State of California

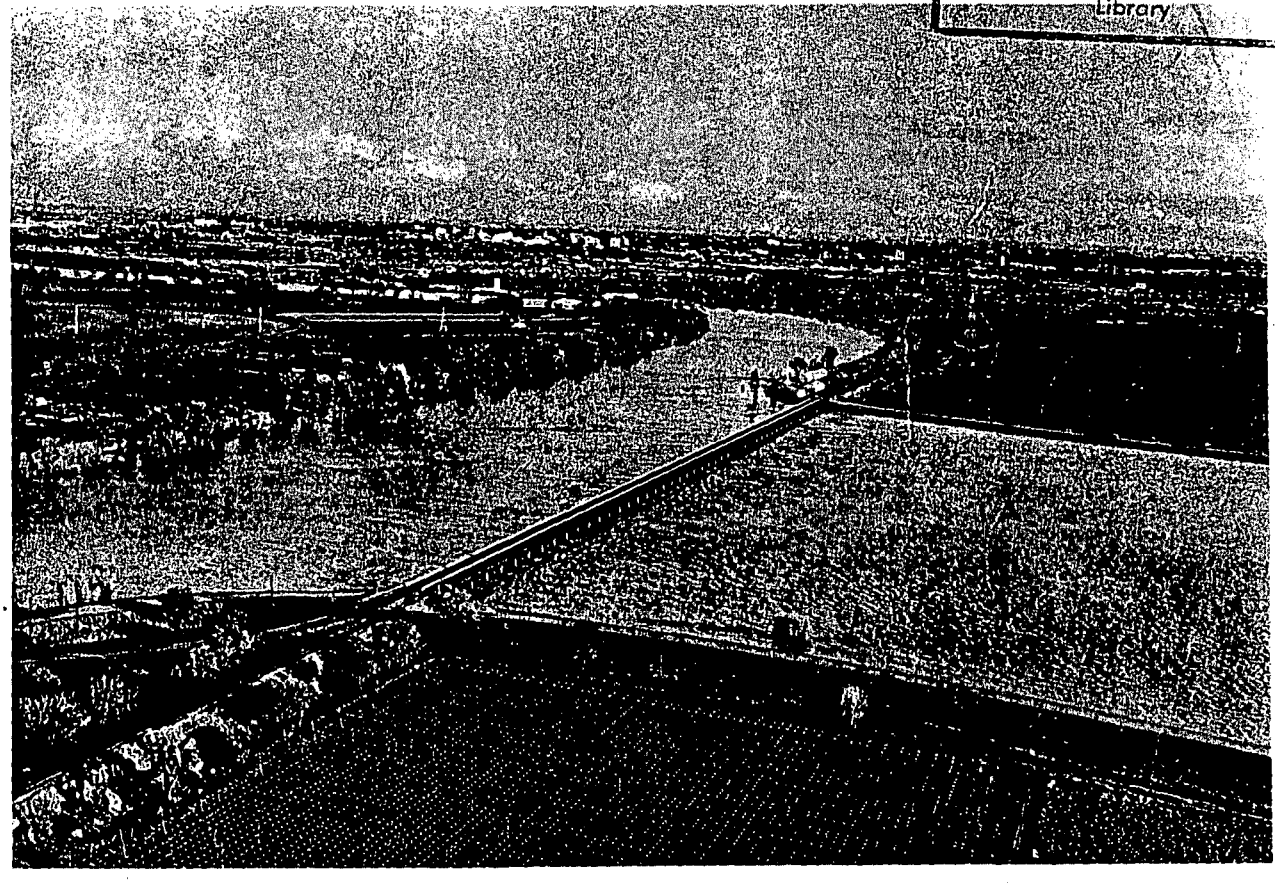
THE RESOURCES AGENCY

Department of Water Resources

BULLETIN No. 69-65

CALIFORNIA HIGH WATER 1964-1965

Including A Progress Report On The California Flood Control Program



NOVEMBER 1966

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Rainfall-Runoff

Streamflows in Northern and Central California ranged from moderate levels to extremely high, record-breaking values during the storms of December 1964 and January 1965. The following paragraphs discuss the rainfall and runoff in the drainage basins of the major areas affected, and also include comparisons with previous maximum peak flows of record and descriptions of major reservoir operations. A general topographic map depicting the major drainage areas in California is shown on Plate 1.

