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MEASUREMENT, TABULATION AND ANALYSIS
OF RAIN AND SNOWFALL IN
THE TRUCKEE RIVER BASIN

FINAL REPORT

1 February 1979-30 June 1982

Sponsored By
REGIONAL ADMINISTRATIVE PLANNING AGENCY

PREPARED BY
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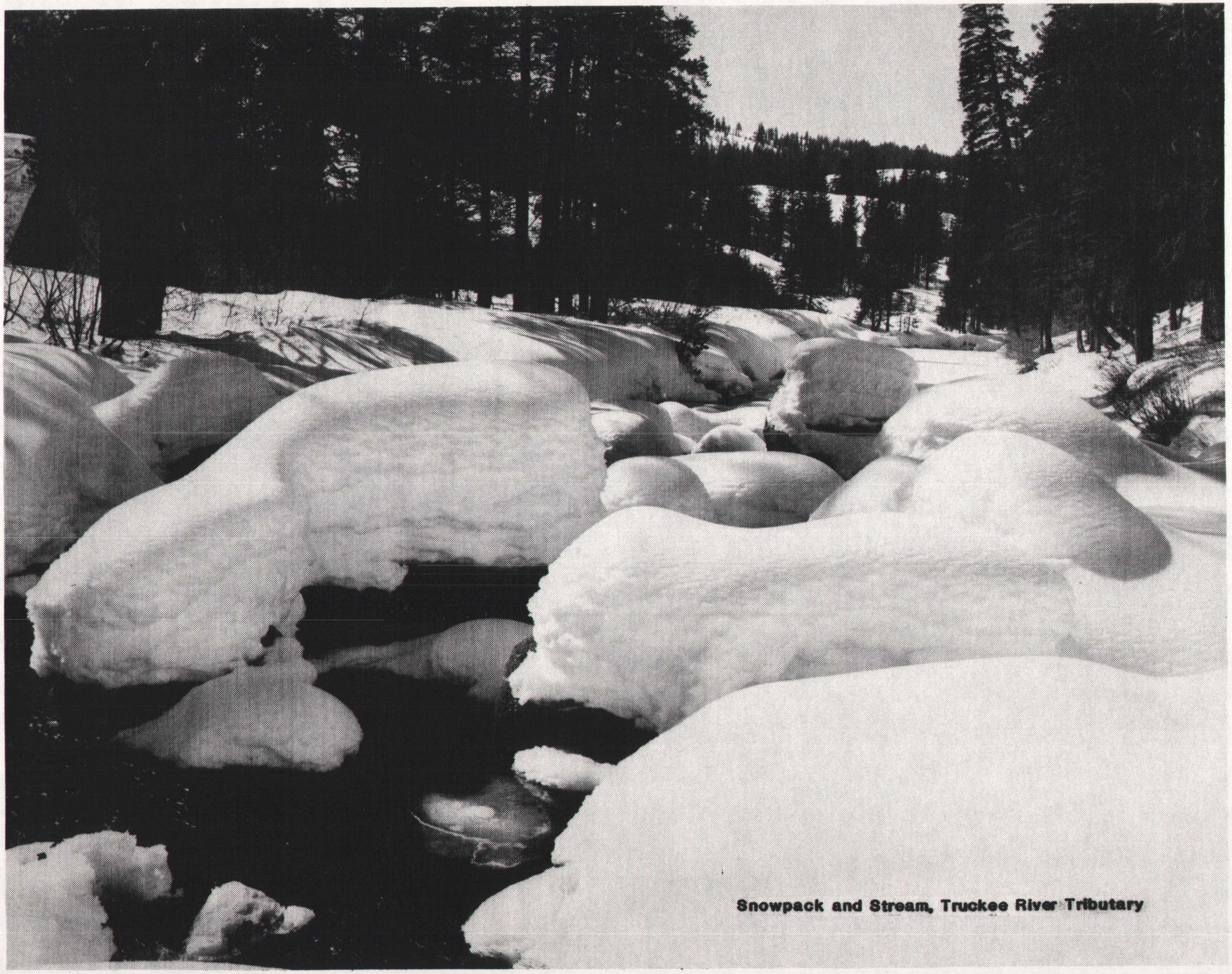
Reno, Nevada

August 1983

ATMOSPHERIC SCIENCES CENTER



Snowpack and Stream, Truckee River Tributary

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TABLE OF CONTENTS

ABSTRACT

A mesoscale network of precipitation gages in and near the Truckee River Basin is described and methods of measurement are discussed. Precipitation data for the period 1968 through 1982 are tabulated (Appendix A) in inches of water for each month and year together with mean values for the 14-year period. (English units are used and the water year is defined as 1 July through 30 June). Finally a series of isohyetal maps and relevant togographic maps are included in Appendix B to show the estimated spatial pattern of average annual precipitation.

ACKNOWLEDGEMENTS

The primary funding for the establishment and maintenance of the DRI mesoscale precipitation network in the Lake Tahoe - Truckee River area has been provided by the U.S. Bureau of Reclamation in a series of contracts from 1965 to the present. (Project Skywater, the Pyramid Lake Project, and the Sierra Cooperative Pilot Project.) Besides the current authors, others who contributed much to the field work and data analysis are Michael S. Owens, Fred Rogers, and Paul Fransioli.

INTRODUCTION

On 6 February 1979 the Atmospheric Science Center (ASC) of the Desert Research Institute (DRI) was authorized by the Washoe Council of Governments (WCOG), now the Regional Planning Agency (RAPA), to proceed with a proposed project entitled "Measurement, Tabulation, and Graphical Analysis of Rain and Snowfall and Associated Climatological and Hydrological Data in Washoe County and the Truckee River Basin." The agreement, dated 23 January 1979, stated the following objectives:

1. Maintain and expand a mesoscale network of precipitation gages to obtain quantitative rain and snowfall measurements in the mountainous region of Washoe County, Nevada and the adjacent area of the Truckee River watershed in California.
2. Tabulate historical data from sites in the DRI mesoscale network for the period 1966 to the present.
3. Analyze data on precipitation, snowpack and related climatological data in the form of areal and temporal distributions of these quantities in the Truckee River Basin and adjacent areas of Washoe County.

The sponsorship of WCOG provided a full-time assistant during a nine-month period in 1979 to reduce and tabulate precipitation and snowfall measurements made in the period 1968-1979; to maintain the Lake Tahoe-Truckee River network of precipitation gages during the late winter and spring of 1979; and to install additional recording gages in and near the Truckee Meadows area during late fall of 1979. The contract was extended without funding to the summer of 1980 to allow for delays in the refurbishing of the additional gages, and to permit the expansion of the network and the measurement of rain and snowfall throughout the strong 1979-80 season.

A second phase of the project was intiated in December 1980 with work to begin in January 1981. The principal task, to be accomplished with the advice and support of the Water Resources

Division of the U. S. Geological Survey in Carson City, was to prepare isohyetal maps of average annual precipitation in the Truckee River Basin. This contract provided funds for an assistant climatologist to compile data needed for the analysis, to assist in maintenance of the DRI mesoscale precipitation gage network in 1981, and to conduct a hydrological survey of wells in Washoe Valley during the summer of 1981.

This report presents the results of the extended project. The text discusses the DRI mesoscale precipitation network and the principal results through 1982 and it describes the expanded precipitation gage network. (The network is a cooperative enterprise of the Nevada Weather Watch, the Northern Nevada Branch of the American Meteorological Society, the Desert Research Institute, and the National Weather Service.) Appendix A contains detailed tabulations of the data and other related information, and Appendix B consists of the isohyetal maps of average annual precipitation. Following this is a list of References and a Bibliography of relevant reports, maps, and other data sources.

TOPOGRAPHY AND CLIMATOLOGY

The Lake Tahoe-Truckee River drainage area lies partly within the central Sierra and partly within the western edge of the Great Basin. The central Sierra, as distinguished from the northern Sierra and the southern (or High) Sierra, extends from Yuba Pass on the north to Sonora Pass on the south. On its western slope it comprises the watersheds of the Yuba, American, Mokelumne and Stanislaus Rivers which flow into the Great Valley of California. On its steeper eastern slope, the central Sierra comprises the headwaters of the Truckee, Carson and Walker Rivers which flow into Nevada lake basins -- Pyramid Lake, Lake Lahontan, the Carson Sink, and Walker Lake.

The area surrounding Lake Tahoe, the largest body of water in the Sierra, is of relatively high relief. The lake itself, at an elevation near 6200 ft. is drained by the Truckee River which descends to 4400 ft. in Reno enroute to Pyramid Lake. Besides the lake, other nearby flat areas are large valleys to the north which contain several reservoirs near 6000 ft. elevation, and the valleys east of the Carson Range near 4500 ft. elevation containing Reno, Washoe Lake, and Carson City. Surrounding Lake Tahoe, the upper Truckee River, and the high meadows are relatively high mountains, the Sierra on the west with crests of 8000 ft. to 9000 ft., and the Carson Range on the east with higher crests of 9000 ft. to 10,000 ft.

The weather in the area surrounding Lake Tahoe is influenced mainly by air masses from the Pacific. Cyclonic storms bring precipitation generally in the period October to June with maximum amounts in the winter months (December to March). The months July through September are usually dry with occasional periods of thunderstorms in moist, tropical air from the southeast. There is great variability in precipitation from year to year, often of the order of 50 percent, and even greater spatial variation as a result of oreigenic effects. The average annual precipitation varies from less than 7 inches in Reno and vicinity to more than 70 inches on the west slope of the Sierra. Snowfall often exceeds 400 inches per year on the higher elevations where it comprises 60 to 90 percent of the total precipitation. Because of heavy forest cover over much of the area, the snowpack is retained for a long period extending into summer, resulting in uniform streamflow. The average water content of the snowpack on 1 April varies from 20 to 40 inches between 6000 and 7000 ft. and 40 to 50 inches above 8000 ft. When extensive flooding occurs it is usually the result of heavy warm rains in December or January of some winters.

The air flow is predominantly westerly; wind speeds are light most of the time but approach gale force over ridges in big storms. Sunshine is abundant most of the year and average temperatures are moderate. The biggest temperature variations occur in the large valleys where the diurnal range is of the order of 30 to 40^{o}F much of the year. Fog forms frequently during storms on the west slope of the Sierra and between storms in the valleys east of the Sierra crest. During most of the year the air is exceptionally clear with visibility of the order of 50 to 100 miles.

The geographical features of the Lake Tahoe-Truckee River area are shown in CSAA maps of the Lake Tahoe, Reno and Carson City areas, and in the USGS 15 and 7.5 minute series of topographic quadrangles. Further information on the climate is discussed by Houghton, Sakamoto and Gifford (1975): Nevada's Weather and Climate. Current climatological data and descriptions of recent weather events are found in the quarterly publication, Nevada Weather Watch (1976-81).

