Trip Report
Scott Valley, Siskiyou County, California
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Background and Objectives:

One of the objectives of the Scott River Watershed Coordinated Resource Management Planning (CRMP) committee, which is comprised of representatives from 14 different agencies and groups plus local landowners, is to enhance 4.5 river miles of the Scott River, a major tributary to the Klamath River. Funding for the Scott River Restoration Project has been made available through the Cantara Loop Fund, with a matching grant from the Wildlife Conservation Board. California Department of Fish and Game will serve as contract administrator and will do much of the design, although the NRCS, Salmon Initiative Restoration Team, and the University of California will also provide in-kind conciliation and assist with project development.

The Project site is located in the upper reaches of the main stem of the Scott River, where it runs through prime agricultural land used mostly for pasture. Along this reach, the Scott River is alternately confined by levees and unconfined. High flow events commonly flood large areas of the valley floor, seasonally inundating pastureland, temporarily grazed lands, and undeveloped flood plain within the bankfull channel.

To a large degree, landowners have adapted to the flooding and allowed the system to utilize its flood plains. Frequent shifts in the channel have, however, resulted in local areas of agricultural land loss and have inhibited the reestablishment of riparian vegetation. Another resource issue of concern regards fisheries habitat; the CRMP Fish Subcommittee's 1995 report notes that "rearing and spawning conditions for anadromous fish stocks in the Scott River system are affected by: excessive (sand-sized) sediment, (seasonal) lack of water (streamflows due to droughts, diversions, and subsurface flows through accumulated gravels), high stream temperatures, and lack of instream cover." Unscreened diversions are also cited as contributing to the declining fisheries.

The Scott River Restoration Project has adopted a holistic restoration methodology for evaluation and design. Efforts to control erosion from granitic sediment source areas in the upper watershed are ongoing, with initial emphasis placed on the French Creek drainage. Other measures presently being considered as potential means to help restore the biologic, geomorphic, and land-use functions of Scott River include:

* <u>Vegetative and structural bank stabilization measures</u>, including rock and vegetative deflectors, toe rock, willow mattresses and baffles, and plantings;
* <u>Instream structures</u>, including boulders, debris structures, root wads, and logs and woody debris, to increase holding and rearing pools, channel complexity, and invertebrate populations;
* <u>Cottonwood, willow, and ponderosa pine plantings</u> of higher gravel bars, stable setback areas, and unvegetated banks, to restore portions of the riparian corridor;
* <u>Fish screens on diversions</u> to reduce losses of salmonid and other fish species, as well as other aquatic fauna; and

* Fencing to manage livestock utilization of the riparian corridor, to ensure vegetative recovery of especially the woody perennials, and to protect the system during critical spawning periods.

Performance criteria have been developed for the proposed measures, and some fencing, fish screens, and other components of the project have already been installed. Attached is a handout developed by the CRMP and RCD and distributed during their Diversion Management Workshop which was held April 25, 1996.

The RCD and the CRMP, through the Field Office and Area, requested NRCS technical assistance to review the proposed measures and offer recommendations for design and implementation.

Observations and Conclusions:

Gravel Tailings

1. Large-scale gold dredging in the 1930's and 1940's left massive, 25-foot high tailings piles of gravel and cobbles along a five- to six-mile reach downstream of Callahan, at the head of the project reach. The team observed a somewhat discontinuous distribution of grain sizes within the tailings piles; some of the tailings piles are capped with relatively large cobbles with very few fines, while other piles consist of smaller gravel-sized fragments both with and without a sandier sublayer.

2. A cursory review of historical aerial photos indicates that the main channel of the Scott River where it flows past the tailings was diverted to the eastern edge of the valley and tailings piles sometime prior to 1944. This and other channel modifications would have affected the river system downstream by increasing the sediment yield as the channel adjusted to its new course and winnowed out fines. Aerial photos also show how the eastward diversion of the channel shifted the course of the downstream channel correspondingly eastward.

3. The team observed evidence of mass wasting of the tailings piles above the existing channel, indicating that these steep piles of unconsolidated sediment are contributing sediment to the system. How efficient the system is in transporting the coarse material to downstream reaches was not evaluated, although it is possible that gravels from the tailings piles are delivered during high flows to downstream reaches, adding significantly to the creation and growth of gravel bars, thereby contributing to channel instability and shifting.

Barnes' Ranch above Fay Lane

4. A paddle-driven fish-screen was recently installed at the diversion at this site. The diversion comes off the west side of Scott River and conveys flows northward through a roughly six foot deep ditch excavated into a gravelly soil.

