A SUMMARY OF THE CASPAR CREEK WATERSHED STUDY

as presented to

THE CALIFORNIA STATE BOARD OF FORESTRY

in

Sacramento, California

26 February 1965

DAVID M. BURNS, Forester II, California Division of Forestry

Assistant Forest Manager, Jackson State Forest

SUMMARY OF THE CASPAR CREEK WATERSHED STUDY

The Caspar Creek Watershed Study is location on the Jackson State Forest. It is a cooperative study by the California Division of Forestry, the Pacific Southwest Forest and Range Experiment Station, the California Department of Water Resources and the California Department of Fish and Gems. The precipitation records were started in 1961. The weirs, however, were not completed until November 1962.

The study area is five (5) miles south of Fort Bragg and five (5) miles inland. It consists of two (2) comparable watersheds: the North Fork which drains 1264 acres, and the South Fork which drains 1078 acres.

The timber stands in both watersheds are dense mixed young growth redwood and Douglas-fir. The timber stand in the North Fork drainage is 65-70 years old, while the South Fork timber is older, around 80-85 years.

Neither watershed has been logged since the original logging - over 65 years ago. There has been little or no disturbance since the original logging.

The specific objectives of the cooperative study are:

First - to measure the amount of sediment produced in a North Coast watershed that has not had unnatural disturbances in 65-85 years.

Second - to measure flood peaks and the degree to which water quality and stream sedimentation are affected when road building and logging practices are designed to minimize excessive runoff and erosion.

and Third - to measure stream channel changes following logging and to determine what effects these changes have on fish life and fish habitat.

The overall plan is to calibrate the undisturbed watersheds for a five (5) or six (6) year period. A road system will then be built in the South Fork, leaving the North Fork as the control. Then, after waiting another 4-6 years, the South Fork will be logged. All that ime the North Fork will still remain as the undisturbed control. We are now in the middle of the calibration period.

In order to put the December 1961, storm in its proper prospective, the largest storms for the past three rain years have been plotted for comparative

purposes. The rain year is from October 1 through September 30 of the following year.

Since 1962, the rainfall in Caspar Creek has not been intense over a very long period of time. The most rain in a single 24 hour period was 4.88 (almost five (5) inches) on December 21, 1964 (see Graph I). The next highest rainfall figure was 2.95 (almost three (3) inches) on October 11, 1962 (the Columbus Day storm). The third highest rainfall figure for a 24 hour period was on January 20, 1964, when 2.23 inches of rain fell.

By mid-March 1963, the Caspar Creek drainage had already received about 28 inches of rain. Then the largest storm of the 1962-63 season occurred, bringing another 15 inches. The highest daily mean flow during the storm period ryas 57 cubic feet per second. Another way of expressing the discharge is in acre feet. For the same 24 hour period, the discharge was about 113 acre feet. The total flow volume represented by Graph II is 931 acre feet for the storm period.

The largest storm of 1963-64 occurred in January 1964 after the watershed had received 20 inches of rain. During the storm period almost seven (7) inches of rain fell. on the area. The largest daily mean flow was 74 cubic feet per second, or about 147 acre feet. The total flow represented by the graph for this period is 573 acre feet.

By December 15, 1964, the watersheds had received about 18 inches of rain before the "big" storm. The storm started on the 18th and rained for 23 days., bringing an additional 23 inches of rain. The highest intensity rainfall (up to five (5) inches in 24 hours) fell in the early days of the storm. The highest daily mean flow reached 139 cubic feet per second or 276 acre feet in one day. The total flow represented by the graph is 1822 acre feet,

The runoff of 1822 acre feet from the 30 day period of December 15, 1964 to January 14, 1965 is about 89% of the total runoff for the whole rain year of 1962-63 when the annual rainfall was 43.73 inches. This compares to the 44.00 inches of rain so far in 1964-65. During the same 30 day period, roughly 80% of the rain during that period ran off the already saturated watershed.

These three storms show the differences between the rainfall patterns and the flow characteristics on the largest storms for the past three (3) years. In each case the watershed was fairly well saturated. The biggest difference was in the intensity of the rainfall and the length of the storms.