STORMS

Characteristics and Mechanisms

The heavy precipitation which is experienced in the Sierra Nevada during the winter half of the year falls from clouds associated with frontal and cyclonic storms which approach California from the Pacific Ocean. The clouds form over the sea in moist, ascending air currents of maritime tropical or maritime polar origin. They develop further and precipitate with greater intensity in stronger ascending currents over the land. These vertical air currents are complex in time and space because they result from a variety of mechanisms: general ascent produced by widespread convergence in cyclonic flow; more intense lifting in frontal zones; strong oreigenic lifting on the windward slopes of hills and mountains; and thermal convective instability triggered by the ascending motion.

Houghton (1969) discussed the various rainfall regimes in the Great Basin. In western Nevada the Pacific regime is dominant but the Continental regime is often present in late spring while for several days during most summers the Gulf regime brings thunderstorms to the area. A series of articles by Klieforth (1977-79) describes the synoptic scale storms and associated mesoscale phenomena experienced throughout the year in western Nevada and eastern California.

Storm Types

Five principal "winter" (October through May) storm types are recognized according to the classification system suggested by Smith, et al (1979):

(1) High latitude front and upper trough. (Implies only maritime polar air.)

(2) Mid-latitude front and upper trough. (Mainly maritime polar air with some maritime tropical air lifted by occlusional processes.)

(3) Low-latitude front with deep upper trough. (Implies mainly maritime tropical air.)

(4) Confluent air masses. (Generally maritime polar and maritime tropical air masses brought together over a region along a frontal surface with tropical air contributing most of moisture.)

(5) Cold cyclone. (Mostly continental polar or modified maritime polar air with little or no frontal activity.)

Storm Duration and Magnitude

A storm period is defined as the time between the beginning and ending of nearly continuous precipitation at stations in the Sierra, e.g., Blue Canyon or Soda Springs. The average duration of Sierra storms is 30 to 35 hours.

An arbitrary classification of the magnitude of storms is based on the amount of precipitation measured at Blue Canyon or the greatest amount measured at any station in the Lake Tahoe-Truckee River area. Storms are classified as light if the measured precipitation is less than 0.50 inch of water, moderate if the amount is between 0.50 and 2.50 inches, and heavy if it exceeds 2.50 inches. A further breakdown of storm magnitude is given in the following table.

Class	Range (inches)	Average in.	Average mm
C-	<.10	.05	1
C	.10 - .30	.20	5
C+	.30 - .50	.40	10
B-	.50 - 1.50	.80	20
B	1.10 - 1.70	1.40	35
B+	1.70 - 2.50	2.10	53
A-	2.50 - 3.50	3.00	75
A	3.50 - 5.00	4.25	108
A+	>5.00	6.00	150

D: No measurements made

E: Climatological data not available or incomplete

F: No precipitation at any site

Similarly it is useful to categorize precipitation intensity according to the amount which is recorded in one hour. Accordingly, light precipitation is 0.01 or 0.02 inches of water per hour, moderate 0.02 to 0.16 inches per hour, and heavy 0.16 to 0.32 per hour; amounts over 0.32 inches per hour are very heavy.

It is worth noting the frequent occurrence of what might be called "negative" storms or "snow-eaters" -- storms with little precipitation but strong, dry winds which evaporate water from moist surfaces. Also big storms with strong winds with or without precipitation often combine with topography and vegetation to bring about a local redistribution of the existing snowpack.

MESOSCALE AND SYNOPTIC LABORATORY

The Synoptic Laboratory of the Atmospheric Sciences Center is concerned with analysis of past and present weather in the southwestern United States. Most of the data for current analysis, case studies and forecasting are obtained through the cooperation with the National Weather Service Office at Reno International Airport. However, facilities at the ASC laboratory include facsimile and teletype machines for receipt of regional upper air soundings, maps and cross-sections, hourly weather reports from surface stations including weather radar observations, pilot reports, etc., and measurements from electronic mountaintop weather stations. This climatological data is stored in the Sage Building. The ASC archives include the following data from 1965 to 1983: Daily Weather Maps, annotated teletype sequences and facsimile maps, Sacramento weather radar plots, cloud photographs, and a log of daily weather observations.

Associated with the Synoptic Laboratory is a mesoscale network of weather stations and precipitation gages in the mountains surrounding Lake Tahoe and the Truckee River basin. Rain and snowfall are measured after each storm at about 50 sites, some 20 of which are equipped with recording snow gages of the heated tipping-bucket type. Other instruments include maximum-minimum thermometers, hygrothermographs, barographs, snow boards, and remote recording weather stations. A major activity in the laboratory focuses upon the analysis of the spatial and temporal variation of precipitation and associated mesoscale weather phenomena over the Central Sierra.

THE MESOSCALE NETWORK

The network of precipitation gages had its beginning in 1965 with the installation of the Slide Mountain weather station at 9,650 ft. on the crest of the Carson Range between Lake Tahoe and Reno. (Its predecessor was the Mt. Rose Observatory at 10,880 ft., established and maintained by Dr. James Church of the University of Nevada in the early 1900's). The remote-recording Slide Mountain station began operation on 7 November 1965 and has operated successfully during most of the succeeding 18-year period. The wind velocity and air temperature data from that site are the only synoptic weather reports from the crest of the central Sierra. A second electronic weather station was installed on Peavine Mountain in 1970.

During the winter of 1965-66, several precipitation measuring sites were established at about mile intervals along the eastern slope of Nevada State Route 27 (Mt. Rose Highway). In March, 1966 four heated tipping-bucket snow gages with recorders were installed at four sites between 5,700 ft. and 8,280 ft. near the Mt. Rose Highway on the east slope of the Carson Range. Additional measuring sites and gages were added in 1967, and several more have been installed at new sites since then.

The mesoscale network monitors an area of about 1,000 square miles. Fig. 1 shows the locations of most of the recording gages. The major purposes of these measurements are to gather basic background information on the natural distribution of precipitation from different types of storms in this mountainous area and to evaluate possible downwind effects of cloud seeding projects in the central Sierra.

The instrumentation, techniques of measurement, maintenance problems, logistic aspects and reduction of data are discussed in the following sections.

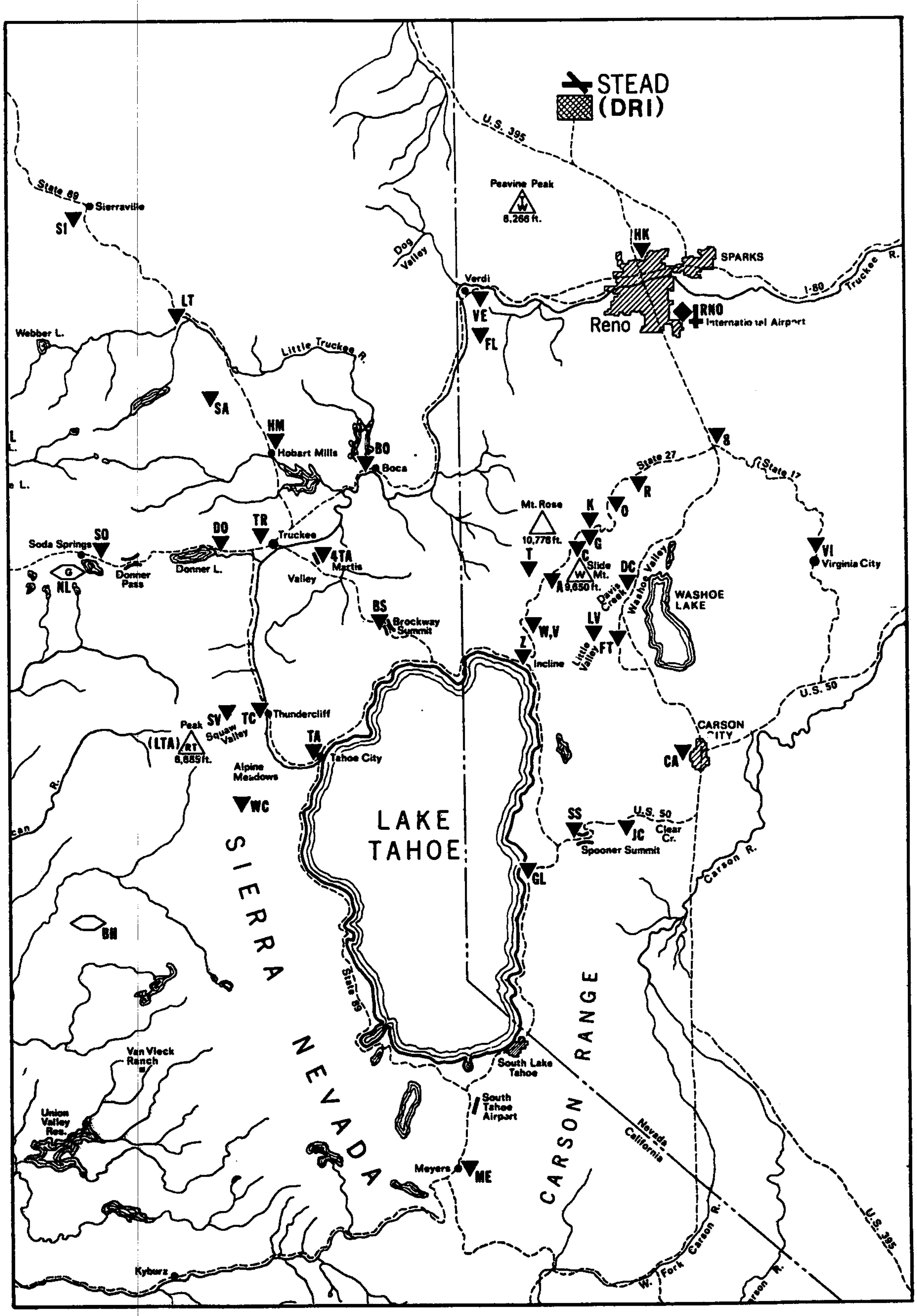

FIGURE 1: Map showing the location of the measurement sites in the mesoscale precipitation gage network.

SITE LOCATION IN MOUNTAINOUS TERRAIN

Among the problems and considerations in establishing a mountain precipitation network are accessibility of sites, representativeness of the data, spatial separation and temporal requirements, as discussed below.

1. Accessibility -- With the intention of measuring precipitation after each storm, and because of the necessity of frequent maintenance for recording gages, it was desirable to place the sites as near to existing all-year roads as possible. The minimum distance from the highway for site location was determined by the desire to make the instrument and measuring devices nearly invisible to the public and keep them beyond the reach of debris from rotary snowplows.