North Coastal Area

The unprecedented floods which peaked on December 22-23 on the Smith River, Klamath River, Redwood Creek, and the Eel River exceeded all previous floods of record. New record flows also occurred in the partially regulated watersheds of the Russian, Trinity, and Mad Rivers, although upstream dams stored portions of the heavy headwater runoff, resulting in attenuated peaks along downstream reaches of these rivers. Only in the small Mattole River Basin did unimpaired runoff result in peak flows and stages less than historic maximums. The high flows and the corresponding heavy runoff volumes resulted primarily from the precipitation which fell on December 21 and 22; but, as could be expected, they were influenced considerably by a procession of antecedent storms which began early in November and continued at regular intervals through the first 11 days of December.

Precipitation over most of the principal watersheds of the North Coast area during November was 150 to 250 percent of normal, with measured amounts ranging as high as 20 inches in the Smith and Eel River watersheds.

Several stations at elevations below 2,000 feet reported light snow as a result of a low freezing level during the second of three storms that occ during November. Early in December, approximately 2 to 6 inches of rainf from two minor storms were recorded in the basins north of the Russian Ri During the second December storm, the freezing level as determined by the Medford, Oregon, upper-air soundings appears to have been situated around 8,000-foot elevation in the more mountainous northern basins of the North Coast. Thus, in the six weeks following November 1, a series of five stc pushed through this region depositing moderate amounts of rainfall, which established a relatively high level of soil moisture in the North Coast b Following December 11, the freezing level dropped to as low as 2,000 fee and for the next eight days fluctuated continuously between this level a 6,000 feet. This essentially describes the general pattern of events in North Coast area that led up to the devastating floods throughout the re

On December 19, following seven days of low upper-air temperat the freezing level began to rise slowly and light intermittent rainfall continuing through December 20 and resulting in 1 to 6 inches of rainfal various locations in the North Coast. At the start of this rainfall the was very little flow in any of the North Coast rivers. As an example, i the Eel River at Alderpoint, a discharge of only 2,000 cfs at a stage of feet was flowing past the gage on the morning of December 19.

A few hours before midnight, December 20, a 6- to 12-hour per heavy precipitation resulted in 7 to 8 inches of rainfall from the head of the Russian River north to the Smith River Basin. Following six hou light precipitation, another prolonged period of heavy precipitation be

around 6 p.m. and lasted about 24 hours, during which more than 20 inches of rain was measured. During these two periods of precipitation, the freezing level rose rapidly to over 8,000 feet. The response of the rivers to this second period of precipitation was immediate, with rates of rise in excess of 1.0 foot per hour occurring at many locations. The previously noted Eel River at Alderpoint rose from 4.9 feet at 6 a.m., December 19, to a maximum of 87.2 feet around 8 p.m. on December 22 -- a rise of over 82 feet in 86 hours.

In general, the daily pattern of storm rainfall was similar on all basins in the North Coast -- light intermittent rainfall on December 19 and 20 followed by two days of extremely intense rainfall. The rainfall on December 21 and 22 was primarily responsible for the tremendous flows, but this excessive runoff was certainly abetted by the high soil moisture conditions resulting from the rainfall from the antecedent storms during the previous 50-day period. Analysis of available data indicates that snowmelt contribution was not significant during peak runoff periods.

In the text which follows, the rainfall and runoff in each of the principal basins within the North Coast are discussed separately. Selected rainfall reports and computed peak runoff events are listed for each basin and, where possible, for primary tributaries within a basin. Locations of North Coastal area precipitation and stream gaging stations are depicted on Plate 41, and selected streamflow and reservoir hydrographs are illustrated on Plates 19-24.