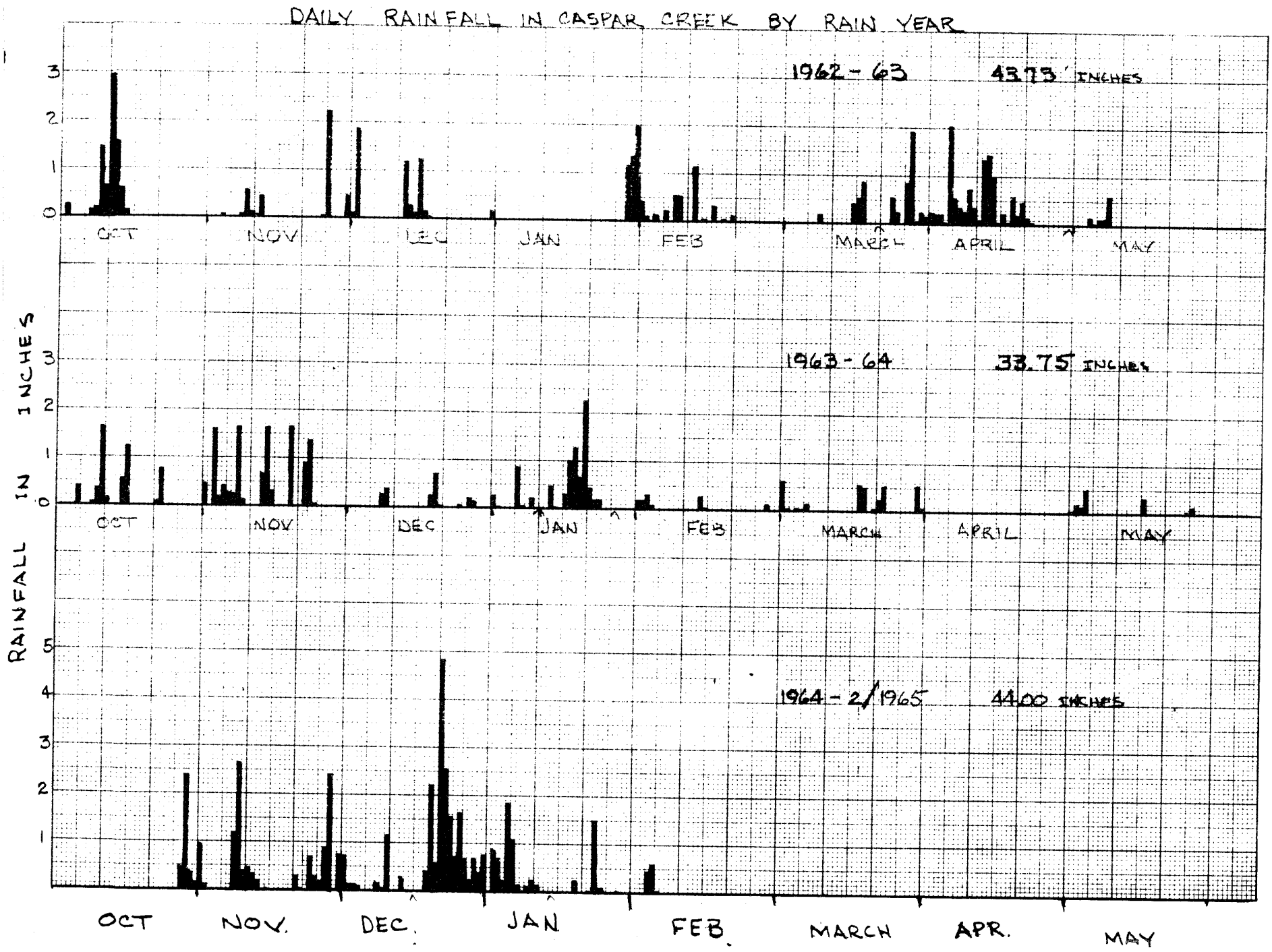
The debris or bedload deposited behind the weirs was running on an annual average of 66 cubic yards per square mile for the North Fork and 57 cubic yards per square mile for the South Fork from the summer of 1962 to the summer of 1964 (see Graph III). From the summer of 1964 to mid-January 1965 the debris deposited increased in the magnitude of about 10 times. The North Fork pond collected 677 cubic yards per square mile and the South Fork collected 409 cubic yards per square mile during the six month period. However, it is safe to say at least 95% of the debris load moved into the pond during the "big" storm.