Ownership of the land on which the measuring sites are located varies greatly. Many are on U.S. Forest Service land, several are on right-of-ways belonging to the Nevada State Department of Transportation, and many are on private land belonging to individual owners or corporations. Permission for the use of these sites was obtained from each owner and their cooperation is gratefully acknowledged.

2. Representativeness -- It is necessary to select locations where winds are not excessively strong, i.e., where the precipitation falls more nearly vertically than horizontally. On the other hand, too much shelter such as overhanging vegetation has to be avoided also. Generally, the sites chosen are those in which the vegetation, whether sagebrush, deciduous trees or conifers, provides sufficient "roughness" to serve as protection from gale winds but at the same time does not extend more than a maximum angle of about 45° above the gage. Sites which do not meet these criteria, where serious drifting occurs or which are leeward of natural obstructions, are soon abandoned.

3. Spatial Separation -- In an area where large gradients in precipitation amounts are commonly observed, it is necessary to discover empirically what a suitable distance between gages should be. This is simply defined as the density necessary to interpolate with reasonable confidence between measuring points. In some areas, such as the Mt. Rose Highway with its large range of elevation, sites about a mile apart seem necessary. In other areas where elevation changes are much less and precipitation gradients consequently less, a spacing of about 5 miles seems sufficient. This is not to imply that an optimum mesoscale network exists; there are large areas between roads where measurement sites are needed but installation is prohibited by economic and logistic considerations.

4. Temporal Considerations -- Recording gages are located at several sites for the purpose of establishing the time of occurrence and rates of fall of precipitation in different parts of the area. Fronts and precipitation bands within major storms often traverse the area and their movement and change of intensity can be traced using recording gage data.

The placement of recording gages is further influenced by power availability and their spacing is influenced by their reliability; in some areas where recording gage density is greater than in other parts of the network, the partial redundancy of measurements compensates for frequent equipment failures. The timing of site visits is determined by the intervals between storms, the need to complete most of the tasks in daylight and the time required to reach all sites, a factor which varies greatly with the season, snow cover and road conditions.

NON-RECORDING MEASUREMENTS

1. Rain Cans -- In an area where precipitation can occur as either rain or snow, where snowfall amounts are often great, and where measurements cannot be made daily, it is necessary to have a dual system of measurements. For liquid precipitation or snowfalls of the order of a few inches, 6" diameter, 7" high cans are used. These are placed in simple wooden holders which are set on the ground and later, as the winter season progresses, are set on top of the snowpack. Both the can and holder are painted silver to minimize solar heating. If the can precipitation is liquid at the time of the site visit, it is measured directly in a graduated cylinder and the empty can is replaced in the holder. If the precipitation is frozen as ice or snow or as a mixture of liquid and solid water, it is removed, covered with a plastic bag bearing the site designation, and placed in a 6-can collection box which is subsequently brought into a warm room for melting prior to measurement, and an empty can is put in the holder.

Measurements of the liquid precipitation are made in milliliters (ml). The diameter of the can is such that the conversion factor used to obtain the amount in inches is 2.15×10^{-3}. Thus, 1000 ml or 1 liter equals 2.15 inches. Each can has a volume of 3.2 liters and can contain almost 7 inches of rainfall before overflow occurs.

The can has to be kept in a nearly vertical position atop the snowpack in order to be prepared for the rain-on-snow events experienced frequently in the Sierra. If the interval between storms is relatively long and accompanied by thawing temperatures, strong winds or both, it is necessary to visit the site to re-set the holder which may become tilted as a result of erosion of the supporting snow surface. During most winter weather between storms, the can remains properly upright for about a week on the old snow which has been packed around the holder to retard erosion. To avoid losing it after a heavy snowfall, it is marked by a 6-foot tall, 1 x 2" green-tipped silver stake on its northeast corner, i.e., opposite the prevailing southwesterly wind. At a few sites, standard 8" cans are used instead of 6" cans. Fig. 2 shows a 6" can in place.

2. <u>Snow Boards</u> -- To measure storm snowfall amounts more than a few inches in depth (which cause bridging in the 6" diameter cans and consequent undermeasurement), 2 x 2 foot snowboards of 1/4" or 1/2" plywood are placed on the bare ground or snow surface. These are also painted silver to retard solar heating and premature melting of the snow. The new snow accumulation of the board is cored by a 6" diameter can which is then righted and placed in the carrying box with a plastic bag over the top to prevent evaporation during overnight melting indoors. The plastic bag is labeled according to the site designation and whether it is a can or board measurement.

After coring of the board during which the depth of new snow is measured with a stick graduated in tenths of an inch, the board is placed on the undisturbed snow surface with its top level with the surface of the snow and marked by another 6-foot stake on its northeast side. If the depth of new snowfall is greater than about 10 inches, a Mt. Rose sampling tube with cutting edge is used instead of a can to take a core. In this case, the conversion factor used to obtain the amount of liquid precipitation in inches from a measurement made in ml is 3.53×10^{-2}; thus 100 ml = 3.53 inches.

Just as it is necessary to re-set cans on the snow surface when inter-storm weather affects the snowpack, so it is important to re-set the board if its top surface is not level with the snow surface. Occasionally on warm spring days following a snowstorm, the board will sink an inch or two into the soft layer of new snow. Then when a subsequent snowfall occurs

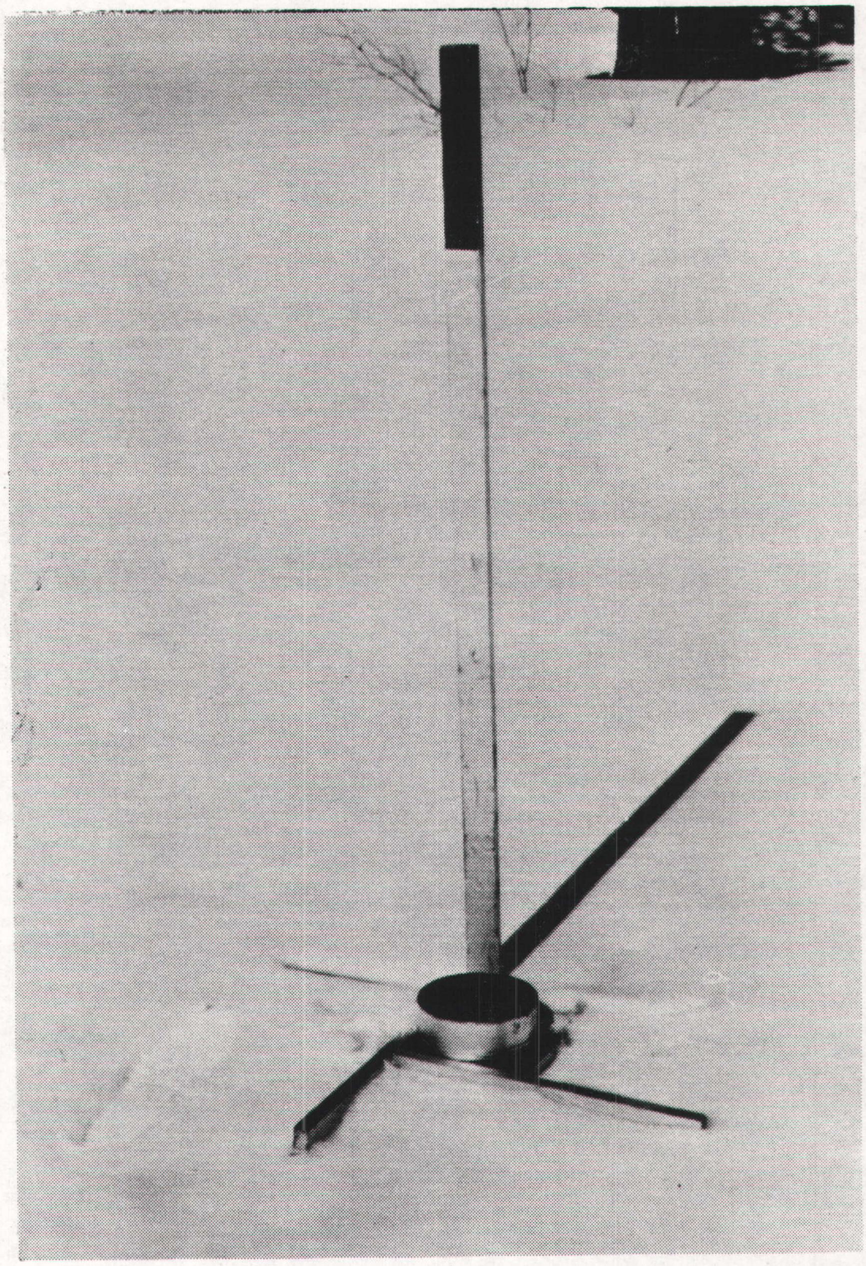

FIGURE 2: 6-inch precipitation gage, holder and stake in place at Site W (Eagle Drive, Incline).

with any wind, the board will over-measure the new snow. On the other hand, if rain or strong winds precede a new snowfall, the snow surrounding the board can be eroded, leaving the board on a pedestal. Then if a new snowfall occurs with any wind, the board will under-measure the new snow. Thus it is not sufficient to visit network sites only after storms; frequently visits have to be made prior to a new storm to ensure accuracy of measurement. Figs. 3 and 4 illustrate typical sites.

3. Snowpack Surveys -- At each site in the mesoscale network, a 12-foot long, 2 x 2" silver painted snow stake is placed vertically in the ground to a depth of about 18" and marked at 6" intervals from "0" at ground level to 10 feet. These are used to monitor total snow depth and to mark the location where periodic snow cores are taken, using the Mt. Rose sampler to determine the water content. At remote locations, the water content is measured by weighing the sampler containing the snow core and then weighing the empty sampler, the diameter of the latter being so chosen as to permit the difference in weight to be read on the scale in inches of water. The aluminum sampler consists of detachable units, each 30" long, with a movable handle and with a steel cutting edge on the primary unit. At elevations above 8,000 ft. in some seasons, it is necessary to place extensions on the snow stakes. The maximum depth at any site in the DRI network so far has not exceeded 17 ft. Information from snow surveys made on or near the first of each month from December through May are given to the Snow Survey Supervisor of the Soil Conservation Service in Reno for publication.

