



**THE FEATHER RIVER COORDINATED RESOURCE MANAGEMENT GROUP**

**RED CLOVER CREEK  
DEMONSTRATION  
PROJECT**

Fact Sheet # 3

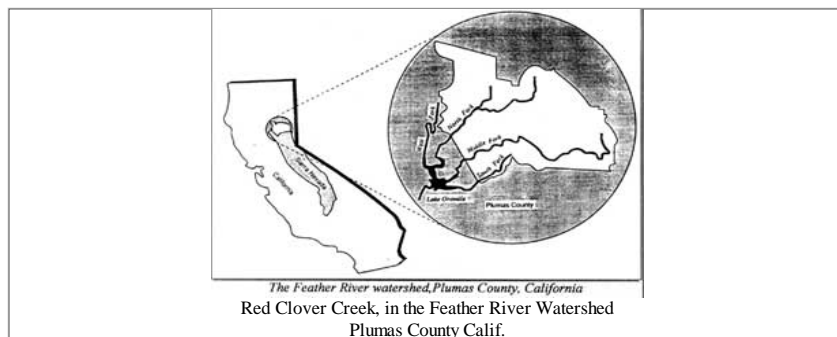
March 1996

**FIRST PROJECT**

In 1985, erosion problems in the Feather River water-shed prompted an alliance of local, state, and federal agencies and landowners to organize themselves into the Feather River Coordinated Management group (CRM). CRM group members decided to conduct a small demonstration project in the head waters of the Feather River watershed as a first step toward coordination of erosion control efforts across the entire watershed. Goals for the demonstration project were to test whether erosion control techniques would be effective at stabilizing stream banks, slowing sediment production and improving water quality. They also hoped to develop a cooperative process among supporting organizations that could be used on future projects.

**PROJECT LOCATION**

The demonstration project is located on a one mile stretch of Red Clover Creek, a tributary of Indian Creek, which feeds into the the East Branch of the North Fork of the Feather River (EBNFFR). The creek flows through Red Clover Valley, a highly crested alluvial valley at an elevation of 5,400 feet in Plumas County, California, 30 miles Northeast of Quincy. The valley, which is six miles long and two miles wide, is privately owned and used for grazing cattle while the surrounding sparsely forested public land is administered by the Plumas National Forest. Near the project area. Red Clover Creek flows in a meandering channel up to 50-60 feet wide and 10 feet deep, with bare and eroding vertical banks.



**SITE HISTORY**

Red Clover Creek has down cut it's channel severely over time due to both natural processes and intensive land use. The amount of vegetation and number of plant species found along the creek has declined dramatically since the turn of the century. Before 1880, Red Clover Creek was a narrow stable channel with vegetation, including hardwood trees, willows, and grasses, growing along it's banks. Increased land use and disturbance since that time has produced a drier, less vegetated site which is vulnerable to large floods and erosion. Timber harvesting, mining, railroad and road construction, and grazing have acted together to cause the decline.

Unmanaged grazing can lead to stream degradation when cattle consume and trample plants leaving stream banks bare of protective vegetation. Without this plant cover, the stream's banks erode more quickly during storms. Bank erosion leads to widening and deepening of the channel over time. The deeper channel drains the lands adjacent to the creek more quickly. The shallow water table across the flood plain lowers, drying out plants and soils. Fewer plant species can survive under these drier conditions which allow sage brush to replace the more desirable willow, sedges and grasses. This reduces the area's suitability for grazing by livestock and wildlife. The silt produced by eroding banks also clogs the stream and covers spawning gravels, making it less suitable for fish habitat.

**PROJECT PLANNING**

The Red Clover Creek Demonstration Project was conceived to attempt to reverse the stream's decline. Planning of the project started in August of 1985. A team of agency resource experts surveyed the site and then a study plan was developed by the Feather River CRM Steering Committee. The project site is on a privately owned ranch, while the control area is on land administered by the USFS.

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Feather River Coordinated Resource Management

The Feather River CRM group agreed on the following project objectives:

- \* *Stabilize the stream banks to reduce erosion and sediment transport downstream, and*
- \* *Raise the ground water table and water storage capacity to restore meadow habitat and moisture.*

It was anticipated that meeting these objectives would also increase range forage quantity and quality, improve water quality, and fish and wildlife habitat.