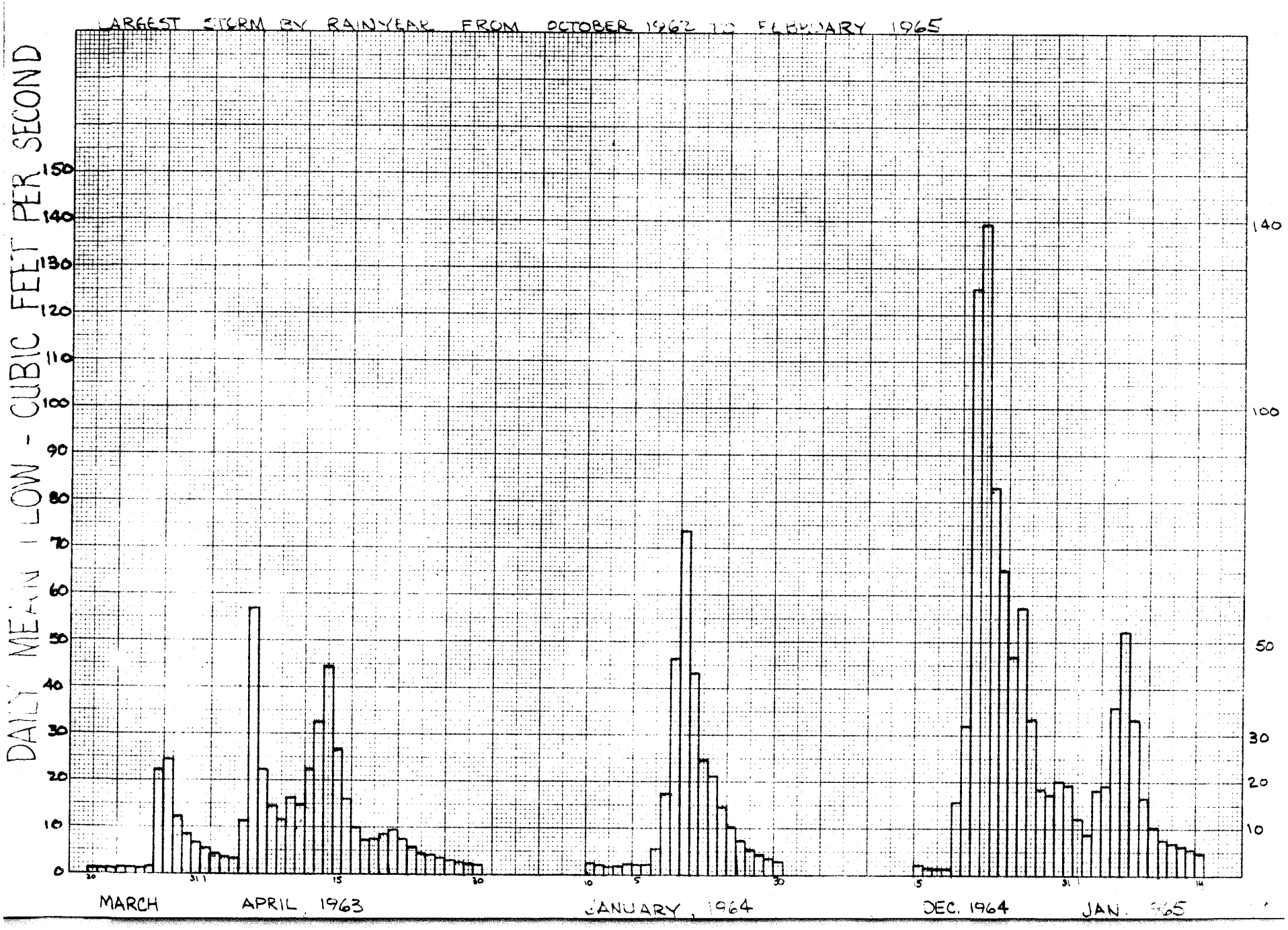
The nature of the debris is mostly river run (rounded gravel) with some silt. No particle size analysis has been made yet.