5. At this location, gravel berms have been placed on the active flood plain east of the existing low flow channel, effectively cutting off a part of the flood plain from the active system and diverting the flow westward. Rip rap was placed on the west bank to reduce erosion triggered by the shifting channel, although bank erosion and land loss continue on the west bank upstream of the riprapped section. Viewed from a distance, the isolated section of flood plain appeared to support a relatively dense stand of riparian trees and shrubs.

6. From its course along the western edge of the flood plain, the Scott River channel swings eastward and impinges on the eastern edge, where it has eroded the bank and caused land loss. Comparison of 1979 and 1983 aerial photos document the erosion, land loss, and channel shifting that has occurred recently, and shows that the stream is attempting to reestablish meanders in what had been a straightened reach.

Spencer's Ranch at French Creek

7. Aerial photos indicate that the Scott River channel at its confluence with French Creek has shifted its course often during the past decades. Presently, the channel forms a large meander with a 12-foot high cutbank to the west, and a broad, gravelly flood plain/point bar to the east. Land loss on the western bank has been correspondingly high, although an instream bar has begun to develop at the confluence near the western bank, diverting flows eastward locally.

8. The landowner has worked to slow the rate of bank erosion and land loss by planting willows on the west bank and running a drip line to facilitate establishment. The field team noted new growth on many of the cuttings.

Black Ranch

9. Rock deflectors were installed along a levee reach with vertical eroded banks and occupied by bank swallows. These were constructed last season. On average, the deflectors used roughly 40 cubic yards of rock with a D75 of roughly 24 inches, and were spaced approximately every 50- to 70-feet along the sweeping outside eastern bank. New construction was just completed on the opposite side of the river.

10. As a part of this project, willows and cottonwood (?) stakes were planted along the edge of the low flow channel at the base of the levee cutbank and between the deflectors. New growth was observed on many of the willow plantings.

11. A rain-on-snow event occurred while we were there, and we were able to see that these simple deflectors were effective in moving the high velocity component of the river out away from the bank. Woody debris had accumulated behind the deflectors and was also working to divert high velocity flows toward the center of the channel. Fresh deposits of fine-grained sediment between the bank and both the upstream and downstream edges of the deflectors serves as evidence that the deflectors have created a relatively low velocity zone along the edge of the bank.

Scott River Morphology

12. As part of their 1990 study of production and transport of sand-sized sediment from granitic source areas in the Scott River watershed, Sommarstrom and others used historical and measured cross-section data, aerial photos, and other historic reports, to document the history of channel alterations and sediment storage in the Scott River system. Among their findings:

    a. "The 1861 flood, in combinations with mining debris, caused the upper Scott River to alter its course from the west side to the east side of the valley downstream of Callahan."

    b. "At the turn of the century, the river channel at the northern end of Scott Valley was very winding and heavily vegetated with cottonwood and willow." Much of the riparian vegetation was subsequently removed, reaches of the channel were straightened, and levees constructed for agricultural production and flood control, including work by the

Corps of Engineers in the summer of 1938. "Floods followed in 1938-39 and 1940-41, causing extensive bank erosion."

c. The consultants concluded that the channel width and shape had not changed between 1944 and 1989.

d. "Over the years, landowners have put in pilings, revetments and rock riprap to protect the streambanks. Following major floods, debris and 'coarse bedload material' have been removed from problem areas of the stream and the channel reshaped."

e. The channel has, over the decades, experienced a cyclic pattern of aggradation and degradation; the floods of 1955, 1964, and 1974 deposited sediment in the channel and across the broad flood plain, while slight net degradation and removal of the aggraded deposits occurred during the intervening periods. In 1989, the bed elevation of the channel near Fort Jones was between 1 and 10 feet lower than in 1956.

f. The consultants estimated channel sediment storage and transport capacity for each of the 10 channel reaches between Callahan and the end of the valley. Results are reported in chapter 3 of their study.

13. Recent historical shifts in the Scott River channel were summarized using aerial photos taken in 1964, 1979, 1983, and 1995, and 15-minute maps based on 1951 photos. Sketches and scanned images of the channel, flood plain, and adjacent valley lands between the tailings and the French Creek confluence are attached. Our reconnaissance-level evaluation confirms local reports that: 1) the channel between the tailings and Fay Lane Bridge is attempting to reestablish its meanders (the 1964 photos show a very straight reach at this location); and 2) the channel at the French Creek confluence is very dynamic.

