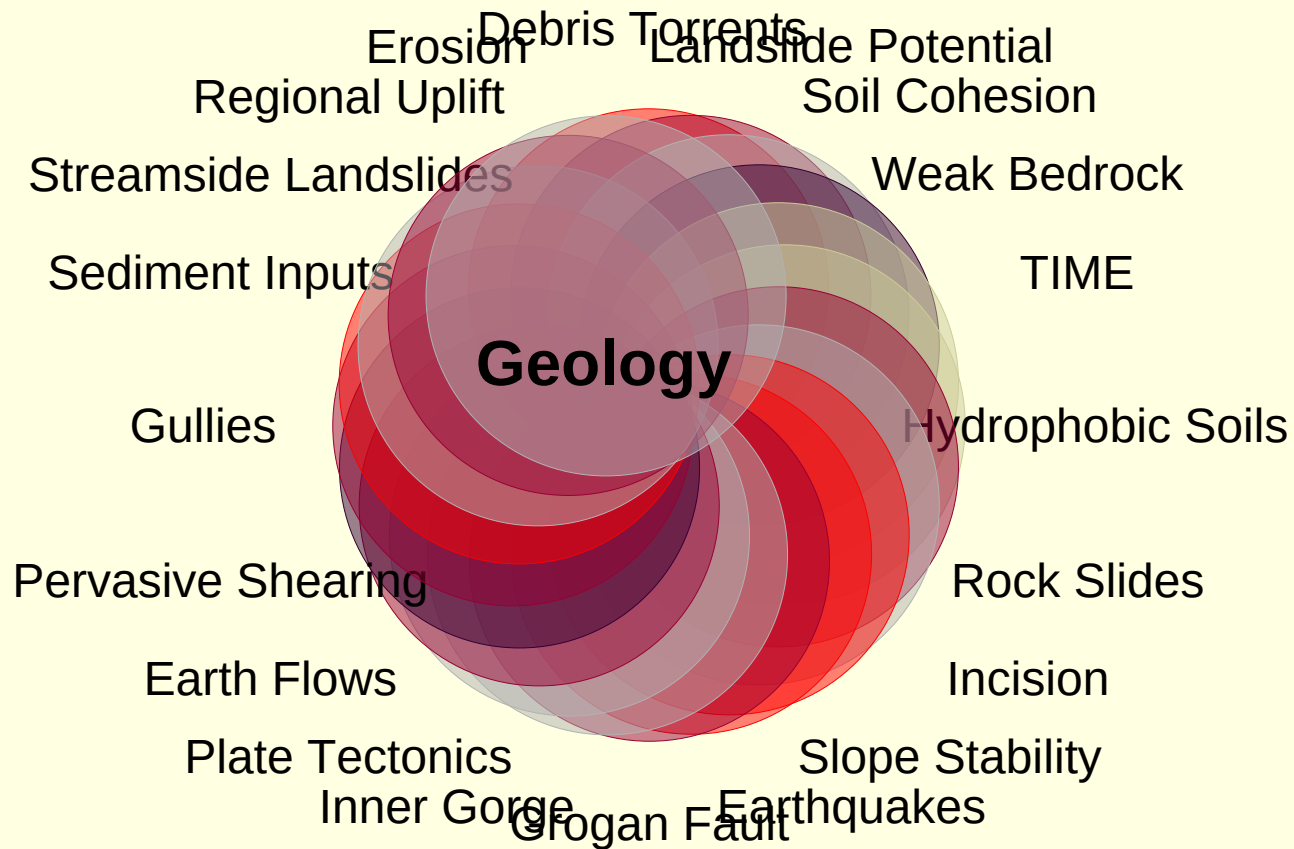
Basin Scale Limiting Factors

- Warm water temperature in mainstem Redwood Creek
- Many tributaries lack the combination of structural components that create habitat diversity and complexity
- Large reduction in area and habitat quality of the estuary/lagoon