4. Problems and Errors of Measurement -- Very little loss of data has occurred because of vandalism. Human interference is rare and generally takes the form of innocent mischief: a ski touring class tramples the new snow on the board, or a

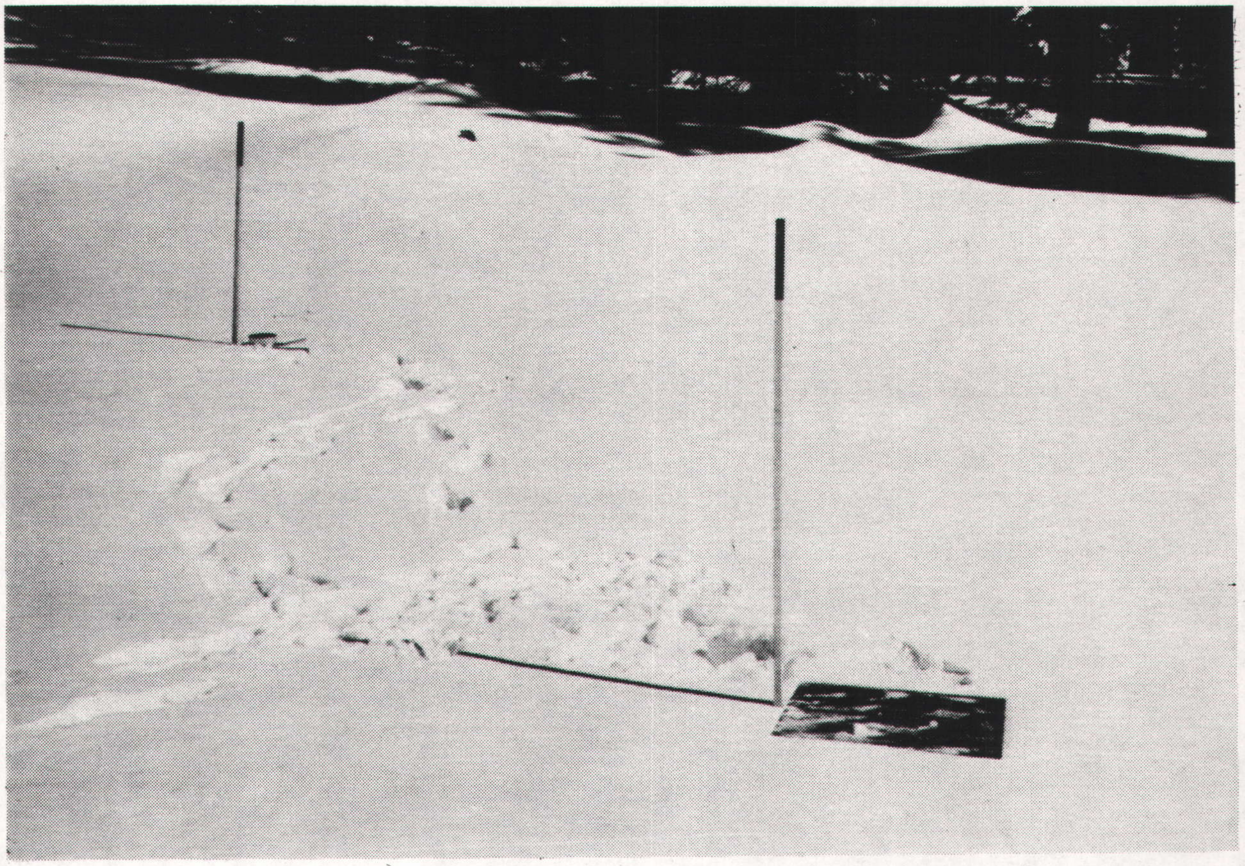

FIGURE 3: Can, snowboard and stakes on snowpack at Site W (Eagle Drive, Incline).

FIGURE 4: Site BS (Brockway Summit) showing rain can, snow board, snow stakes, measuring equipment, heated tipping-bucket gage and recorder box, and storage gage.

child "borrows" the board to slide on the snow. Destruction of equipment is usually caused by natural disasters (one site was buried by an avalanche, another was burned over in a forest fire) or by accidents such as when an 8" can and holder were crushed by a truck.

In almost all cases, it is possible to determine from the can and board measurements the amount of solid and liquid precipitation that has fallen at a site. If it has been all rain, the can amount is the "true" value; if all snow and no melting or evaporation has occurred, the board measurement is usually taken for the "true" value. After light snowfalls of 2" or less followed by warm weather in spring, the snow sometimes disappears from the board by melting before measurement, whereas the same amount of snow which falls in the can is retained and taken as the "true" value.

When mixed rain and snow occurs, -- usually in the form of rain first, followed by snow as colder air follows a frontal passage--, and the snowfall is not greater than about 6", the can measurement is usually greater and is accepted as the "true" value. If rainfall occurs after a substantial fall of snow, and before a site can be visited, the new snow can absorb a considerable quantity of water before runoff occurs from the board. It is only in the case of a substantial rainfall followed immediately by a heavy snowfall that uncertainty exists and under-measurement is possible. Even then it is often possible to arrive at a reasonable estimate of the two amounts.

At some sites above 8,000 ft. in the Carson Range, only snow boards are used after the first heavy snowfall of the season. The main reason for this economy is to shorten the time-consuming task of digging out cans and holders after each snowfall. Although 90 percent or more of the winter precipitation at these sites falls in the form of snow, the amounts from occasional rainfall may be lost and thus the cumulative total precipitation for the season may be underestimated. The water content of snowpack cores can be used to retrieve the precipitation that had fallen between visits to that site if the interval is two weeks or longer.

5. Logistics of Site Visitation -- The principal vehicle used by the field meteorologist is a pickup truck equipped with 4-wheel-drive and snow tires. In the truck bed are wooden boxes containing empty 6" cans, extra snow boards and stakes, a ladder, snowshoes and a square-tipped shovel for digging out cans, boards and instrument shelters. The average annual mileage for the truck which is used mainly within the network area is about 15,000 miles. The total road distance to all sites, if one were to visit each in turn from Reno in the most efficient manner, is about 320 miles. In practice, not all of the sites are visited after each storm; some are inaccessible by road at times and some require more attention than others.

It is possible to visit all of the sites in one long day in the fall; it requires two days when almost all of the precipitation is in the form of rain and the ground is free of snow. At least three days are needed when snow has fallen at most sites. For about five months of the season, showshoes or skis are used to reach the most remote sites.

The task of maintaining the mesoscale network and measuring precipitation requires about 800 man-hours from October through the following May. The major deterrents to the pursuit of this enterprise are adverse weather and, occasionally, other commitments.

6. General Results of Non-Recording Measurements -- For the past several years, measurements made of storm precipitation in the Lake Tahoe-Truckee River-Reno-Carson City area have provided basic climatological information on the temporal and

spatial distribution of rain and snowfall within an area comprising about 1,000 square miles. Results of general interest include those noted briefly below.

- The average density of newly fallen snow is 0.17 g cm^{-3}, i.e., 10 inches of new snow contains, on the average, 1.7 inches of water. (This is in contrast to densities nearer to 0.05 g cm^{-3} commonly found in the Colorado Rockies; 0.30 g cm^{-3} often found in the Cascade Mountains of Oregon; and 0.10 g cm^{-3}, the ratio most frequently used to convert snow depths to water equivalent.)
- At an elevation of about 6,500 ft. above sea level, 50% of the annual precipitation falls in the form of snow; on the west slope of the central Sierra, the 50% snowfall level is about 500 ft. lower, while along the east slope of the Carson Range, it is about 500 ft. higher. At elevations about 8,500 ft. snowfall comprises more than 95% of the precipitation which falls during the period October through May, and snow covers the ground for more than half of the year on the average. Consequently, the water content of the snowpack at these higher elevations from December through April can be used to approximate the cumulative seasonal precipitation.
- The greatest annual precipitation and the greatest amount for most individual storms falls at the highest elevations. Some new climatological records for Nevada have been established. These include the following published in Weatherwise (1971 and 1981):

*Greatest Snowfall:

24 hours	25.0 in.,	20 January 1969
Single storm	75.0 in.,	18-22 January 1969
Calendar month	124.0 in.,	January 1969
Season	323.0 in.,	1968-69

(All at Site G, Mt. Rose Resort, 8,280 ft.)

*Note: Some of these records were broken during the winters of 1981 and 1982-83.

*Greatest Snow Depth:

173.0 in., 1 March 1969
(At Site A, Tahoe Meadows, 8,540 ft.)

- The density of the winter snowpack increases throughout the season from near 0.20 g cm^{-3} after the first fall storm to about 0.56 g cm^{-3} in late spring prior to melting. The rate of maturing depends upon the distribution of storms throughout the season and the occurrence of warm weather episodes including rainfall.

- Two-dimensional southwest to northeast profiles of storm precipitation over the Carson Range have shown that the ratio of the amount measured at the crest, near 9,000 ft., to that measured in the leeward valley, below 5,000 ft., varies according to the wind velocity and the thermal stability of the air mass. Closed cyclones with general convergence and ascending motion are associated with ratios of about 2:1. Storms with strong westerly wind components produce the greatest orogenic effect on precipitation distribution which often results in a ratio of 20:1.

7. Reduction and Tabulation of Precipitation Data -- A major task of this project was to organize the non-recording gage precipitation, snowfall and snowpack measurements of the past several years in the DRI mesoscale network. These data are tabulated in Appendix A. Data from a total of 37 sites are included. The site designations, locations, elevations, and periods of record are listed in Table 1, and an example of these tables is presented for Site A (Tahoe Meadows) in Table 2.

*This record was broken during the seasons of 1981-82 (175 inches) and 1982-83 (200 inches).

SITE	LOCATION	ELEVATION FT	YEARS OF RECORD	PERIOD OF RECORD
BLU	Blue Canyon Airport	5280	42	1940-1983
SO	Soda Springs 1E	6885	38	1945-1983
DO	Donner Memorial Park	5937	28	1955-1983
SV	Squaw Valley Fire Station	6240	20	1962-1983
TA	Tahoe City	6230	72	1910-1983
BS	Brockway Summit	7200	15	1968-1983
4TA	Truckee-Tahoe Airport	5900	15	1968-1983
TRS	Truckee Ranger Station	5995	99	1883-1983
HM	Hobart Mills	5850	13	1970-1983
SA	Sagehen Creek	6340	28	1955-1983
SI	Sierraville Ranger Station	4975	72	1910-1983
BO	Boca	5575	92	1890-1983
HK	Northwest Reno	4600	15	1968-1983
RNO	Reno Airport	4404	112	1870-1983
VI	Virginia City	6340	41	1941-1983
CC	Carson City	4651	85	1897-1983
SS	Spooner Summit	7260	14	1969-1983
GL	Glenbrook	6350	39	1943-1983
LV	Little Valley	6540	14	1969-1983
3I	Cliff Ranch	5265	15	1968-1983
FT	Franktown, Cliff Ranch	5250	15	1968-1983
DC	Davis Creek Park	5160	15	1968-1983
8	Jct. U.S. 395 & NV 27	4590	15	1968-1983
7	Sage Bend	4820	15	1968-1983
6	Lancer	5110	15	1968-1983
4	Whites Creek	5670	15	1968-1983
R	Evergreen Hills Road	5700	15	1968-1983
2	Jones Creek	6000	15	1968-1983
0	RNR Test Site	6400	15	1968-1983
MK	Mount Rose Bowl	7400	15	1968-1982
K	Sky Tavern	7620	15	1968-1983
G	Mt. Rose Resort	8280	15	1968-1983
A	Tahoe Meadows	8540	15	1968-1983
U	Upper Incline	8000	15	1968-1983
V	Apollo Way	7300	15	1968-1983
W	Eagle Drive	6860	10	1968-1978
Z	Third & Incline Creeks	6235	15	1968-1983

TABLE 1: Sites for which average monthly and annual precipitation data are tabulated in Appendix A.