**CLIMATE**

annual precipitation - 20-25 inches  
air temperature - 48 degrees annual mean  
frost free days per year - 80  
elevation - 5,400 feet

**SOILS**

size - fine grained to gravelly loam

### PROJECT DESIGN

The Red Clover Creek Demonstration Project combined building in-stream structures with revegetation and grazing exclusion. The design consisted of:

**\* Construction of four loose rock check dams**

Dams were built across the creek to reduce water speed, trap sediment, stabilize stream banks, and induce groundwater infiltration. Dams also created ponds to raise the adjacent water table out into the meadow and increase water storage.

**\* Stream bank stabilization and revegetation**

Banks were planted with native moist site species including aspen, alder, willow and grasses to restore and stabilize areas disturbed by dam construction. Banks were then lined with small cut pine trees to protect bare soil and slow water to encourage stream bank building and vegetation growth.

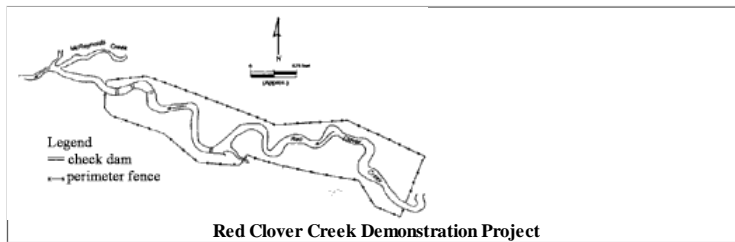
**\* Fencing of the riparian corridor**

One mile of stream was fenced creating a 70 acre enclosure. Fencing excluded livestock and vehicle traffic from the project area to encourage growth of vegetation and minimize erosion.

**\* Monitoring of results**

Project results were monitored for 10 years assessing effects on water table level, water storage, vegetation recovery, fish habitat, water quality, and wildlife use. Information was collected after construction both on site and in a downstream section of the creek which served as a control area.

Check dam construction was completed in Spring 1986, while revegetation was finished by Spring 1987.



Red Clover Creek Demonstration Project

**depth** - relatively deep  
**permeability** - low to moderate  
**available water capacity** - high  
**fertility** - relatively low

#### STREAM

**flow** - high of 1,000 CFS in April/May  
 low of 3 CFS July/September  
**width** - 50-60 feet with 8-12 foot high cut banks  
**drainage area** - 75 square miles  
**sediment yield** - 830 tons per square mile  
 (Red Clover - Dixie subwatershed)  
 640,000 cubic yards in the last 30-50 years

#### VEGETATION

**East side Sierra Nevada type including:**  
 sagebrush, cheatgrass, willow and sedge meadows, some willow, alder and cottonwood

### PROJECT MONITORING

Feather River CRM members agreed to monitor the project to evaluate its success at reversing stream degradation, stabilizing stream banks and raising the water table. They also wanted to know whether physical changes in the stream positively affected vegetation, fish and wildlife abundance and water quality. Analysis of ten years of monitoring data has documented the following results:

**STREAM CHANNEL SHAPE & STABILITY:**

Check dams successfully reduced the velocity of stream flow, which allowed sediments to deposit along stream banks, causing the channel to narrow and become more sinuous. Sloughing of vertical stream banks slowed due to successful revegetation and bank reinforcement.

Channel improvements also occurred in the project's control area due to changes in grazing management. The channel dramatically narrowed and stream bank vegetation began to reestablish without the help of check dams, but at a slower pace. This implies that changes in grazing management alone may provide channel benefits at a lower cost than intensive restoration efforts when changes aren't needed quickly and land management changes can be sustained over a long-period.

**GROUND WATER LEVELS:**

The elevation of the groundwater table was significantly increased in the vicinity of the check dams compared to control areas, contributing

to meadow recharge and the rapid growth of riparian and flood-plain vegetation, which helped stabilize soils and vegetation in the project area.