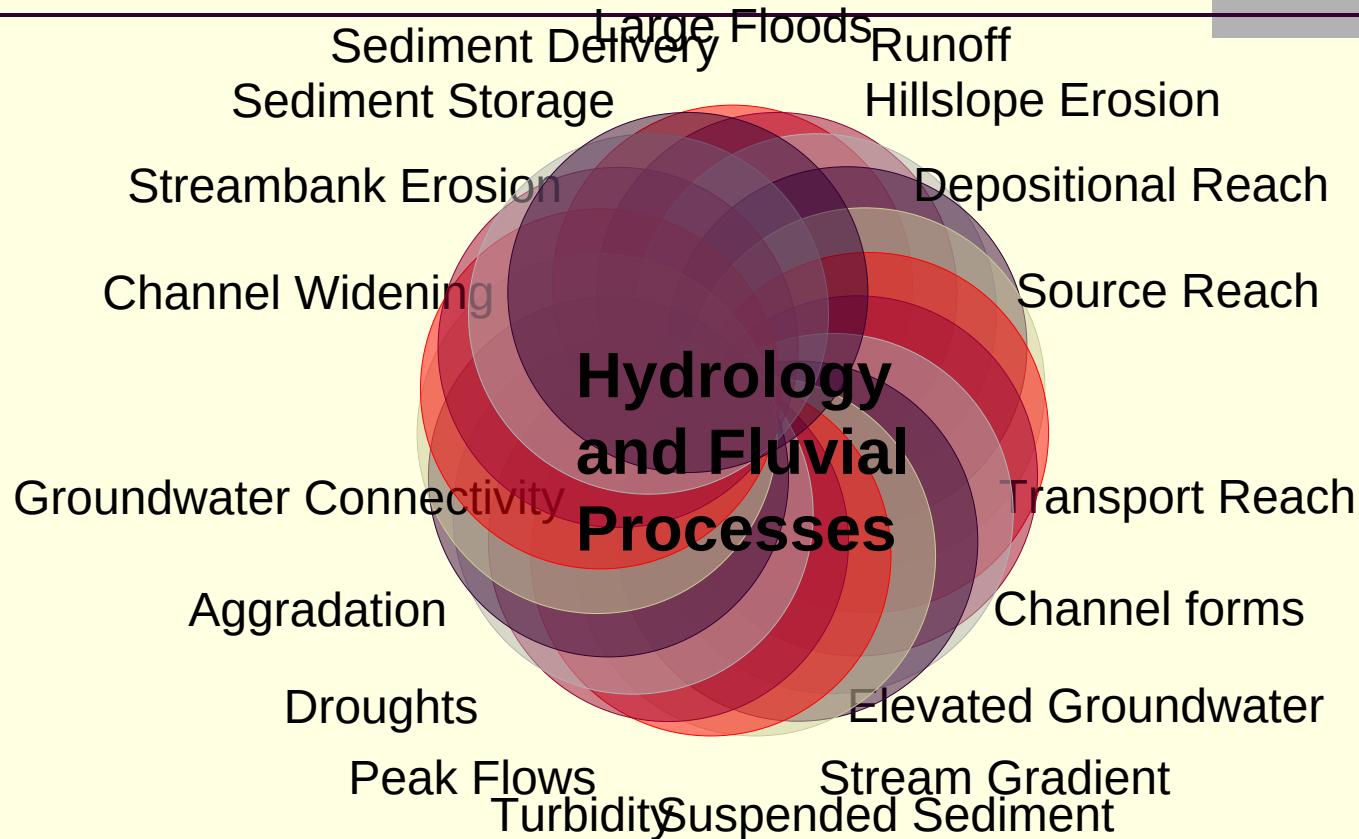
Stream Habitat Forming Elements, Processes and Links to Watershed Conditions



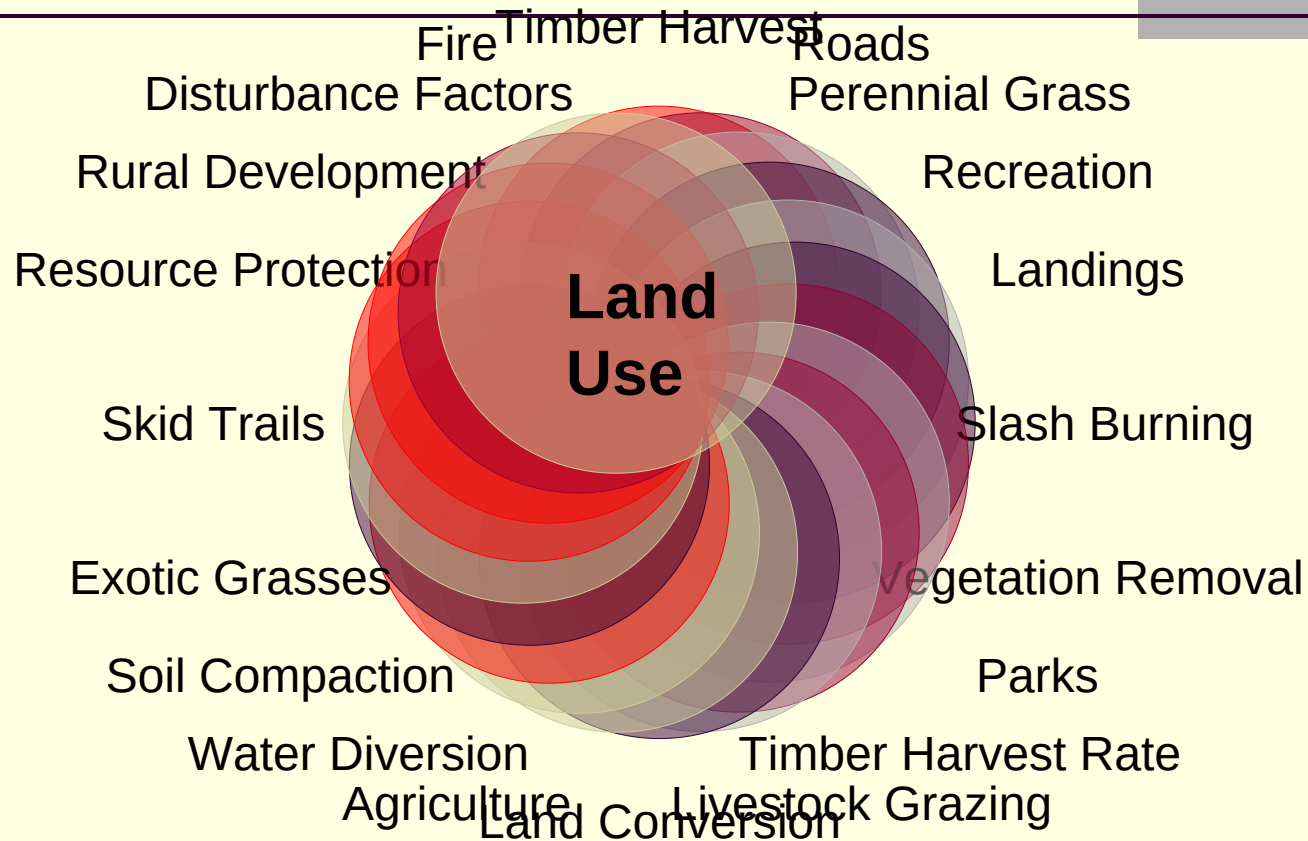
Stream Habitat Forming Processes and Elements