TABLE 2

SITE *A--Tahoe Meadows*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.22	1.05	.33	1.19	4.95	14.13	(37	.12	3.03	2.86	0	3.68	80.00
69-70	.02	0	0	2.17	2.39	11.51	11.44	3.79	4.99	5.51	0	2.69	44.51
1970-71	.02	0	0	1.64	7.83	19.50	4.91	1.38	10.27	3.06	4.94	.79	54.34
71-72	.18	.73	.92	1.78	4.78	12.37	3.56	5.24	.84	7.65	1.42	1.23	40.70
72-73	.26	.12	2.16	4.45	8.36	9.26	13.19	7.40	4.40	.65	1.16	.94	52.35
73-74	0	.05	.19	2.86	13.64	7.06	7.85	3.90	7.87	10.55	.07	0	54.04
74-75	2.32	.37	0	.03	5.24	6.80	4.80	17.26	14.14	5.93	1.46	.59	58.94
75-76	.04	2.01	.73	3.65	2.50	.80	1.93	4.50	4.49	1.36	.15	.09	22.25
76-77	2.01	2.91	1.80	1.16	1.40	.10	5.65	5.17	4.19	T	5.12	1.85	31.36
77-78	.27	.02	.35	.53	7.01	13.68	16.59	10.07	6.12	4.36	1.48	.06	60.54
78-79	.38	.08	2.65	0	4.08	4.24	10.03	14.92	5.66	3.09	1.87	.31	47.31
79-80	1.22	1.74	.02	3.53	3.00	16.13	15.37	11.77	5.19	4.15	2.64	.84	65.60
1980-81	.60	.36	1.15	1.02	1.27	5.78	11.46	2.49	5.06	1.49	3.03	0	33.71
81-82	.01	0	.43	6.00	17.32	16.72	9.88	7.99	17.84	10.60	.59	3.57	90.95
AVERAGE:	.54	.67	.77	2.14	5.98	9.86	10.98	7.72	6.72	4.15	1.71	1.19	52.42

Summaries and examples of other data analyses are presented in tables and figures at the end of this section in the following order:

Table 3: Annual precipitation data--average, maximum and minimum total water, snowfall and water content of snowfall in inches at 28 sites in the Truckee River basin, 1969-1982.

Table 4: Monthly, seasonal and annual precipitation data at Site A, Tahoe Meadows in the 1981-82 season.

Table 5: Precipitation and snowfall data (including percent of precipitation as snowfall) for each month and year, and the average value of these quantities, for the period 1969-1982 at Tahoe Meadows. (Note that the 1982-83 data have been added, but that they are not included in the averages).

Table 6: Snow survey data on or near 1 April at Tahoe Meadows for 16 years (1960-83), and the average values for that period.

Figure 5: Temporal accumulation of season precipitation (water content) and snowpack water content at Site A (Tahoe Meadows) for the years 1980-81 and 1981-82.

Figure 6: Topographic profile, average annual precipitation in inches of water, and average 1 April snowpack water content in inches of water along the Mt. Rose highway between Lake Tahoe (Site Z) and Highway 395.

Table 7: Snow survey measurements, depth and water contents in inches near the first of each month for 10 sites (O, N, M, K, G, D, A, U, V and W) in the Galena Creek-Mt. Rose-Incline area.

8. Isohyetal Analyses -- The precipitation measurements made during several seasons are sufficiently complete in time and space to permit the drawing of isohyetal maps for individual storms as well as for annual totals. (Note that the water year is defined as 1 July through 30 June). Maps initially on a scale of 1:62,500 (1 inch = 1 mile) constructed for three storms (8-10 July 1974, 9-12 January 1979, and 28-29 August 1979) are shown as examples in Figures 7, 8 and 9. Maps of average annual precipitation for much of the Truckee River drainage are shown in Appendix B. The relevant U.S. Geological Survey topographic map quadrangles included in the Appendix are listed below:

15 Minute Series (1:62,500, Contour interval 40 ft)

Mount Rose, NV	1950
Virginia City, NV	1950
Carson City, NV	1956
Loyalton, CA	1955
Truckee, CA-NV	1955
Dogskin Mountain, NV-CA	1957

7.5 Minute Series (1:24,000, Contour interval 20 ft)

Reno NW, NV	1967/1982
Reno NE, NV	1967/1982
Verdi, NV	1967/1982
Reno, NV	1967/1982
Vista, NV	1975/1982

The analyses are in the form of clear-view overlays to be placed over the indicated quadrangle. The lines of equal precipitation (isohyets) are drawn at intervals of two inches of water on the 7.5 minute maps and at intervals of 2 to 4 inches of water on the 15 minute maps. The choice of map scale and isohyet interval were based on considerations of terrain, number of data points, and the gradients of annual precipitation. The historical data used are shown on each overlay with the decimal point indicating the location of the weather station or measuring site; these data are the averages from the DRI sites for the period 1969-1979, the long-term averages of varying periods (see Table 1) for current weather stations, historical averages for sites (e.g., Lewers' Ranch) no longer in existence, and shorter-term measurements of several years (e.g., those by the U.S. Forest Service in and near Dog Valley).

The isohyetal lines were carefully drawn for these data and for what they suggested, in a general pattern, about the relationship of precipitation to elevation. Thus the topographic contours were principal guidelines and the mesoscale measurements in the Mt. Rose area suggested that similar patterns prevailed in areas where there were few data points. The results of earlier precipitation studies and isohyetal analyses including those by James (1971), Van Denburgh et al. (1973), Rush (1967), Rantz (Goodridge, 1980), and the Corps of Engineers (1980) were all carefully studied. Special consideration in the present analysis was given to personal knowledge of the terrain features, storm winds, snowdrift patterns and vegetation types. For example, it is observed that much snow is blown from the upper windward slopes and deposited on the leeward side, and that, on forested crests, rime ice accumulations account for a significant local increase in precipitation. With respect to vegetation, the types and distribution of trees, especially conifers, guided the analysis. Among the conifers at higher elevations, special note was made of those which are indicators of relatively heavy precipitation or deep snowdrifts--lodgepole pine (*pinus murrayana*), red fir (*abies magnifica*), western white Pine (*pinus monticola*), and mountain hemlock (*tsuga mertensiana*).

Site	Precipitation Avg.	Precipitation High	Precipitation Low	Snowfall Avg. Snow	Snowfall Avg. Water	Snowfall High Snow	Snowfall High Water	Snowfall Low Snow	Snowfall Low Water	% Total Precip. as Snow
8	10.86 (69-82)	18.04 (69)	6.60 (81)	10.0	1.42	28.0 (69)	3.18	T (77)		16
7	11.51 (69-82)	19.90 (69)	5.48 (81)							
6	13.11 (69-82)	22.91 (69)	7.20 (76)	18.4	2.88	46 (69)	6.15	T (77)		23
4	15.09 (69-82)	25.07 (69)	6.71 (76)	36	5.90	82 (69)	12.35	5.5 (77)	.83	40
2	20.34 (69-82)	36.93 (82)	7.85 (76)	51	8.00	107.4 (69)	14.81	~ 14 (77)	2.1	40
R	20.26 (69-82)	32.48 (82)	10.43 (76)	47	7.34	97.8 (69)	13.76	9.9 (77)	2.39	37
O	27.96 (69-82)	48.22 (76)	13.73	82	13.40	147.2 (69)	21.01	29.6 (70)	5.62	51
N	30.49 (69-76)	44.95 (69)	11.51 (76)	137 (69-75)	24.52	~ 192.2 (69)	~ 34	74.9 (70)	14.58	80
M	34.32 (69-77)	57 (69)	15.95 (76)	153 (69-76)	24.93	~220 (69)	~ 33	35.5 (76)	~ 6.5	71
K	37.72 (69-82)	58.46 (82)	16.93 (76)	14.3	26.57	~224.8 (69)	~ 37.7	40.1 (76)	7.23	71
G	46.26 (69-82)	71.89+ (82)	21.22 (76)	208	37.93	319.8 (82)	60.34	64.5 (77)	10.38	82
D	44.07 (69-75)	67.6 (69)	28.77 (72)	188	37.80	292.6 (69)	58.63	144.5 (72)	26.69	86
A	52.32 (69-82)	83.51 (82)	22.25 (76)	226	45.93	352.0 (82)	77.41	76.8 (76)	14.09	88
U	37.21 (69-82)	63.48 (82)	13.66 (76)	154 (69-79)	32.34	265.8 (69)	52.63	33 (76)	5.45	86
Y	32.19 (69-82)	50.32 (82)	12.84 (76)	104	22.37	181.3 (69)	34.59	10.7 (76)	2.56	69
W	27.46 (69-78)	~40.4 (69)	11.65 (76)	89.3 (69-78)	18.27	~ 165 (69)	~ 29	19.5 (76)	2.73	67

TABLE 3: Annual precipitation data--average, maximum and minimum total water, snowfall and water content of snowfall in inches at sites in the Truckee River basin, 1969-1982.

Site	PRECIPITATION Avg.	High	Low	SNOWFALL Avg. Snow	Avg. Water	High Snow	High Water	Low Snow	Low Water	% Total Precip. as Snow
Z	21.10 (69-82)	36.91 (82)	10.95 (77)	35	7.67	64.6 (69)	14.98	16.3 (77)	2.11	36
LV	29.37 (70-82)	56.83 (82)	16.84 (81)	55 (73-78)	13.22	73.7 (75)	20.27	27.6 (76)	6.16	48
31	24.37 (70-82)	45.61 (82)	12.30 (81)							
FT	23.00 (70-82)	46.60 (82)	11.63 (81)	26.4	4.89	56.5 (71)	9.33	0.5 (70)	.08	21
DC	20.80 (70-82)	41.08 (82)	9.44 (77)	20.5	3.84	38.1 (71)	6.35	0.8 (70)	.14	18
JC	17.84 (71-82)	26.32 (74)	10.41 (76)	27.1	5.67	59.0 (71)	12.79	9.9 (77)	1.66	34
SS	26.39 (71-82)	37.31 (71)	15.70 (76)	80.6	17.37	129.7 (71)	28.26	34.8 (77)	6.45	66
4TA	24.50 (69-82)	47.49 (82)	10.27 (76)	51	11.25	96.9 (69)	21.50	12.0 (77)	2.95	46
BS	37.37 (69-82)	63.23 (82)	10.69 (76)	146	27.62	252.2 (69)	48.03	14.3 (76)	3.55	74
TC	39.34 (74-82)	47.77 (74)	16.62 (76)	76	17.34	106.6 (75)	28.75	32.9 (77)	6.98	51
HM	24.14 (71-82)	52.05 (82)	10.91 (76)	56	13.16	93.4 (71)	19.58	13.3 (77)	3.4	55
BF	26.11 (74-82) ex. 78	68.89 (82)	11.24 (77)	84 (74-82) ex. 77,78	23.37	92.5 (82)	28.6	23 (76)	3.45	69

The precipitation seasons (1 July to 30 June) used in calculation of averages are indicated in parentheses.