Diversion Management Workshop

14. The Siskiyou Resource Conservation District and the Scott River Watershed CRMP Committee hosted a Diversion Management Workshop for local landowners and interested parties. The team attended the early sessions and had the opportunity to visit with some of the attendees and to listen to presentations by Dr. Ron Miner and Glen Pearson. The Workshop was well attended and appeared to generate some good discussions.

15. Dr. Miner, a professor of Agricultural Engineering with Oregon State University Extension Service, discussed preliminary findings of research being conducted in the John Day Watershed in Oregon. He and other researchers completed a three-year study to monitor spatial and temporal variations in stream temperatures, and to identify the key factors responsible for these fluctuations. Among the observations and conclusions offered by Dr. Miner:

* Solar radiation was overwhelmingly the main heat contributor to the heat budget of the system, suggesting that shade is one of the important ingredients in keeping streamflow temperatures cool.
* The main control of water temperatures in the overall system is, however, the amount of water in the system. The relative contribution of rainfall and snowpack is also important.
* Preliminary research suggests that "shaded streams" experience smaller variations between upstream and downstream temperatures than those on "unshaded streams."
* The significance of shallow subsurface flows on cooling or modulating stream temperatures remains unclear; the effect of the time lag generated by the subsurface flows needs to be evaluated (e.g. will subsurface water recharged in the spring influence streamflow temperatures in August?).
* Tailwater coming off irrigated fields tends to be relatively warm. Dr. Miner speculated that irrigation timing and tailwater return/reuse systems (to reduce the total volume of warm flows entering the system) may be options to consider to help reduce temperatures.

16. Glen Pearson, ground water geologist with the California Department of Water Resources, explained the interrelationship of ground water and surface water and the limitations that this hydrologic 'interconnectedness' poses on strategies to augment water supplies using ground water. Mr. Pearson noted that:

* DWR monitors four wells in Scott Valley, taking ground water level measurements in the fall and the spring. Data from one of the wells suggest a roughly ten-foot decline in the ground water levels, with a slight (but less than predicted) improvement since the break in the drought in 1992.
* DWR used the "land use" method and 1990 data to estimate that surface water supplies account for 91 percent (roughly 94,000 acre-feet) of local water use, with the remaining nine percent supplied by ground water.
* Scott Valley water users pump an estimated 9,000 acre-feet of ground water from the shallow valley fill aquifer annually. The recharge rate roughly balances withdrawls, with roughly 7,000 acre-feet of recharge supplied by irrigation and the remaining volume recharged from creeks, ditches, and rainfall (?). Given the present land uses in Scott Valley, Mr. Pearson "doesn't see much problem with the ground water resource" in the valley. Ground water utilization is not so much a way to increase the total volume of water in the system as it is a potentially important component of an overall water management strategy that can be used to influence the timing and location of the flows.

Recommendations:

Gravel Tailings

1. Evaluate sediment transport and yield of coarse-grained material from the tailings to downstream reaches. Stream restoration measures proposed for downstream reaches may be less effective if the tailings are contributing large volumes of gravel to the system. Depending on results of this evaluation, measures to reduce sediment yield from the tailings to downstream reaches may be appropriate.

Barnes' Ranch above Fay Lane

2. Consider using a series rock deflectors along the eastern bank to reduce streambank erosion and land loss. Our qualitative evaluation suggests that the deflectors should be spaced on the order of every 50 feet and should be oriented outward from the bank slightly upstream. Root wads and logs may be incorporated into the design to increase habitat complexity. The deflectors should extend to top of bank and tie into competent bank/terrace material a total distance of a least twice the depth to the channel bottom at this point. Geotextile fabric placed between the embankment and the rock will reduce the risk of failure by undermining. A schematic showing the basic components of a typical rock deflector is attached.
3. Consider removing the gravel berms that have effectively cut off a portion of the eastern edge of the active flood plain from the system. Unncessarily restricting the width of the flood plain tends to increase the velocity and therefore the erodibility of the streamflows, and may also trigger lateral adjustments in the channel downstream.
4. Consider vegetative plantings along the outside banks as a means of controlling excessive erosion and land loss. Choose species that are environmentally acceptable and would enhance the riparian habitat, and that would successfully establish and provide erosion control. Plantings may have to be irrigated to ensure establishment.

Spencer's Ranch at French Creek

Consider using a series of rock and vegetative deflectors along the west cutbank to reduce streambank erosion and land loss. Rock should be appropriately sized to withstand anticipated streamflow velocities, and should extend from maximum scour depth to two feet or so above bankfull stage. [Bankfull stage is the level at which water begins to flow over the flood plain. Flows near bankfull stage - bankfull discharge - move the most sediment over the long term and so are considered the most active in terms of forming the channel.]