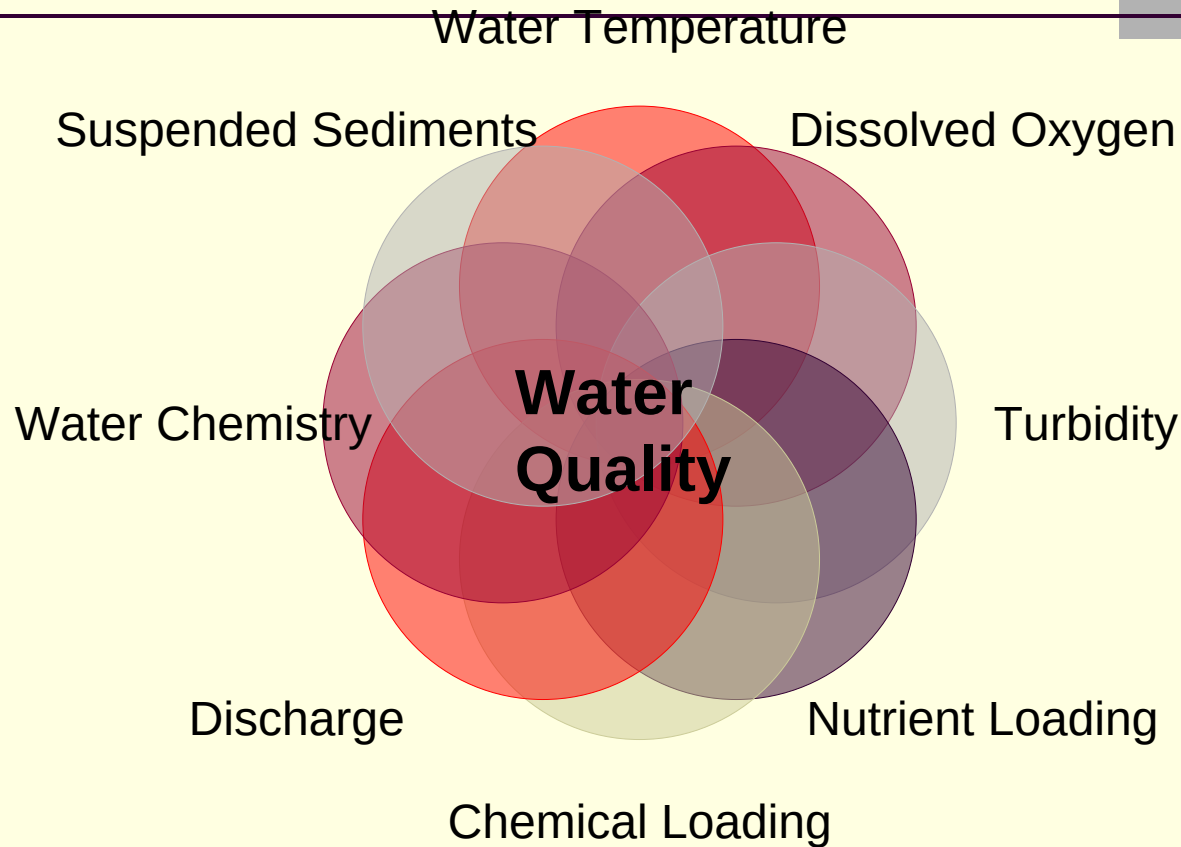
Stream Habitat Forming Processes and Elements