TABLE 3 Continued

SITE: Tahoe Meadows

SEASON: 1981-82

	TOTAL PRECIP	SNOWFALL SNOW (IN)	SNOWFALL WATER (IN)	SNOWFALL AVERAGE DENSITY	MAX TOTAL DEPTH	SNOW SURVEY SNOW (IN)	SNOW SURVEY WATER (IN)	TEMP MAX	TEMP MIN	CUMULATIVE PRECIP
JULY	.01							82	28	.01
AUGUST	0							84	30	.01
SEPTEMBER	.43	2.0	.50	.25	2			77	20	.44
SUMMER TOTALS	.44	2.0	.50	.25	2			84	20	
OCTOBER	6.00	25.9	5.68	.22	20			66	10	6.44
NOVEMBER	17.32	73.0	17.04	.23	62			57	2	23.76
DECEMBER	16.72	63.0	13.84	.22	92			48	-9	40.48
FALL TOTALS	40.04	161.9	36.56	.23	92			66	-09	
JANUARY	9.88	62.2	9.78	.16	117	81	30.2	49	-18	50.36
FEBRUARY	7.99	27.8	7.99	.29	117	110	41.7	46	-14	58.35
MARCH	17.84	67.0	15.46	.23	138+	117	50.8	46	----	76.19
WINTER TOTALS	35.71	157.0	33.23	.21	138+			49	-18	
APRIL	10.60	33.0	7.61	.23	175	175	72.9	--	---	86.79
MAY	.59	4.5	.59	.13	142	142	69.7			87.38
JUNE	3.57				72			74	8	90.95
SPRING TOTALS	14.76	37.5	8.20	.22	175+			74	8	
YEAR TOTALS	90.95	358.4	78.49	.22	175+			84	-18	90.95

TABLE 4: Monthly, seasonal and annual precipitation data at Site A, Tahoe Meadows in the 1981-82 season.

TABLE 5

PRECIPITATION AND SNOWFALL AT TAHOE MEADOWS 1968-1983

	J	A	S	O	N	D	J	F	M	A	M	J	TOTAL
1968-69													
Total Precip.	.22	1.05	.33	1.19	4.95	14.13	→	~49	3.03	2.86	0	3.68	~80
Snow { Inches				3.9	17.3	67.9	→	~175	22.3	14.1			~300
Snow { Water				.95	3.57	14.13	→	~44	3.03	2.86			~69
% precip. as snow				80	72	100		90	100	100			86
1969-70													
Total Precip.	.02	0	0	2.17	2.39	11.51	11.44	3.79	4.99	5.51	0	2.69	44.5
Snow { Inches				3.4	10.5	41.4	65.5	20.9	22.8	30.2			195
Snow { Water				.88	2.39	11.51	11.44	3.79	4.99	4.49			39.5
% precip. as snow				41	100	100	100	100	100	81			89
1970-71													
Total Precip.	.02	0	0	1.64	7.83	19.50	4.91	1.38	10.27	3.06	4.94	.79	54.3
Snow { Inches				7.5	39.3	103.4	16.2	8.8	54.4	16.7	24.6		271
Snow { Water				1.32	7.57	19.50	4.91	1.38	10.27	3.06	4.94		52.9
% precip. as snow				80	97	100	100	100	100	100	100		97
1971-72													
Total Precip.	.18	.73	.92	1.78	4.78	12.37	3.56	5.24	.84	7.65	1.42	1.23	40.7
Snow { Inches			6	8	26.8	56.8	25.7	24.7	4.3	45.3			198
Snow { Water			.92	1.6	4.42	12.37	3.56	5.24	.84	7.65			36.6
% precip. as snow			100	90	02	100	100	100	100	100			90
1972-73													
Total Precip.	.26	.12	2.16	4.45	8.36	9.26	13.19	7.40	4.40	.65	1.16	.94	52.3
Snow { Inches				8.2	47.8	39.1	81.4	44.5	23.7	1.0			246
Snow { Water				1.11	6.97	8.91	13.19	7.40	3.74	.41			41.7
%precip. as snow				25	83	96	100	100	85	63			80
1973-74													
Total Precip.	0	.05	.19	2.86	13.64	7.06	7.85	3.90	7.87	10.55	.07	0	54.04
Snow { Inches				10.0	54.2	31.8	43.6	23.9	35.1	37.2			235.8
Snow { Water				2.19	12.63	6.22	7.85	3.90	7.87	10.31			50.97
% as snow				77	93	88	100	100	100	98			94
1974-75													
Total Precip.	2.32	.37	0	.03	5.24	6.80	4.80	17.26	14.14	5.93	1.46	.59	58.94
Snow { Inches					24.6	38.9	26.2	87.8	81.1	29.6	5.1		293.3
Snow { Water					5.08	6.80	4.80	17.26	14.14	5.93	1.21		55.22
% as snow					97	100	100	100	100	100	83		94
1975-76													
Total Precip.	.04	2.01	.73	3.65	2.50	.80	1.93	4.50	4.49	1.36	.15	.09	22.25
Snow { Inches				3.5	10.7	4.3	13.0	25.4	23.4	0.8			76.8
Snow { Water				1.14	2.50	.77	1.93	4.50	3.76	.12			14.72
% as snow				31	100	96	100	100	.84	9			66
1976-77													
Total Precip.	2.01	2.91	1.80	1.16	1.40	.10	5.65	5.17	4.19	T	5.12	1.85	31.36
Snow { Inches					5.5	0	25.4	26.0	21.8		18.1		96.8
Snow { Water					1.40		5.61	4.94	3.79		3.01		18.75
% as snow					100	0	99	96	90		59		60

TABLE 5 (CONTINUED)

	J	A	S	O	N	D	J	F	M	A	M	J	TOTAL
1977-78													
Total Precip.	.27	.02	.35	.53	7.01	13.68	16.59	10.07	6.12	4.36	1.48	.06	60.54
Snow { Inches				1.8	34.7	67.9	77.8	46.5	27.6	14.3	3.0		273.6
Snow { Water				.53	6.89	13.59	16.59	10.02	5.51	2.87	.68		56.68
% as Snow				100	98	99	100	99	90	66	46		94
1978-79													
Total Precip.	.38	.08	2.65	0	4.08	4.24	10.03	14.92	5.66	3.09	1.87	.31	47.31
Snow { Inches					19	25.5	58.7	73.5	32.5	8.3	5.5		223
Snow { Water					4.02	4.14	10.03	14.92	5.55	2.44	1.69		42.79
% As Snow					99	98	100	100	98	79	90		90
1979-80													
Total Precip.	1.22	1.74	.02	3.53	3.04	16.13	15.37	11.77	5.19	4.15	2.64	.84	65.60
Snow { Inches				6.8	17.6	68.8	54.5	~60	32.7	14.9			255.3
Snow { Water				1.33	3.84	16.13	15.37	11.77	5.12	4.15			57.71
% as Snow				38	100	100	100	100	99	100			88
1980-81													
Total Precip.	.60	.36	1.15	1.02	1.27	5.78	11.46	2.49	5.06	1.49	3.03	0	33.71
Snow { Inches					6.0	24.5	66.0	10.1	23.0	4.2	5.5		133.9
Snow { Water					1.26	5.68	11.46	1.90	5.06	1.43	1.50		28.29
% as Snow					100	98	100	76	100	96	50		84
1981-82													
Total Precip.	.01	0	.43	6.00	17.32	16.72	9.88	7.99	17.84	10.60	.59		(87.38
Snow { Inches			2.0	25.9	73.0	63.0	62.2	27.8	~67.0	~33.0	4.5		358.4
Snow { Water				5.68	17.04	13.84	9.78	7.99	15.46	7.61	.59		77.99
% as Snow				95	98	83	99	100	87	72	100		89
Average													
Total Precip.	.54	.67	.77	2.14	5.98	9.86	10.96	7.71	6.72	4.15	1.80	1.01	52.32
Snow { Inches			.5	5.6	27.6	45.3	53.4	39.3	33.6	17.9	4.8		22.6
Snow { Water			.1	1.2	5.7	9.5	10.7	7.6	6.4	3.8	1.0		46.0
% Precip. as snow			13	56	95	96	97	98	96	92	56		88
1982-83													
Total Precip.	.90	.25	6.04	6.95	15.38	13.79	11.72	19.59	14.06	5.78	3.15	.88	98.49
Snow Inches			15.5	19.5	88.6	62.3	65.5	91.0	65.0	31.7	8.2		447.3
Snow Water			1.80	4.11	15.01	13.79	11.72	19.08	12.85	5.50	2.0		90.6
% as snow			30	59	98	100	100	97	91	95	63		92

TABLE 6

Site A, Tahoe Meadows (8,540 ft.)

