CHAPTER 3
PROBLEMS AND OPPORTUNITIES

Cache Creek Levee Failure, January 27, 1983, looking south towards Woodland.

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PROBLEMS AND OPPORTUNITIES

This chapter describes the Lower Cache Creek flood and natural resource problems and opportunities in the study area. The information is useful in identifying potential flood damage reduction measures and plans.

PROBLEM IDENTIFICATION PROCESS

Geotechnical, hydrologic, hydraulic, geomorphological, and economic analyses of existing flooding conditions were completed to identify flood problems.

Discussions with agencies, technical support groups, and individuals were important to the problem identification process. Primary coordination activities included the May 30, 2000, public workshop; monthly team meetings; weekly technical review meetings; and the February 8, 2001, City of Woodland Flood Task Force meeting, as well as many other Flood Task Force meetings. Entities involved in the process included the Corps, USFWS, DWR, DFG, Yolo County Department of Public Works, City of Woodland Department of Public Works, Technical Advisory Committee for the Flood Task Force, City of Woodland Flood Task Force, Woodland City Council, Yolo County Board of Supervisors, Woodland Chamber of Commerce, Farm Bureau, Yolo County Flood Control and Water Conservation District, Cache Creek Conservancy, and Citizens at Large.

Ongoing communication between agencies and the public is documented in the Draft EIS/EIR. In addition, USFWS has been involved in the mitigation analysis and, along with NMFS, has provided a species list.

LOWER CACHE CREEK FLOOD PROBLEMS

NONDAMAGING CHANNEL CAPACITIES AND LEVEE FAILURES

The potential for flooding in the city of Woodland from overflow from Cache Creek is attributable in varying degrees to a number of factors, primarily insufficient conveyance capacity. Other factors include hydraulic restrictions imposed by bridges, the diversion of overflow by the I-5 embankment, the California Northern Railroad embankment, and the Cache Creek Settling Basin levees.

The conveyance capacity of the leveed reach of lower Cache Creek depends on the ability of the levees to withstand the floodflows. Levees can fail for several reasons, and it is generally not possible to predict how, when, and where they will fail. A

geotechnical risk-based analysis was conducted to estimate the reliability of the levee system in this study.

The geotechnical analysis assessed the probable failure point (PFP) and the probable nonfailure point (PNP) of the lower Cache Creek levee system. The PFP is the point at which the water-surface elevation would result in an 85 percent chance of failure. The PFP was not determined because the probability of failure at the top of the levee was determined to be 50 percent. The PNP is the point at which the water surface would have a 15 percent chance of failure, and it was determined to be approximately 2 feet below the top of levee.

The nondamaging channel capacities of Lower Cache Creek were estimated as the bank-full capacity for the non-leveed reach and at the PNP for the leveed reach. The nondamaging channel capacity was estimated to be 30,000 cfs in the leveed and non-leveed reaches. The nondamaging flow for the leveed reach compares well with the design flow of 30,000 cfs for the Lower Cache Creek Levee Project. At the time of design, the levees were intended to provide protection from a flood having a 1 in 10 chance of occurring in any given year.

FREQUENCY OF FLOODING

The frequency of flooding in the city of Woodland from lower Cache Creek depends on the frequency of floodflows in Cache Creek, on the condition of the levees, and on flood fighting. A hydrologic model using the HEC-1 computer program was used to develop discharge-frequency information at points of interest. (See Appendix C.) A hydraulic model using the UNET computer program was used to develop stage (water surface elevation)–discharge information at points of interest. (See Appendix D.) The flooding frequencies from lower Cache Creek were determined based on this discharge-frequency and stage-discharge information, geotechnical information, and topography.

Flood frequencies and peak flows at CR 94B are indicated in Table 3-1 for flood events having chances of 1 in 10, 20, 50, 100, 200, and 500 of occurring in any given year (recurrence intervals of 10, 20, 50, 100, 200 and 500 years). The existing levee system was designed to convey 30,000 cfs with a freeboard of 3 feet. The capacity of the existing system has decreased since it was constructed, and 30,000 cfs is expected to have only about 2 feet of freeboard under current conditions. Results of the geotechnical analysis conducted for this feasibility study indicated that the levees could reliably pass a flow of 30,000 cfs.

The risk of levee failure increases as the freeboard decreases and becomes about a 100 percent chance of failure at the point that a levee is overtopped. The point of failure is very difficult to predict as it depends on levee construction, channel and levee maintenance, duration of flood events, operations during flood events, flood fighting efforts (sandbagging and levee protective measures) as well as such things as debris accumulations at bridges, obstructions, and upstream failures. In 1995, floodwaters

overtopped the levees/banks upstream from I-5 at a flow of about 36,500 cfs. Although floodwaters did escape from Cache Creek during the 1995 flood event, the levees downstream from I-5 did not fail, and the volume of water that escaped was not large enough to reach the city of Woodland. At CR 94B, the 1995 flood event is estimated to have had a peak flow with a chance of occurring of approximately 1 in 40 and a 3-day volume with approximately a 1 in 20 chance of occurring in any given year. The existing levee system is estimated to have a maximum capacity of a flow with a 1 in 10 to 1 in 20 chance of occurring.