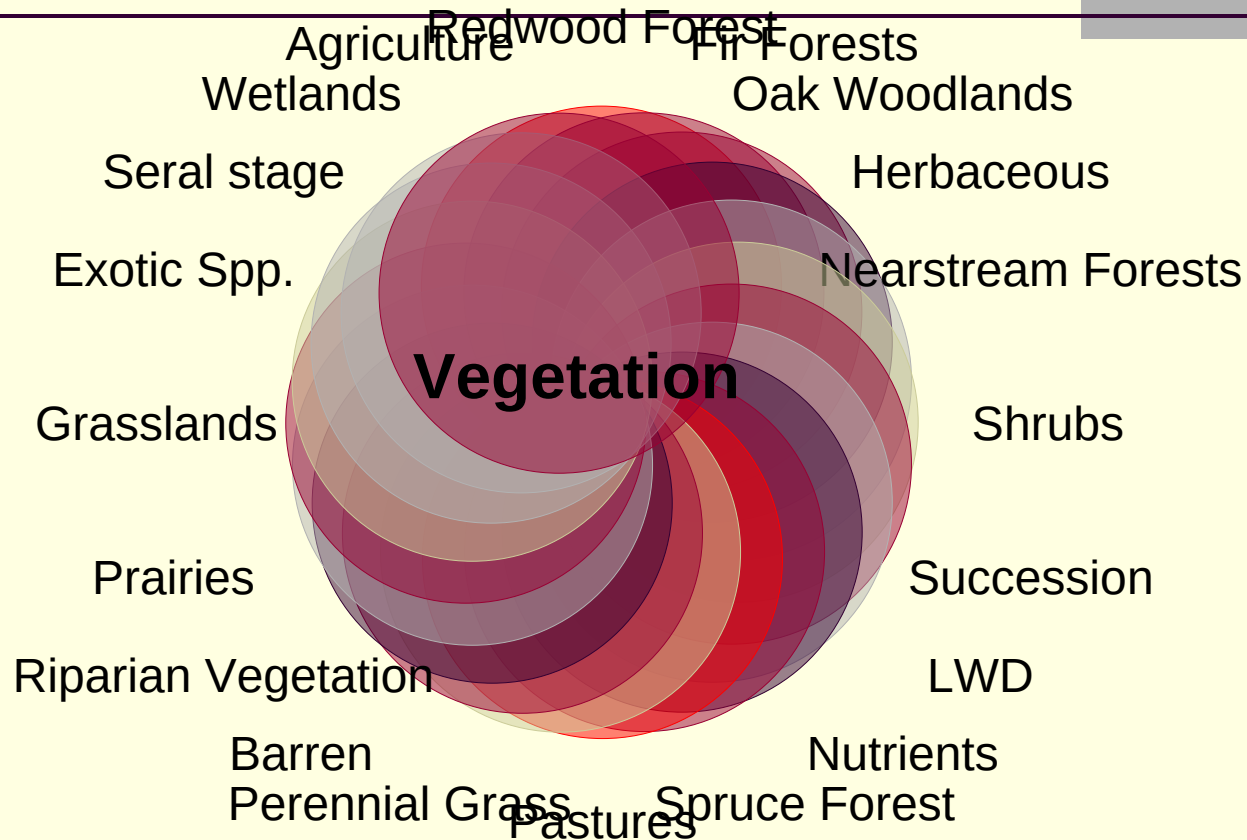
Stream Habitat Forming Processes and Elements



Stream Habitat Forming Processes and Elements



Stream Habitat Forming Processes and Elements



Four primary factors that affect stream conditions

- 1) The Redwood Creek Basin is naturally susceptible to erosion
- 2) Large winter storm events initiate erosion processes on the landscape
- 3) Land management actions that increase erosion potential or accelerate runoff that results in excessive sediment input to streams;
- 4) Land management actions in riparian and nearstream forests that reduce shade canopy, reduce bank stability, reduce LWD loading potential, and impair air cooling, microclimate effects

Findings

- The present habitat problems observed in most streams of the basin are related to excessive sediment in stream channels and/or the lack of a large conifer contributions from riparian and nearstream forests;
- The negative impacts from excessive sediments are in some cases exacerbated by the general lack or accumulations of instream large wood debris (LWD);