Black Ranch

6. Continue to monitor and document the effectiveness of the rock deflectors. If additional deflectors are considered, incorporate geotextiles into the design, placing the fabric between the embankment material and the rock to reduce the risk of failure by erosion. Our observations that these structures are successfully checking streambank erosion supports the hypothesis that appropriately designed rock deflectors would be potentially effective erosion control measures where flow and geomorphic conditions are similar.

Submitted:

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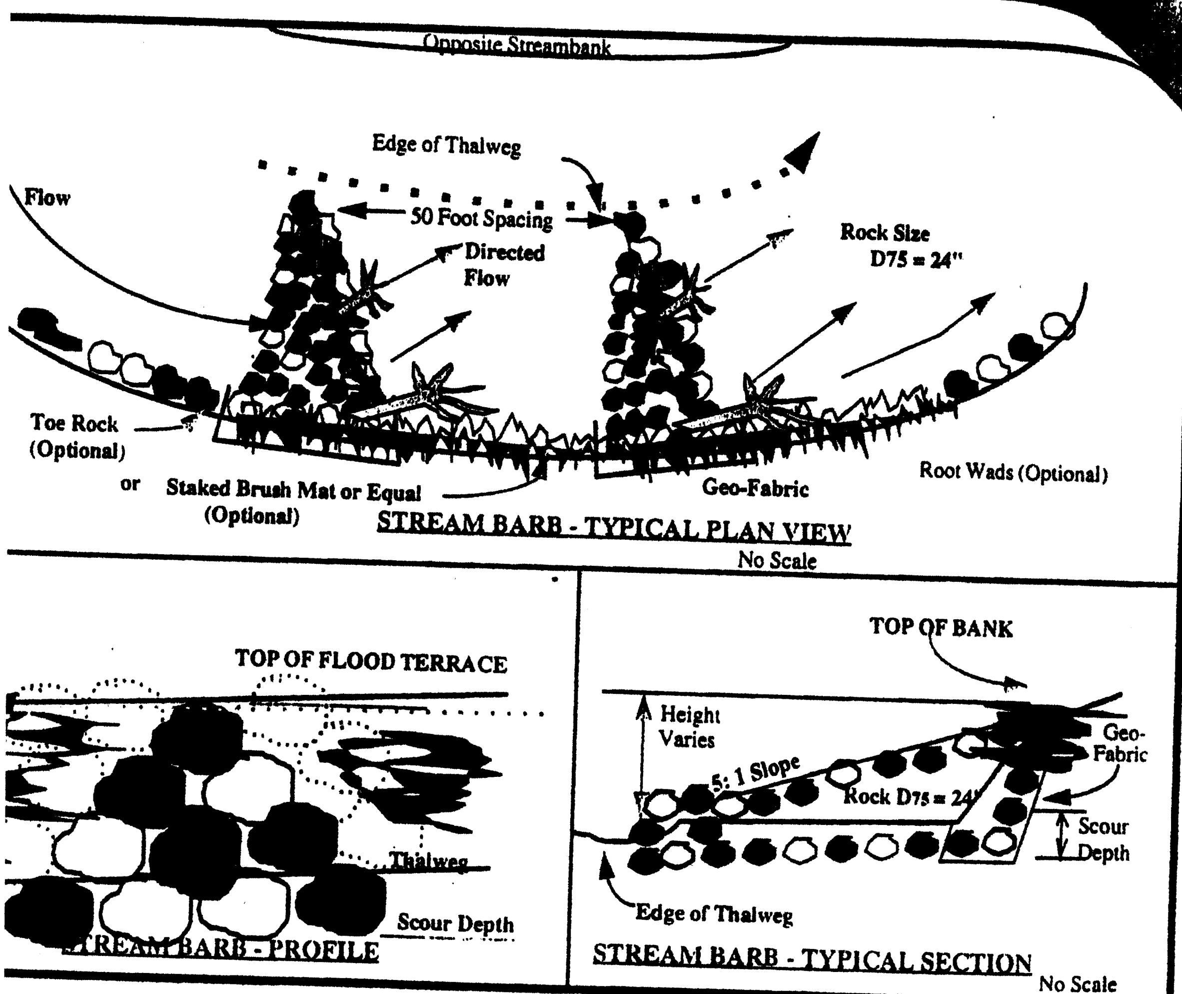

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TOE ROCK WITH VERTICAL BANK CHANNELS