1 April Snow Survey

Year	Date	Snow (in.)	Water (in.)	Density
1968	31 March	71.0	29.5	.42
1969	28 March	151.0	67.5	.45
1970	1 April	84.5	38.8	.45
1971	31 March	110.5	41.9	.38
1972	29 March	53.0	24.7	.47
1973	9 April	96.0	43.5	.45
1974	5 April	118.0	(47.2)	(.40)
1975	28 March	139.0	53.4	.38
1976	30 March	45.0	15.4	.34
1977	3 April	36.0	10.0	.28
1978	28 March	117.0	54.0	.46
1979	29 March	108.0	42.7	.40
1980	26 March	137.0	56.2	.41
1981	28 March	69.0	23.4	.34
1982	8 April	175.0	72.9	.42
1983	30 March	190.0	80.0	.42
Avg.	31 March	106.2	43.8	.41

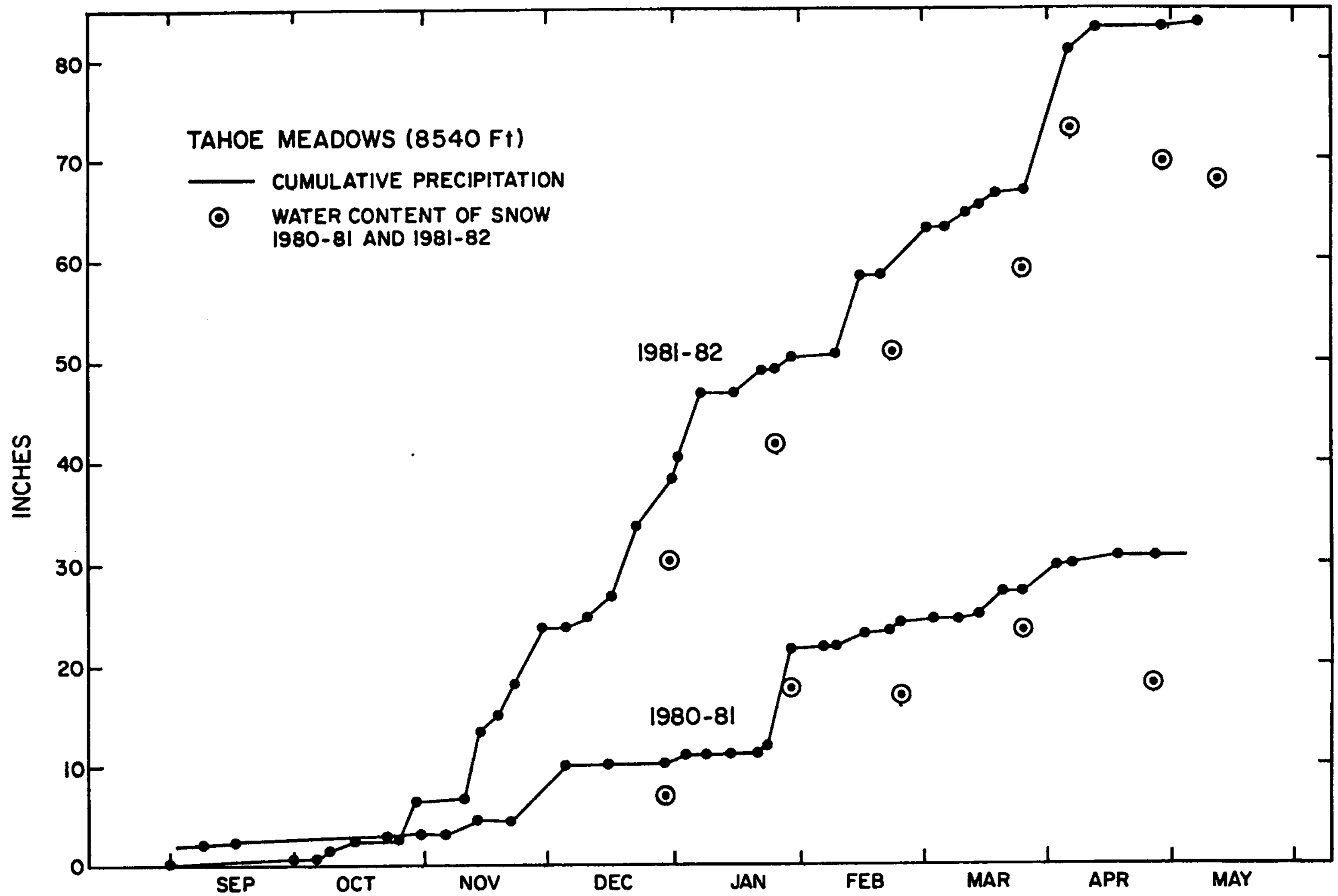

FIGURE 5: Temporal accumulation of seasonal precipitation (water content) at Site A (Tahoe Meadows, 8540 feet) for the years 1980-81 and 1981-82. The circled points indicate the water content of snow cores taken with a sampling tube on the dates indicated.

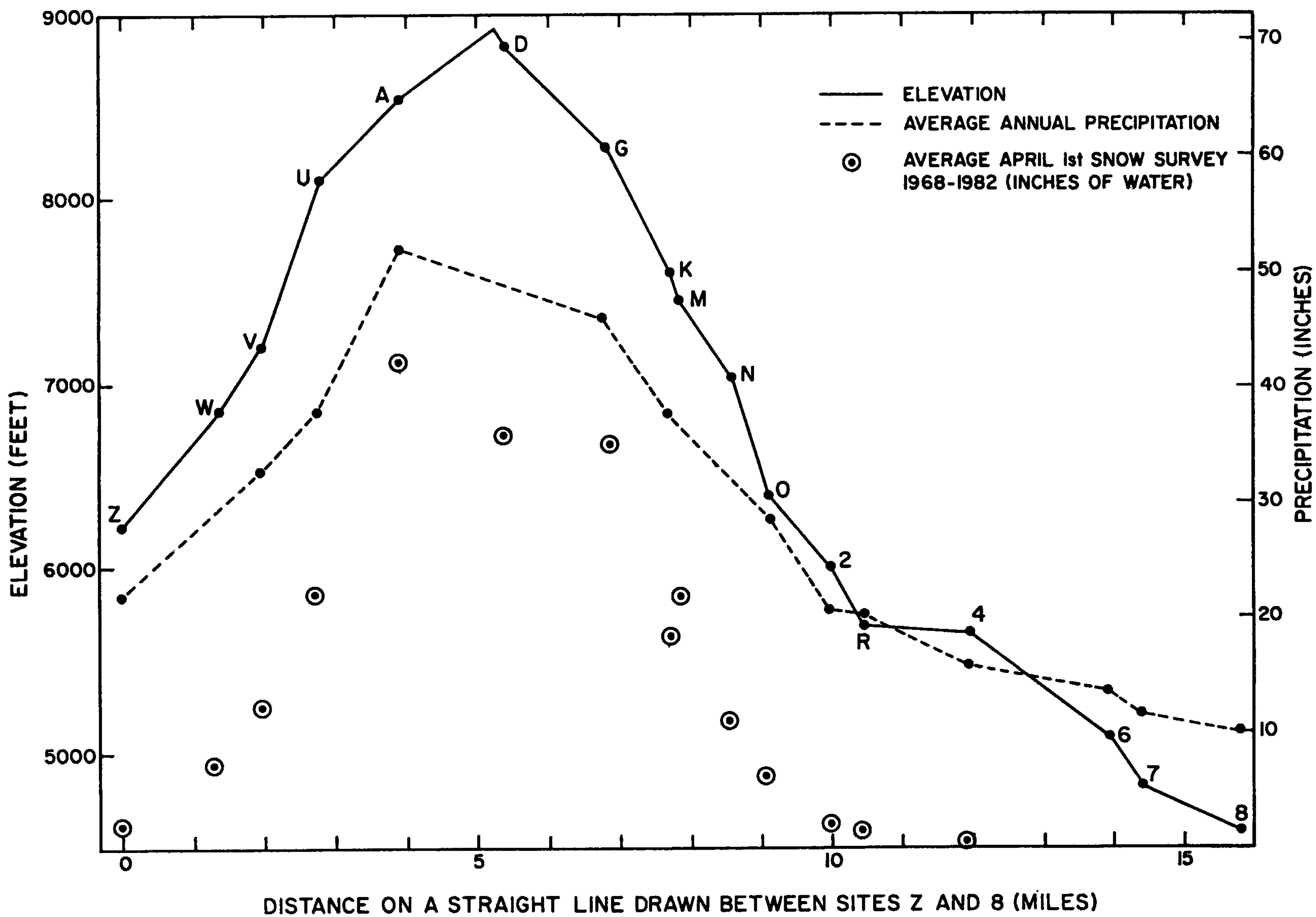

FIGURE 6: Topographic profile, average annual precipitation in inches of water, and average April 1st snowpack water content in inches of water along the Mt. Rose highway between Lake Tahoe (Site Z) and Highway 395 (Site 8).

TABLE 7

Snow Survey Measurements: Depth and Water Content in Inches Near First of Month, MT. ROSE AREA

SITE	YEAR	DEC	JAN		FEB		MAR		APR		MAY		JUN
O	1967		8	3.5			22	10.9	41.5	16.0	30	11.8	
6,400'	68		18.5	4.9	19	6.0	6	2.1	0		0		
	69	2.5	18	4.9	36		60		35.5	15.4	0		
	1970		3		5	1.6	8	1.2	0		0		
	71	24	38	12.0	30.5	13.6	24	11.6	15	6.5	0		
	72	1.5	26		27	8.5	12.5	5.7	0.5		0		
	73	6	8	2.7	20.5	5.0	24	7.4	10		0		
	74	17	8.5	3.2	8		23	10.2	6		0		
	75	5	12	12.5	12.5		32	10.7	43	15.4	26	11.2	
	76	0	1		0		18		0				
	77	0	0		12	2.9	12		4		0		
	78	0	15	4.8	33	11.2	41	15.2	12	5.4	0		
	79	8.5	15	4.2	18	5.5	30	8.7	20.5	6.0	0		
	1980	0	23	5.1	21	6.7	35.5	10.8	24	9.4	0		
	81	4	0		24	4.1	7.5	2.8	0		0		
	82	6	14	1.8	25		8	3.5	0		0		
	83	22	31	8.3	43	12.3	54	17.5	46	19.1	29	12.4	
	MEANS:	7.0	14.0	4.3	21.0	6.5	25.0	8.5	15.0	6.7	5.0	2.1	
N	1967		14.5	5.5			42	14.8	48.5	18.7	42	18.7	
7,060'	68		30.5	10.1	29	10.6	31.5	12.9	18	9.4	0		
	69	6.0	34.5	11.6	72		93.5		62	32.1	0		
	1970		8		18	5.6	24.5	5.6	8	4.0	0		
	71	48	58	19.6	63	28.1	37.5	17.0	44.5	24.5	0		
	72	2.5	43	10.3	41	13.9	34	14.8	0		0		
	73	11.5	16	6.0	39	11.8	45	15.2	25	9.8	0		
	74	29	23	6.7	12		31	13.4			0		
	75	9.5	13.5		19		47	17.2	60	23.7	37	18.6	
	76	0	1		0		24		0		0		
	77	0	0										
	78						62	24.4	35	15.3	0		
	79		16	4.3	26	7.4	41	12.1	34	10.5			
	1980				33	11.5	56	16.8	37	15.7			
	81				36	6.2	10	4.2	0		0		
	82	7	15	2.0			14	6.1	6	3.7	0		
	83		47	14.8	66	19.4	88	31.4	80	32.3	56	25.1	
	MEANS:	16.0	23.0	8.3	35.0	11.5	43.0	14.7	31.0	13.3	9.0	4.2	

TABLE 7

Snow Survey Measurements: Depth and Water Content in Inches Near First of Month, MT. ROSE AREA