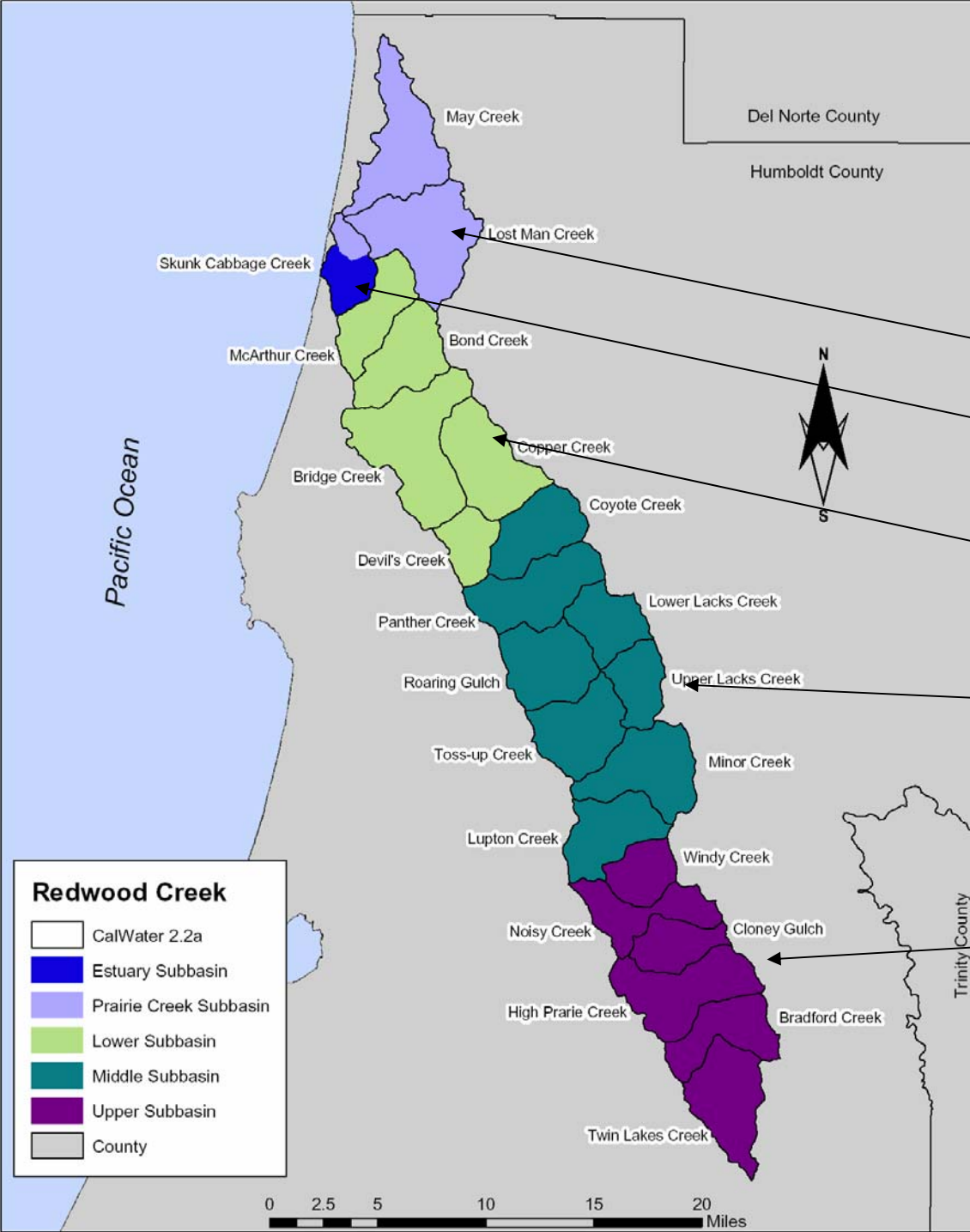
Basin Scale Recommendations

- Identify and treat sources of excessive sediment inputs to stream channels
- Promote growth and retention of large conifers in riparian and nearstream forests
 - Thin from below where appropriate
- Consider adding LWD and SWD as channel forming elements and to increase shelter complexity

Basin Scale Recommendations

- Increasing salmonid abundance and distribution in the Redwood Creek are vital steps to restoring viable populations in California
- A long term, concerted monitoring effort between land owners, interested parties and responsible agencies is needed to determine the status, abundance and trends of anadromous fish populations of Redwood Creek

Subbasins: composed of planning watersheds that have common physical, biological, and/or cultural attributes.



PRAIRIE CREEK

ESTUARY

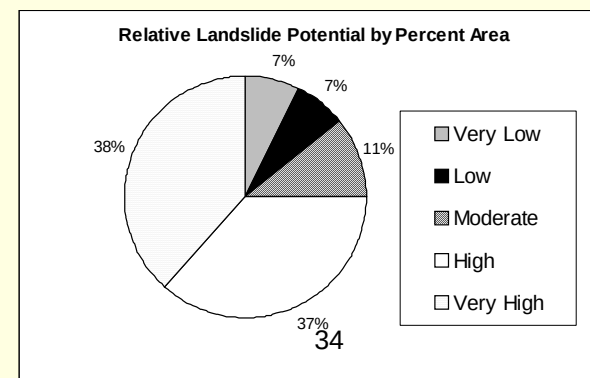
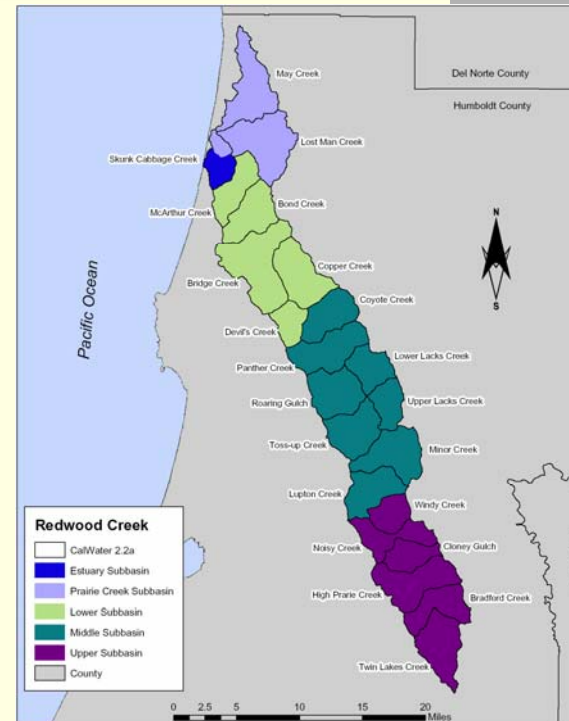
LOWER

MIDDLE

UPPER

Percent Area in High + Very High Landslide Potential

Redwood Basin	72 %
Estuary	49%
Prairie Creek	56%
Lower	71%
Middle	80%
Upper	73%



Middle and Upper Subbasin Nearstream Forest Condition

- A 150 foot buffer width along each bank of fish bearing reaches is 75% composed of trees less than 24 inches in DBH.
- Thirty-five percent of the area was composed of trees less than 12 inches DBH.