**PLANT SPECIES DIVERSITY & DENSITY:**

The number of plant species and density of vegetation cover along stream banks and in the adjacent meadow increased as the water table elevation increased. There was a clear trend from sagebrush to more desirable riparian meadow vegetation.

**FISH AND WILDLIFE POPULATION:**

Average populations of adult trout increased greatly but re-production did not increase because no spawning or rearing habitat was created. Waterfowl usage and nesting increased 700% over the control site and deer use greatly increased. Neotropical migrant birds are now using the site and the short-eared owl, a state listed species of special concern, reproduced there. Meadow vole populations increased in step with the increasing trend to moist meadow plant species.



Red Clover Creek in September 1985, before the demonstration project. Stream banks are bare of vegetation, and sage brush dominates the landscape.

**APPEARANCE:**

Stream channel shape and vegetation was tracked using photographs taken at 13 permanent photo points. Photos, such as those shown at the right, show the healing process from raw stream banks into well vegetated banks.

**COOPERATIVE PROCESS:**

The Coordinated Resources Management organizational framework was successful for project coordination. The CRM process was retained and used in an additional 19 projects between 1985 and 1995. (See Fact Sheet #1 for a description of this process and Fact Sheet #2 for a list of projects.)

**PROJECT COOPERATORS**

The design and implementation of the Red Clover Creek Demonstration Project took the combined efforts of numerous agencies and individuals. The ten year monitoring program was funded and carried out by Pacific Gas & Electric company and the California Department of Water Resources. Funding, services, donations, and in-kind staff time contributed include:

**LOCAL/PRIVATE****Pacific Gas & Electric**

Construction funds, design \$ 11,500  
Monitoring water table, vegetation, fishery, and geomorphology for 10 years \$ 100,000

**Landowner**

Donated rock, excluded cattle from project area

**Indian-American Valley Resource Conservation District**

(now the Feather River Resource Conservation District)

Directed the Soil Conservation Service 's assistance

**Plumas Corporation**

Project coordination, permit applications, construction supervision

**Plumas County Community Development Commission**

Construction loan to Plumas Corporation, CCC crew planting

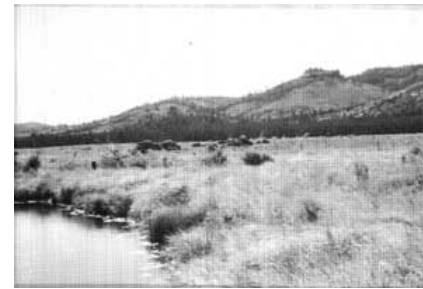
**STATE**

**California Department of Forestry** \$41,000

Funded check dam construction, did archaeological study

*"Red Clover Creek Demonstration Project created an oasis of high quality wetland-riparian habitat in an area where there was little before. Using both rock check dams to raise the ground water table and fencing to exclude grazing led to faster vegetation recovery than could have happened using only one of these stream restoration techniques."*

*(Department of Water Resources, 1993)*



*Red Clover Creek in August 1993 after the demonstration project. Stream banks are covered with moist site plant species.*

**California Department of Fish & Game** \$20,000  
Funded fencing, design assistance, fishery and wildlife study assistance  
**California Department of Water Resources**  
Wildlife studies

**FEDERAL****Natural Resource Conservation Service**

Dam design

**US Forest Service**

Rock blasting, project siting and design, revetment  
pine tree donations

**TOTAL PROJECT COSTS = \$172,500**

(does not include personnel costs for state and federal agencies)

**REFERENCES/REPORTS**

Department of Water Resources, State of California. *Red Clover Creek Demonstration Area Wildlife Study*. District Report. May 1993. 37 p.

Pacific Gas & Electric Company, *Erosion Control Demonstration Project in Red Clover Valley: Fish & Water Quality*. PG&E Research and Development Final Report 009.4-9.1, Donna Lindquist - Project Manager. May 1991.

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Pacific Gas & Electric Company *Red Clover Creek Erosion Control Demonstration Project: Ten Year Research Summary*. Cost Reduction Projects Report 95-30924022.1, Donna Lindquist - Project Manager. December 1995.

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