MUD AND ROCK CREEK FLOOD PROTECTION PLAN (SWRP PROJECT 33)

General Project Information

This project includes a plan to manage the Mud and Rock Creek watersheds as a holistic system. The public will be encouraged to participate in the development of the plan through identification of problems or be addressed in the plan and providing input on the identified causes and recommended solutions to the problems. The plan development will be coordinated with the City of Chico, Butte County, the California Department of Fish and Wildlife, the California Department of Water Resources, the US Army Corps of Engineers, and other appropriate agencies. The plan will include at least the following topics:

- **Flood Control:** Assess existing and future (at buildout of the City of Chico) flooding, identify the causes of the flooding, and develop a solution to reduce or eliminate the flooding. The flood evaluations will be performed using modern analysis techniques such as Geographical Information System (GIS) land use mapping, light detection and ranging (LiDAR) topographic mapping, and computer based hydrologic and hydraulic modeling to identify flooding areas. Other modern techniques include installation of stream stage and flow gages with telemetry to record the flow data. The flow data can be used for "real time" management of flood warnings and flood management operations. Once the flooding problems have been identified, solutions will be evaluated, including options for regional and local detention basins, enlargement of undersized channels, bridges, culverts, and the use of agricultural land for temporary storage of flood flows and improving levees. The City of Nord occasionally floods, so recommendations to reduce flooding in the City of Nord will be evaluated. Flooding issues in some neighborhoods that cause spillage of raw sewage and prevents access to homes will be evaluated and improvements identified. As part of this plan, existing infrastructure in need of repair, such as bridges and levees, will be evaluated and prioritized. The potential for Low Impact Development (LID) techniques to help reduce flood flows will also be evaluated.

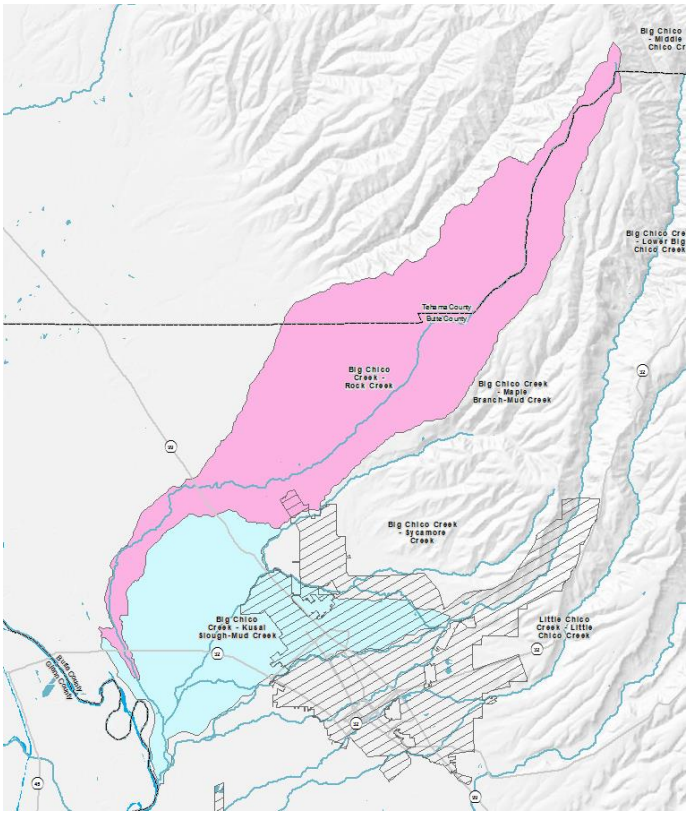

Figure 1. Mud Creek and Rock Creek Watershed

- **Water quality:** The water quality in Chico's creeks are declining as a result of urban development and increasing stormwater runoff. Use of LID techniques can reduce pollutants and urban runoff entering major waterways. As part of this plan, opportunities for LID projects will also be identified and prioritized, including in the Airport commercial area, residential neighborhoods along the Mud and Rock Creeks, Nord School, and disadvantaged communities (DACs), and LID demonstration projects on public properties within Mud/Rock Creek watersheds. LID techniques that will be evaluated include pervious pavement, infiltration trenches, vegetated buffer strips, bioretention, media filters, constructed wetlands, green streets, *etc*. Additionally, nonstructural techniques to improve water quality through public education will be evaluated in the plan, including providing

water quality public education workshops, and the implementation of citizen water monitoring. The plan will also identify opportunities to collaborate with existing watershed protection groups, including Butte Environmental Council, The Stream Team, and others to provide education and to evaluate the efficacy of the projects for improving water quality. If flood control detention basins are needed, they will be designed to also provide water quality treatment.

- **Water supply:** Opportunities to increase groundwater recharge will be evaluated. The potential for stormwater capture and reuse projects will be identified and evaluated, which could reduce demands on the potable water system. If flood control detention basins are needed, they will be designed to also provide infiltration and recharge the groundwater.

- **Erosion and Sediment Management:** The plan will include a comprehensive erosion and sediment management evaluation. Control of erosion and sediment is critical. Areas of erosion along the banks and beds of Mud Creek and Rock Creek will be mapped. Solutions to control the erosion and reduce the sediment in the creek will be developed. Several erosion areas of concern include agricultural land adjacent to Mud and Rock Creek.