Upper Subbasin Issues and Summary Findings

- Suitable water temperature along the uppermost mainstem Redwood Creek provides good juvenile rearing habitat
- The water temperatures begin to increase quickly between Minon Creek confluence and O'kane gauging station to above desirable levels
- Water temperature in Upper Subbasin tributaries are generally suitable for juvenile rearing
- There is a lack of deep and complex pools in tributary streams and mainstem Redwood Creek

Upper Subbasin Recommendations

- A high priority should be placed on reducing the channel width and re-establishing riparian shade and along portions of the upper reach of Redwood Creek
- Consider debris accumulation modification on Lake Prairie Creek
- Add instream shelter complexity where possible

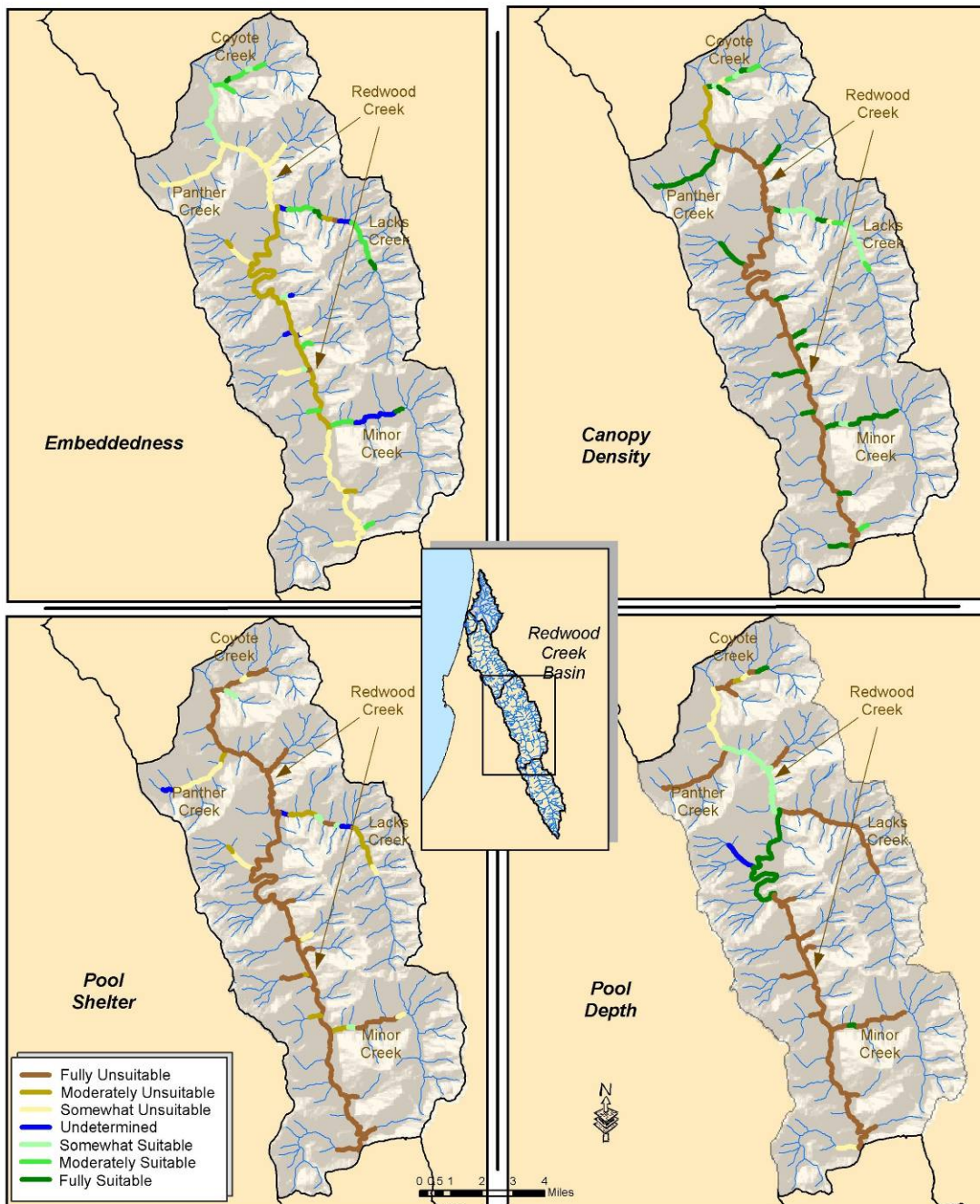


Middle Subbasin Issues and Summary Findings

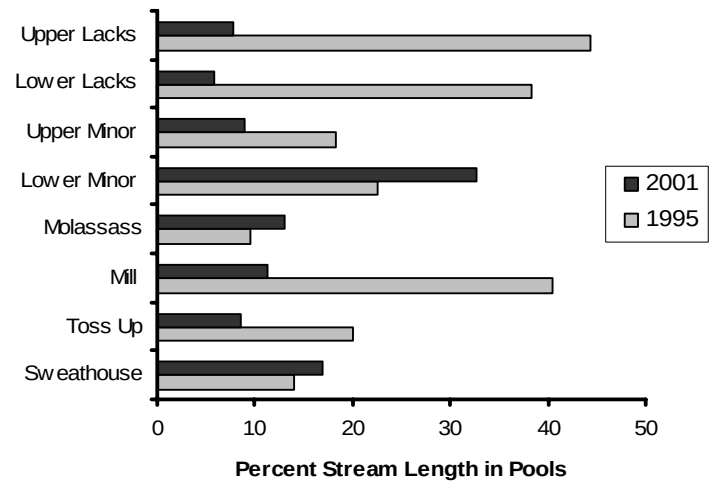
- Coho salmon, once noted as abundant in tributaries (Coyote, Lacks, Minor, Panther others), were not detected in 2001 surveys
- Potential access problems from sediment deltas (Panther Creek)
- Summer water temperatures in tributaries are generally good, but become marginal in the lower reaches (Lacks, Minor and Coyote)
- Tributary streams lack sufficient habitat area in deep, well sheltered pools
- Most tributaries have less than a desirable amount of good spawning habitat.
- Elevated summer mainstem water temperature
- Low amounts of instream shelter elements in mainstem



EMDS Model Results Middle Redwood Creek Subbasin



Percent Stream Length in Pools 1995 vs 2001



Ratios of Pool : Riffle : Run

2001 Stream Surveys

Stream	Survey Length (ft)	Percent Occurrence	%Stream Length	BFW:Pool
Coyote	11,282	37:33:28	26:33:37	4:1
Lacks (Lacks 95)	24,262 (15,147)	15:52:33 (43:15:41)	8:63:29 (41:9:49)	15:1
Minor (Minor 95)	14,418 (14,046)	28:39:33 (25:31:45)	17:44:38 (21:26:53)	10:1
Panther	14,504	46:35:17	33:37:28	6:1
Redwood	130,874	59:16:25	52:12:36	

Trapping and Spawner Data

- **%Survival of eggs to fry to trap**
 - 2001 pop est. $378,000 \pm 42,721$
 - 95 redds in 18 mi.(of 28 mi.) above trap
 - 5.3 redds per mile above trap
 - $28\text{miles} \times 5.3\text{redds} = 148\text{ redds above trap}$
 - $148 \times 4,000 = 592,000\text{ eggs}$
 - $378,000 \pm 42,721 \div 592,000 \times 100 =$