Table 6

Selected Peak Runoff Events
Klamath River and Tributary Basins

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD	Acre-Feet	Inches
Scott River near Fort Jones	653	25.34	54,600	126,000	250,000	7.2
Klamath River at Somesbar	2,560[a]	76.5	307,000	1,034,000	2,050,000	15.0
S.F. Trinity River near Salyer	898	47.6	95,400	239,000	474,000	9.9
Trinity River near Hoopa	2,129[b]	40.3	231,000	614,000	1,220,000	10.8
Klamath River near Klamath	5,462[a,b]	55.3	557,000	1,867,000	3,703,000	12.7

a. Adjusted to exclude Shasta River Basin and portion of Klamath River Basin above the confluence with Shasta River.
b. Adjusted to exclude basin above Trinity Dam.

Redwood Creek Basin

The 278-square-mile watershed of Redwood Creek is characteristic of many of the basins within the North Coast area with its long, narrow configuration and general north-south alignment. Redwood Creek has no major tributaries and, except for the town of Orick which straddles the creek near the mouth, the basin is sparsely populated. Overbanking in and around the community of Orick has occurred six times in the last 12 years.

Antecedent precipitation over the watershed during November was around 12 inches and later, through the first 11 days of December, was around

10 inches. From 2 a.m. to 2 p.m. on December 21, slightly under 3 inches of rainfall was recorded at the rain gage near O'Kane, which resulted in a minor rise at both stream gages in the basin. Following a 6-hour period of no rainfall during which minor peaks were observed at the stream gages at Orick and near Blue Lake from the previous rainfall, an uninterrupted 36-hour period of heavy rainfall began. Within hours, the recessions then in progress were reversed as the small creek responded to the heavy runoff. At the Redwood Creek near Blue Lake gage, a peak stage of 16.05 feet was recorded, with a corresponding instantaneous peak discharge of 16,400 cfs. About 40 miles downstream at Orick, residents witnessed their third major flood in 11 years as the river crested at 24.0 feet. The corresponding discharge was 50,500 cfs. At both stream gage sites, the flows and stages exceeded previous maximum recorded levels.

At the O'Kane rain gage, adjacent to the Blue Lake river gage, the measured rainfall during the 9-day period from December 19 to December 26 was 24.9 inches, while the runoff volume past the stream gage for the 10-day period (December 19-27) was approximately 32.5 inches. Since the measured rainfall was somewhat less than the runoff for a nearly comparable period, apparently heavier precipitation occurred in ungaged upstream areas of the basin.

Peak runoff events for the two basin gages are listed in Table 7.

Table 7

Selected Peak Runoff Events
Redwood Creek Basin

Stream Gaging Station	Drainage Area (Sq. Mi.)	Peak Stage (Feet)	Peak Discharge (cfs)	Dec. 19-27 Runoff Volume		
				SFD	Acre-Feet	Inches
Redwood Creek near Blue Lake	67.5	16.05	16,400	58,900	117,000	32.5
Redwood Creek at Orick	278	24.0	50,500	183,000	362,000	24.4

Mad River Basin

The Mad River flows through a long, narrow basin having a total drainage area of about 497 square miles. The river has no major tributaries, although downstream flows are affected by 51,800-acre-foot Ruth Reservoir, the only major storage facility within the watershed. On December 18, before the precipitation started, only 3,000 acre-feet of storage capacity (equivalent to 0.5 inch of runoff) was available in Ruth Reservoir. As a result of the runoff generated by the 6 to 7 inches of rainfall that occurred on December 19 and 20, the reservoir was filled and spillage began over the 100-foot-wide, ungated spillway on December 20.

On December 20, 21, and 22, during the peak rainfall periods, runoff above Ruth Dam was apparently very heavy. This runoff caused the pool elevation of the reservoir to rise rapidly until around 8 p.m. on December 22, when a reported peak overflow depth of about 19 feet occurred. Undoubtedly, Ruth Reservoir attenuated flows and stages in the downstream reaches, since th

ervoir was holding in temporary storage about 24,000 acre-feet at the ime of peak overflow.

About 9 miles downstream from Ruth Dam, a comparatively moderate peak flow of about 20,100 cfs at a stage of 16.8 feet occurred at the Mad River near Forest Glen stream gage around 5 p.m. on December 22. The highest stage recorded at this gage took place on December 22, 1955, before the dam was built, when the river crested at 24.5 feet (39,200 cfs).