- **Ecosystem:** The plan will also evaluate the ecosystem and floodplain health and identify ways to restore pre-development hydrology to improve the ecosystem; including adding buffers between orchards to reduce pesticide runoff and erosion, and riparian habitat improvements.

- **Education and Outreach:** The plan will evaluate existing public outreach efforts and develop a public outreach and training plan and budget to raise awareness of pollution sources and Best Management Practices (BMPs), including include residential landscaping to conserve water, dry weather runoff capture, river-friendly landscaping, and residential pesticides and fertilizer management. This plan will also 1) opportunities to collaborate with existing watershed protection groups, such as Butte Environmental Council, Stream Team, Friends of Bidwell Park, *etc*., and 2) provides public education and outreach events. Where appropriate, grant program local match funding requirements that can be met by volunteer hours will be identified. Examples of existing programs include the Clean Water Science Ambassadors, Clean Creeks in the Classroom, Block Parties with a Purpose, and the Citizen Monitoring Program.

- **Employment Opportunities:** The plan will evaluate employment opportunities for DACs and tribes by providing LID and green infrastructure job training and certification workshops utilizing LID demonstration projects as training tools. In addition, the plan will also evaluate ways to involve the California Conservation Corps to reduce project costs.

- **Watershed and Location:** Mud Creek and Rock Creek watersheds near the City of Chico within Butte County.

Benefits Resulting from this Project

When the Mud and Rock Creek Flood Protection Plan is fully implemented, the following benefits are expected to occur:

- **Water Quality:** Water quality is expected to be improved because of the implementation of LID techniques that will capture and reduce stormwater and dry weather runoff and increase water quality. And through improved public awareness through their involvement in project implementation and effectiveness monitoring.

- **Water Supply:** Water supply is expected to be improved because implementing infiltration areas will allow some flows to recharge groundwater.

- **Flood Management:** Flood management is expected to be improved because solutions identified in this plan will help reduce flooding problems.

- **Environmental:** The environment is expected to be improved because implementing this plan will help manage sediment and erosion , and other runoff pollutants and will improve receiving waters.
- **Community:** The community is expected to be improved because the plan evaluates creation of job opportunities, improves public involvement in implementing plan objectives which improve a sense of ownership and belonging, especially for DACs.

Project Costs

- **Estimated Plan Preparation Cost:**

  The estimated cost of preparing this plan is to be determined (TBD). This cost does not include the costs of designing and constructing the improvements that will be identified in the plan.

Project Photographs

Photograph 1. Rock Creek along Keefer Road, Chico. Facing east.

Photograph 2. 4. HWY 99 bridge over Rock Creek. Facing south

Initial Projects Included

No other initial projects were included in this plan.

Additional Project Information

The following information was received during a public review period.

The USACE Flood Control Study (2000) considered putting Keefer Slough flows into Mud Creek, but rejected this approach because Mud Creek and the Chico Mud and Sycamore system is at or above capacity now. The gravel pit near Dusty Lane is not available for detention as it fills with hyporheic flows when Mud Creek is full. This was observed during the January 1997 flood event.

There are several problems at Rock Creek and Keefer Slough.

1. At Hagenridge Rd., north of Keefer Rd., Keefer Slough originates from Rock Creek. Since the 1997 flood event, the dominant flow has moved into Keefer Slough where there is insufficient capacity, causing frequent flooding along its banks east and west of Hwy 99. If

Hagenridge Rd. was raised as an earthen dam with large culverts the flow split between Keefer Slough and Rock Creek could be apportioned appropriately for the respective channels.

2. Rock Creek cannot contain additional flows from Keefer Slough because the levees downstream in Nord are at capacity with 5,000 cfs according to the USACE 2000 study. Further, the study showed that Sand Creek, which joins Rock Creek just above Hwy 99, adds another 5,000 cfs at its peak. It is only a coincidence that the levees west of Hwy 99 have not received 10,000 cfs, double their capacity, in recent events. There is a current proposal from Rock Creek Reclamation District to detain flows on Sand Creek to help with this problem.

3. Keefer Slough presently carries excess flows from Rock Creek, but there is minor flooding east of Hwy 99 and currently substantial overland flooding through the orchards near Nord. Keefer Slough needs channel improvements including widening, minor levees, increased flood plain access, and off stream detention east of Hwy 99.

4. West of Hwy 99, the orchards can handle, even benefit from, some short-term inundation. Improved and coordinated small scale multiple channels could be built that would minimize inundation periods and prevent excessive depths at critical locations. One such channel, just east of Nord, is partially constructed running south from the confluence of Rock Creek and Keefer Slough. It is a one-sided levee intended to carry 2,500 cfs if the Keefer Slough levee were to fail at the confluence or east there-of. These flows pond against the Union Pacific Railroad and then pass through to meet the backwater of the Sacramento River.

5. Rock Creek left bank levee east of Hwy 99 to Garner Ln. needs to be raised slightly and uniformly constructed to some reasonable standard. West of Hwy 99 the levees reach capacity more often than every 5 years (5-year event). These should be set back, one side or the other, an additional 50 ft. westward to the Union Pacific tracks.