 - **64% survival (95%CI range = 57-71%)**

Middle Subbasin Recommendations

- Investigate improving fish passage through 500 foot long culvert under HWY 299 on Lupton Creek
- Identify and modify sediment deltas or boulder accumulations that impede upstream migration into tributaries
- Modify large debris accumulations that may impede fish passage on Panther Creek and other tributaries (completed by Green Diamond and the California Conservation Corps in 2004).
- Reduce water temperature in the middle reach of Redwood Creek and the lower reaches of tributary streams
- Add wood into pools and flatwater units to increase shelter complexity, deepen and increase the size of existing pools in tributary streams

Lower Subbasin Issues and Summary Findings

- Elevated summer water temperature and lack of channel shelter complexity are factors most limiting juvenile anadromous salmonid production in lower mainstem Redwood Creek.
- These limiting factors are products of channel aggradation and associated impacts such as a widened channel, lack of shade over the water, and lack of LWD.
- Lower Subbasin tributaries provide water temperature that supports salmonids;

Lower Subbasin Recommendations

- Strategically add wood into pools and flatwater units to increase pool depth and overall shelter complexity in Bridge, Elam, Forty-four creeks and other streams within the subbasin that lack deep complex pools
- Consider adding shelter elements to existing cool temperature refuge sites on Redwood Creek

Prairie Creek Subbasin Issues and Summary Findings

- The Prairie Creek Subbasin supports self sustaining populations of Chinook and coho salmon, steelhead and coastal cutthroat trout.
- Under RNSP management, protection is given to natural resources and refugia habitat that are important to the recovery and expansion of anadromous salmonid populations of the Redwood Creek Basin.
- Debris jams on Lost Man Creek may impede fish passage
- Overall, the best stream habitat of the subbasin was found in areas that received the least amount of land disturbance.

Prairie Creek Subbasin

Recommendations

- Modify large debris accumulation on Lost Man Creek to improve passage of spawning adults.
- Consider adding pool enhancement structures to increase the number of pools or deepen existing pools in Lost Man Creek, May Creek, and Boyes Creek.