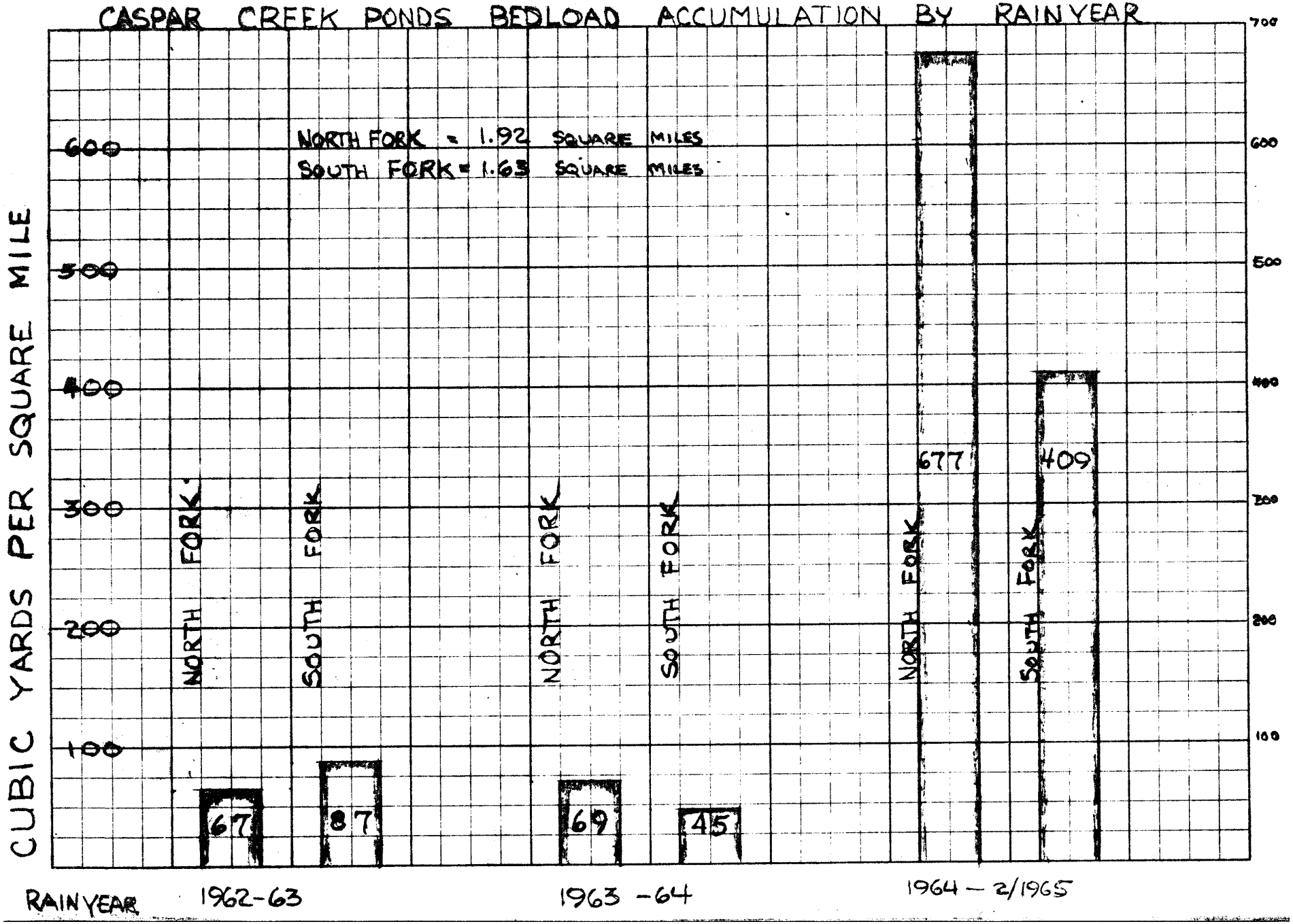
After walking both stream channels, the only sign of disturbance was along the stream channel where the stream had changed its course slightly by digging some alluvial material and redepositing it further down stream. The slopes above the stream channels did not have any slides or slipouts. This seems to indicate that the material in the ponds is just natural stream bottom erosion.

Suspended sediment samples were taken during the storm, but their analysis has not been completed. However, preliminary estimates of these samples indicate that on the day of the highest daily mean flow, the amount of material that went over the weirs was in the neighborhood of 170 cubic yards per square mile. If this fine silt came off the watershed as a uniform layer for the one day period when the daily mean flow was 139 cubic feet per second - a sheet of 0.002 of an inch of soil was removed.

The information gained thus far from the Caspar Creek Watershed Study will be helpful in the future in determining how much runoff and soil movement can be expected from undisturbed watersheds under flood conditions.


DAILY RAINFALL IN CASPAR CREEK BY RAIN YEAR
1962 - 63
43.73 INCHES
1963 - 64
33.75 INCHES
1964 - 2/1965
44.00 INCHES
RAINFALL IN INCHES
OCT
NOV
DEC
JAN
FEB
MARCH
APRIL
MAY


LARGEST STORM BY RAINYEAR FROM OCTOBER 1962 TO FEBRUARY 1965
DAILY MEAN FLOW - CUBIC FEET PER SECOND
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
140
100
50
30
20
10
20
31
15
30
10
5
30
15
31
14
MARCH
APRIL, 1963
JANUARY, 1964
DEC. 1964
JAN. 1965


CASPAR CREEK PONDS BEDLOAD ACCUMULATION BY RAINYEAR
NORTH FORK = 1.92 SQUARE MILES
SOUTH FORK = 1.63 SQUARE MILES
CUBIC YARDS PER SQUARE MILE
600
500
400
300
200
100
700
NORTH FORK
SOUTH FORK
NORTH FORK
SOUTH FORK
NORTH FORK
SOUTH FORK
67
87
69
45
677
409
RAINYEAR
1962-63
1963-64
1964 – 2/1965