Near the mouth of the Mad River at the gage near Arcata an estimated peak flow of 70,400 cfs at a stage of 23.4 feet occurred around 2 a.m., December 23. The record peak stage and flow at this gage are the 27.3 feet and 77,800 cfs of December 1955.

Tables 8 and 9 show various rainfall and runoff values in this basin. As in other basins, most of the runoff resulted from rainfall on and before December 22. After December 23, reports were received of heavy snowfall down to low elevations, marking the end of the rainfall period which generated the high flows in the Mad River watershed.

Table 8

Rainfall Totals for the December Storm
Mad River Basin

Precipitation Station	Observation Time	Rainfall Period (Inclusive)	Rainfall Total (Inches)	Rainfall Period (Inclusive)	Rainfall Total (Inches)
Bridgeville 4NNW	8 a.m.	19-26	21.73	22-23	10.81
Forest Glen	8 a.m.	19-26	24.51	22-23	12.50
Mad River R.S.	8 a.m.	19-26	25.02	22-23	14.77
Blue Lake 8NE	8 a.m.	19-24	18.68	21-22	11.05
Bridgeville	8 a.m.	19-26	17.59	21-22	9.66

The nearby towns of Camp Klamath, Requa, and Klamath Glen were also literall wiped out. Willow Creek, Orleans, and Happy Camp were severely damaged. Hoopa on the Trinity River and the communities of Etna, Callahan, Greenview and Fort Jones in Scott Valley were also damaged.

Federal, state, and county highway and bridge losses were more extensive and severe than for any past flood. Fourteen state bridges were either destroyed or damaged. The beautiful old concrete arch bridge at the town of Klamath, famous for its statues of California Bears on either end, was a casualty.

The principal agricultural damages occurred at the mouth of the Klamath River and upstream in Scott Valley. There was considerable loss of livestock and also losses of crop and pasture lands.

The lumber industry, the principal industry in the Klamath Basin, was especially hard hit. Lumber mills were extensively damaged, and losses of cut lumber and logs were monumental.

Four persons lost their lives in the Klamath Basin, and total flo and storm damages were estimated at $69,500,000.

Redwood Creek Basin

Redwood Creek drains an area of about 280 square miles of the Coa Range Mountains through narrow, deep canyons. The principal tributary is Prairie Creek, which meets the main stem a short distance upstream from the town of Orick.

Orick, the only major community in the basin, which is located in small valley near the mouth of Redwood Creek, was completely inundated unde

five feet of water. The agricultural lands in the valley were deeply silted and covered with logs and debris. Of the 1,500 acres in the flood plains, 1,400 acres were flooded.

No lives were lost in the Redwood Creek Basin, and total flood and storm damages were estimated at $1,300,000.

Mad River Basin

The Mad River rises in the Coastal Mountain Range and flows through mountain canyons and small valleys until it emerges into the delta area in the vicinity of Blue Lake, 10 miles from the Pacific Ocean. The river enters the Pacific Ocean about 14 miles north of Eureka.

The delta area and the agricultural areas in the Mad River Valley were flooded severely, resulting in damage to 6,400 acres by erosion, siltation, and debris deposits, and a high loss of dairy cattle.

Several lumber mills in the flood plain suffered considerable damage, and stockpiled logs were swept downstream and deposited in the delta.