Table 3-1. Estimated Peak Flows for Cache Creek at Road 94B

Return Period[1] (years)	Peak Flow (cfs)
10	31,500
20	42,000
50	53,300
100	63,700
200	70,100
500	78,600

[1]Return period equals (1 divided by the chance of flooding in any given year).

FLOOD PLAINS AND FLOOD DAMAGES

The areas that would be subject to flooding from lower Cache Creek were identified to assess potential flood damages. The flood plains were developed on the basis of computed Cache Creek stages, levee stability, and topography using the UNET and FLO-2D computer programs. (See Appendix D.) The flood plains associated with the flood events with chances of 1 in 50, 100, 200, and 500 of occurring in any given year (recurrence intervals of 50, 100, 200, and 500 years) were delineated. The flood plain and flood elevations associated with a flood event with a 1 in 100 chance occurrence in any year (100-year flood event) are shown on Figure 3-1.

In addition to this hydraulic analysis, FEMA has identified areas of flood hazard in the vicinity of Woodland. The 1 in 100 chance per year flood plain delineated from the April 2001 FEMA Flood Insurance Study (FIS) is shown on Figure 3-2. This delineation has resulted in an increase in flood insurance requirements for existing structures within the FEMA 1 in 100 chance per year flood plain. Due to different methodologies, differences exist between the flood plain determined by FEMA and this study (Figure 3-2). However, both studies indicate that a significant portion of the city of Woodland is within the 1 in100 chance per year flood plain.

N

1 0 1 Miles

LIMITS OF DETAILED STUDY

LIMITS OF DETAILED STUDY

I-5 YOLO

RD 17

70

75

80

85

90

6,000 cfs

13,900 cfs (LF)

Cache Creek

RD 18

RD 99

RD 99E

RD 18A

RD 18B

7,700 cfs (LF)

HWY 16

CALIFORNIA NORTHERN RR

RD 18B

80

75

90

13,600 cfs

RD 19B

RD 96B

RD 94B

RD 20

70

65

60

55

50

45

KENTUCKY AVE

KENTUCKY AVE

HWY 113

RD 101

RD 18C

RD 102

RD 18B

CHURCHILL DOWNS

CACHE CREEK SETTLING BASIN

HWY 16

MAIN ST

MAIN ST

40

I-5

WOODLAND

HWY 113

35

RD 24

GIBSON RD

GIBSON RD

RD 98

LEGEND

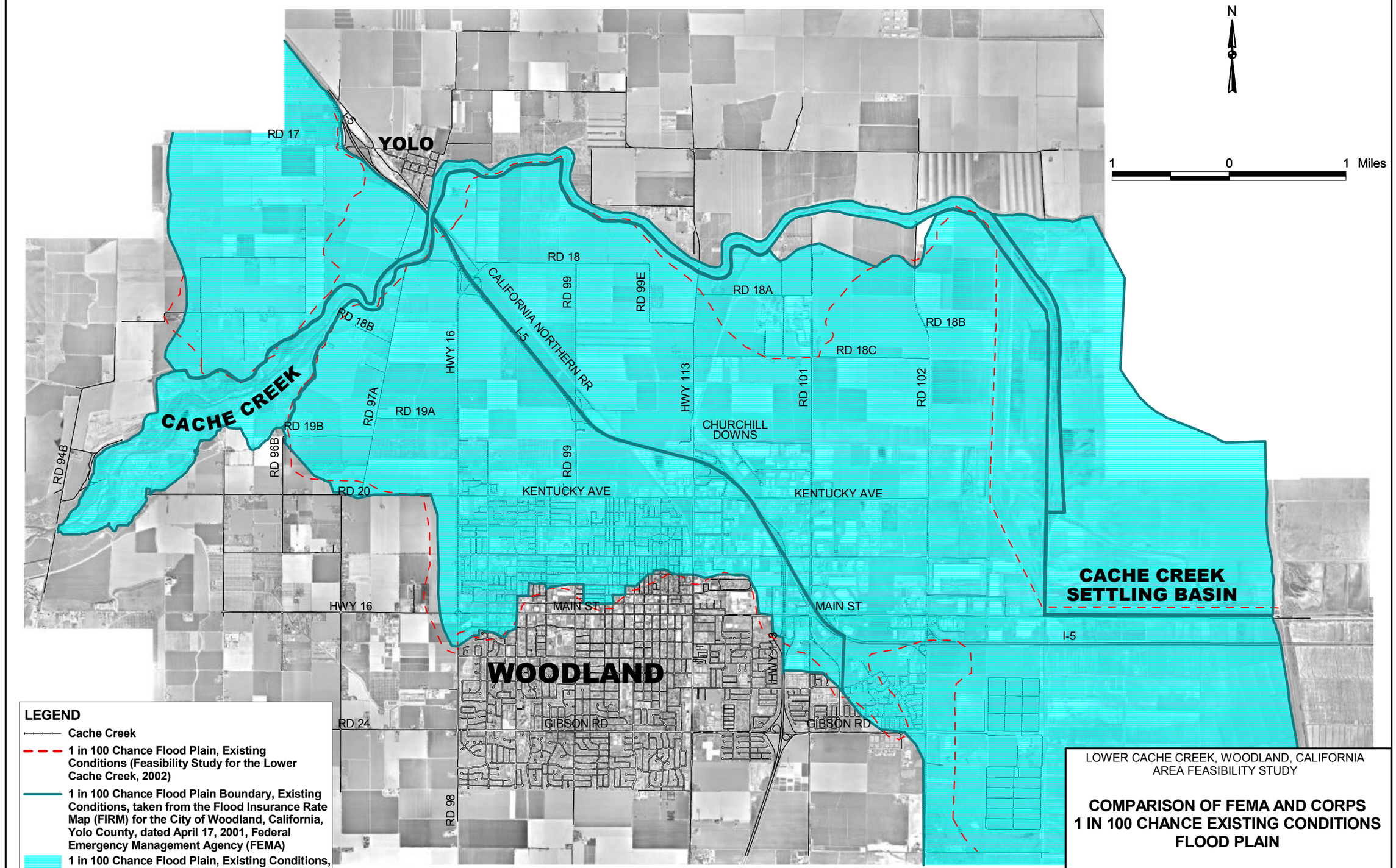
- Creek Alignment
- Existing Levee
- 85 Water-Surface Elevation Contours (Feet)
- Approximate Extent of Overbank Flooding, Existing Conditions
- Peak Flow Escaping Channel
- (LF) Levee Failure
- *Datum* NAVD 88