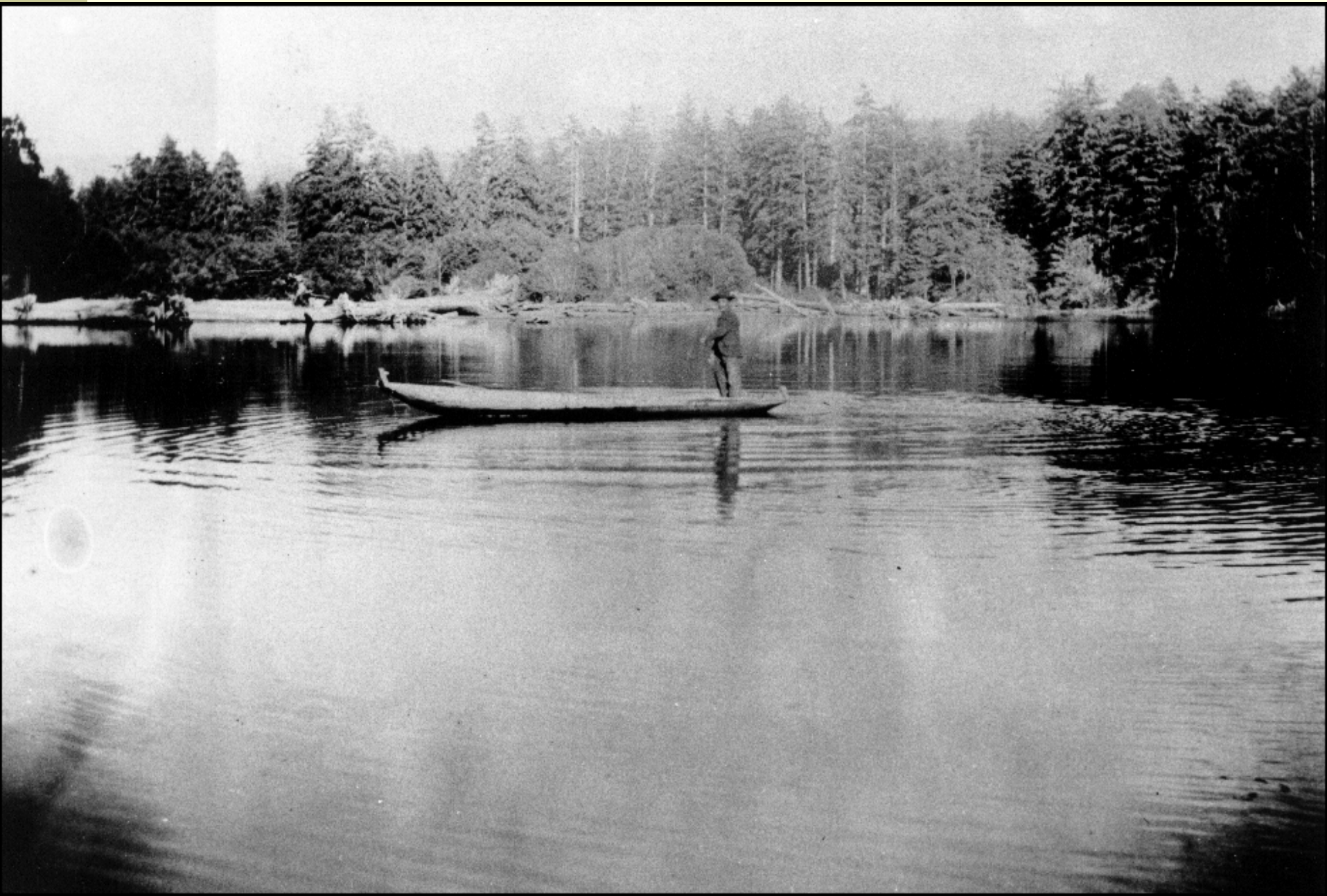
Estuary Subbasin Issues and Summary Findings

- Juvenile salmonid rearing success is limited by poor estuarine habitat conditions
- The estuary/lagoon once supported an abundant, year round population of coastal cutthroat trout
- Survivorship is very low (estimates of 7-15%) for juvenile Chinook and steelhead that rear in the lagoon through the summer
- The fish rearing area of the Redwood Creek estuary/lagoon has been reduced by 50 to 75%
- Habitat shelter complexity is low due to a lack of riparian vegetation and LWD
- Dissolved oxygen levels can be at stressful or lethal levels in the slough channels

Redwood Creek Estuary Fish Sampling - Summer/Fall 2000

Date	Mouth	Chinook Population Estimate	95% CI	Ave FL
June 5,6,8	Open	55,640	± 17,710	72
July 17,18,20	Closed	18,350	± 20,490	74
Sept 11,12	Closed	2,910	± 950	94
Oct 26	Closed	na	na	111







Estuary Subbasin Recommendations

- Use levee set backs, reconfiguration, or levee removal strategies to develop a wider flood plain to restore natural sinuosity, improve connectivity with sloughs and adjacent wetlands
- Promote the development of an effective corridor of riparian vegetation
- Increase structural complexity in the main channel and slough channels
- Where feasible add LWD to increase salmonid shelter complexity
- Leave large wood in estuarine channels, on the beach, and on stream banks for potential recruitment as instream habitat

Improvement in the Redwood Creek Basin

■ ***Advantages***

- Approximately one third of the basin is managed by RNSP to preserve natural resource values
- An interdisciplinary team of watershed scientists from the Redwood Creek Land Owners Association are working together to solve watershed problems
- A basin wide effort is near completion to perform road assessment and road implementation projects
- Several in basin studies have shown relationships between land use, geology, climate, and stream conditions.

Improvement in the Redwood Creek Basin

■ ***Challenges***

- Land use on the basin's unstable geology will require careful planning and mitigation to prevent large scale sediment generating floods like seen in the past
- A watershed wide cooperative land-base needs to be maintained, so treatment options can be implemented at a basin scale.
- The present reduced numbers of coho salmon and summer steelhead populations limit re-colonization potential into improved or expanded habitat conditions.

Thank You