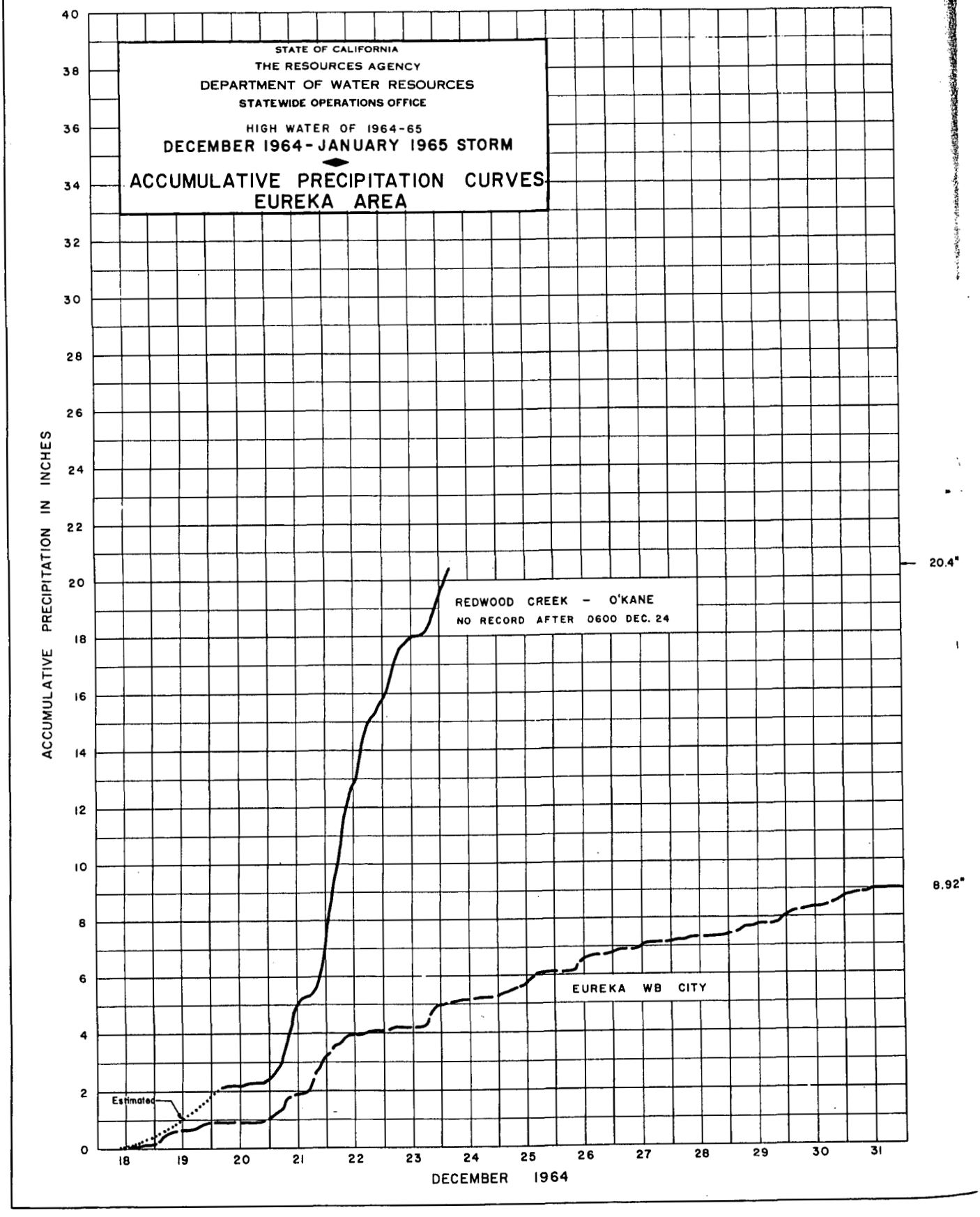
Highway 299 was damaged by slides and washouts, and the Mad River's North Fork bridge lost the approach on the left bank.

No lives were lost in the Mad River Basin, and total flood and storm damages were estimated at $7,800,000.

Eel River Basin

The Eel River drains an area of approximately 3,600 square miles and includes portions of Humboldt, Mendocino, Trinity, Glenn, and Lake counties. The principal tributaries are the Van Duzen, North Fork Eel, Middle Fork Eel,

PLATE 11


STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
STATEWIDE OPERATIONS OFFICE
HIGH WATER OF 1964-65
DECEMBER 1964 - JANUARY 1965 STORM
ACCUMULATIVE PRECIPITATION CURVES
EUREKA AREA
ACCUMULATIVE PRECIPITATION IN INCHES
DECEMBER 1964
REDWOOD CREEK - O'KANE
NO RECORD AFTER 0600 DEC. 24
EUREKA WB CITY
Estimated
20.4"
8.92"