LOWER CACHE CREEK, WOODLAND, CALIFORNIA
AREA FEASIBILITY STUDY

1 IN 100 CHANCE EXISTING CONDITIONS FLOOD PLAIN AND WATER-SURFACE ELEVATION CONTOURS

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
OCTOBER 2002

Figure 3-1



LOWER CACHE CREEK, WOODLAND, CALIFORNIA
AREA FEASIBILITY STUDY

COMPARISON OF FEMA AND CORPS 1 IN 100 CHANCE EXISTING CONDITIONS FLOOD PLAIN

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
OCTOBER 2002

FIGURE 3-2

The city of Woodland was the primary focus of this study; therefore, the detailed flood plain analysis did not extend beyond the areas indicated on Figure 3-2. An assessment of Cache Creek flooding on the areas south of this study area was presented in a Technical Memorandum prepared by West Yost and Associates dated March 24, 1995. (See Appendix L.) The assessment was based on the hydrology and hydraulics analyses completed for the Corps' 1994 reconnaissance study of Cache Creek. It was estimated that during a flood with a 1 in 100 chance occurrence in any year (100-year flood), between 25,000 and 43,000 acre-feet would pond in the area bounded by the Cache Creek Settling Basin levees on the north, the Yolo Bypass levees on the east, and the Willow Slough Bypass levees on the south. Based on the USGS topographic maps, it was estimated that the maximum pond elevation would be 25.0 feet and 27.6 feet, NAVD88 (22.5 feet and 25.1 feet NGVD29), for the above-mentioned volumes, respectively, and that the flooding would not overtop the Yolo Bypass or the Willow Slough Bypass levees, which are at elevation 30 feet NAVD88 (south end). The land use in this area is agricultural, and the flood damages are anticipated to be relatively small.

Flooding from lower Cache Creek results in both monetary and nonmonetary effects. Monetary loss is the primary way of depicting flood damages and assessing the effectiveness of flood damage reduction plans. Monetary losses were assessed by estimating the without-project average annual equivalent flood damages. This was accomplished by weighting the estimated damages from varying degrees of flooding by their probability of occurrence. (See Appendix G.) Average annual equivalent flood damages (excluding future development) would be about $12 million.

In addition to the physical damage to the city of Woodland, a major flood would result in significant disruption and potential damage to the California Northern Railroad, a north-south freight transportation railway, and I-5, a major north-south transportation corridor. The portion of I-5 east of the city would be particularly subject to disruption and damage because the floodflows would pond against the Yolo Bypass levees with no release point.

Flooding could also result in the releases of toxic and hazardous substances stored within the flood plain. Floodflows would also overwhelm the sanitary sewer system, resulting in the release of inadequately treated or untreated wastewater. In addition, the cleanup process would generate significant flood-related debris, which would likely be disposed of in local landfills.

LOWER CACHE CREEK NATURAL RESOURCES PROBLEMS

Within Yolo County there is general concern and interest in the potential to restore environmental resources along lower Cache Creek. Resource problems are summarized as follows:

- Basin characteristics and land use activities result in relatively large sediment yields from the Cache Creek watershed.
- Gravel mining, agriculture, urban development, and flood damage reduction efforts have reduced or removed much of the historic riparian corridor along Cache Creek and have significantly altered the channel morphology of Cache Creek.
- Species numbers and community diversity have been reduced or been lost due to the corresponding degradation or loss of the natural stream process and riparian habitat as well as the introduction of nonnative species.
- Cache Creek is currently designated as an Impaired Water Body due to the presence of mercury in suspended sediment and fish tissue. It is a major source of mercury into the Sacramento-San Joaquin Delta.