SITE	YEAR	DEC	JAN		FEB		MAR		APR		MAY		JUN	
M	1967		39.5	5.5			67	23.8	101	35.7	96	36.9	20.5	9.0
7,440'	68		26	7.8	32	10.2	44.5	16.2	40	11.5	8	3.2		
	69	8.0	38	9.9			121		94	42.3	58	29.5		
	1970		17.5		39	13.0	53.5	16.6	34.5	14.9	21.5	9.0		
	71	50	53	15.5	51	20.1	48	19.8	54	26.2	19			
	72	5.5			48	14.8	42	14.8	15		0			
	73		23.5	8.0	57	16.2	68	20.7	60	20.5	0			
	74	36	32	9.5	38	14.0	66	24.4	62		24			
	75	17	27.5		31		63	22.3	90.5	32.8	80	33.1		
	76	0			0				19	6.0				
	77	0	0								0			
	78						80	30.7	63.5	31.2	40	20.9		
	79		23.5	6.3	37	10.4			62.5	19.5	35	14.3		
	1980				50	15.0	83	24.0	71	28.5	36	16.2		
	81				51.5	11.7	33	11.3	30	11.7	0			
	82						37	15.5	44	19.4	49	21.2		
	83													
	MEANS:		28.0	7.8	40.0	12.5	62.0	20.0	56.0	23.1	31.0	12.9		
K	1967		29	6.3			57	23.1	75.5	28.8	73	24.6	8	3.1
7,620'	68		26	7.7	28	9.5	32	11.2	22	7.5	0			
	69	6.0	41	12.7	95		117.5		89	40.7	41.5	22.3		
	1970		20	4.8	43	14.5	48	17.5	25	10.4	4	1.6		
	71	51	56	17.6	50	20.9	39	19.8	45	21.9	0			
	72	4	47	11.3	42	14.3	37.5	15.1	1		0			
	73	10.5	16.5	5.7	44	12.5	57	19.1	48	15.9	0			
	74	36	29	9.2	31		58	21.4	60		0			
	75	12	19		24		55	21.2	80.5	28.1	67	29.7		
	76	0	1		0		24		0					
	77	0	0		16	5.4	16		5		0			
	78	6	35	10.1	61	20.8	66.5	26.5	46.5	24.3	27	13.1		
	79	8	17	4.8	27	7.5	51	15.2	46	13.1	9	4.4		
	1980	1.5	36.5	7.9	46	15.3	72	22.2	61	27.3	21	10.2		
	81	2.3	7	3.3	42	8.1	17	7.1	4	2.1	0			
	82	16.5	33	8.1	45		30	12.2	34	13.6	29	14.3		
	83	40	62	19.6	75	25.2	103	36.0	97	41.7	97	42.7	14	
	MEANS:	15.0	28.0	8.6	42.0	12.8	52.0	19.1	44.0	18.4	23.0	10.2		

TABLE 7

Snow Survey Measurements: Depth and Water Content In Inches

Near First of Month, MT. ROSE AREA

SITE	YEAR	DEC		JAN		FEB		MAR		APR		MAY		JUNE	
G 8,280'	1967			46	16.6	102	31.4	85.5	31.8			116	49.9	56	29.5
	68	30		34	10.8	41.5	13.8	60.5	27.7	61	28.2	33	17.7		
	69	12		52	15.3	129		164		128	61.8	87	51.0		
	1970	5		32	10.1	69.5	26.9	87.5	30.8	71.5	34.1	63.5	34.1		
	71	65		80	27.7	79	31.0	75	32.5	91	39.0	63			
	72	13		63	16.8	62.5	20.5	64	24.0	36	17.9	22			
	73	21		34	11.8	74	23.7	88	33.5	83	32.5	37	19.3		
	74	47	12.2	50	17.7	59	24.5	94	34.5			55			
	75	26.5		37		41		76	28.0	112	40.6	100	43.0	41	20.5
	76	3		5		11		38		25	9.5	0			
	77	2		1.5		17	5.0	28		26.5		0			
	78	12		51	15.4	90	31.8	104	41.3	91	41.3	75	39.2		
	79	12		27	7.8	48	14.1	82	25.1	82.5	29.3	50	24.2		
	1980	6		44	10.2	73	27.5	116	39.2	107	46.0	74	39.0	22	
	81	23.5		18	5.2	66	15.3	47	16.4	50	17.8	14	5.1		
	82	47		71		94		89	35.7	100	42.7	108	53.5	30	
	83	62		85	26.5	105	34.6	149	55.0	160	66.4	151	68.0	95	
	MEANS:	24.0		43.0	13.7	68.0	23.1	85.0	32.5	82.0	36.2	62.0	31.8	14.0	
D 8,820'	1967			40.5	17.0	96.5	33.5	86.5	35.5			116	49.4	86	41.5
	68	27		33.5	11.0	40.5	13.6	63	24.9	63.5	25.1	47	23.5		
	69	12		39.5	12.1					129		99	54.2		
	1970					76	31.1	91	38.0	80.5	38.6	78	37.6	23	
	71	50		67	23.4	57	25.9	64.5	27.7	69	31.8	61			
	72	13.5		47	12.7	48	15.1	53	18.7	39		28			
	73	21.5		36	11.9	66.5	24.4	82	26.9	81	32.1	52	27.9		
	74			41.5	14.5	52	20.9	67	26.1			51			
	75	20.5		34		41.5		68	22.6	97	36.0	97	41.9	42.5	21.8
	76									37	12.6	35			
	77											0			
	78									86	40.0	80	43.6		
	79			28	8.5	51	15.7	86	27.9	86	31.1	75	33.7	0	
	1980					75	30.3	115.5	41.4	114	46.4	90	47.1		
	81			18	5.4	61	14.6	50	16.4	58	22.2	31.5	14.1		
	82			90	32.1			106	44.3	121	51.5	112	64.4		
	83			85	29.3	97	34.6	148	54.6	170					
	MEANS:			47.0	16.2	64.0	23.6	83.0	31.2	87.0	35.4	66.0	36.5		

TABLE 7

Snow Survey Measurements: Depth and Water Content In Inches

Near First of Month, MT. ROSE AREA

SITE	YEAR	DEC		JAN		FEB		MAR		APR		MAY		JUNE	
A 8,540'	1967			52	18.0	127.5	41.5	106.5	42.1			133	56.2	102	56.5
	68	30		35	10.8	51	21.4	67	27.5	71	24.2	49.5	26.0		
	69	12		59	16.6			173		151	67.4	125	61.1	61.5	
	1970	6		39.5	12.7	78.5	32.0	101.5	39.5	84.5	38.8	83.5	43.8	18	
	71	76		90	31.4	89	37.9	86	37.2	110.5	41.9	96			
	72	20		65	17.0	69	23.1	73	27.4	53	24.7	38			
	73	25		42	15.2	91	32.1	111	40.0	102	43.4	66	35.7	15	
	74	50	14.4	70	24.4	81	34.6	119	44.2			86			
	75	30		42		49		94	34.8	139	53.3	132	57.0	71	38.8
	76	10		13		20		59		45	15.4	30	8.3		
	77	3		1.5		18.5	5.4	33		36		0			
	78	12		66	21.0	109	39.5	122	48.9	117	54.0	106	53.0		
	79	13		29	8.1	58	16.5	107	35.0	108	42.7	86.5	42.0	6	
	1980	12		56	14.3	92	36.3	136	47.5	137	56.2	103	50.1	65	
	81	29		21	6.9	76	17.7	60	16.8	69	23.4	36	18.0	0	
	82	61.5		92		110		117	50.8	135	59.0	142	69.7	72	
	83	73		109.5	33.0	133	44.8	179	65.3	190	80.0	196	95.8	125	
	MEANS	29.0		52.0	17.6	78.0	29.4	103.0	39.8	103.0	44.6	89.0	44.1	32.0	
U 8,000'	1967					96	28	73	29.5			103	45.5	50.5	24.5
	68			27	7.6	50		41	14.7	33		0			
	69			49.5	16.1							76	44.9		
	1970			28.5	7.5	51	20.6	65	26.0	48.5	22.0	41	20.9		
	71	46				45.5	20.8	38	15.2	60	25.9	35			
	72	11.5		44	11.2	40	12.0	46	16.2	23		0			
	73			26		63.5	19.1	79	24.5	62	26.2				
	74			39	10.8	43	15.8	61	22.3			20			
	75	18		26		29		60	22.1	95	33.5	82	30.5	0	
	76	0						26		8					
	77														
	78			44	12.4	75	25.1	78	32.4	68.5	33.6	50	26.0		
	79	7		16	4.4	33	10.8	74	25.6	71	25.4	38	15.7		
	1980	4		36.5	8.5	54	21.9	95	25.4	92	38.8	42	20.5	0	
	81	16		4	1.7	41	9.0	23	7.2	26	10.8	0			
	82	28		48	13.8	66		58	23.7	67	29.7	60	28.9		
	83	50		72.5	23.1	95	31.6	128	43.2	146	57.9	136	57.6	60	
	MEANS:	20.0		35.0	10.6	56.0	19.5	63.0	23.4	62.0	27.6	49.0	24.3		

TABLE 7

Snow Survey Measurements: Depth and Water Content In Inches

Near First of Month, MT. ROSE AREA

SITE	YEAR	DEC	JAN		FEB		MAR		APR		MAY		JUNE	
V 7,300'	1967				67	21.5	44	19.6	64	23.7	75	30.4	18	8.0
	68		22	7.6	30		11	4.9	0		0			
	69	3	30				93		64		21.5	10.8	0	
	1970		23	4.9	35	12.5	32	11.8	12	6.1	0			
	71	36	49	15.7	31	13.1	23	9.4	14	7.2	0			
	72	4	25.5	9.6			28.5	13.2			0			
	73		13		40	12.7	43	15.9	17	9.0				
	74		26	8.5	24	8.5	25	10.5			0			
	75	7			5		34	12.8	67	23.7	38			
	76		5.5				15							
	77						11		0					
	78		21	6.4	47.5	16.6	47	19.8	18	8.5	0			
	79	4.5	6.5	2.0	13	4.6	42	10.4	26	6.7	0			
	1980	2	25.5	5.7	35	12.7	51	15.3	31	13.8	0			
	81	9.5	0		41	7.8	4	0.5	3	0.8	0			
	82	7	22	4.4	33.5		10	4.1	3	1.8	0			
	83	35	57	14.6	69	20.5	103	37.9	113	45.5	101	42.4		
	MEANS	12.0	23.0	7.2	36.0	11.9	36.0	13.3	31.0	11.3	14.0	5.9		
W 6,860'	1967				78	17.7	33	13.6	47	21.5	47	20.2		
	68		16	44			15	6.0	0		0			
	69		20		70		85		45	18.9	11	5.8		
	1970	1.5	18	4.1	26.5	10.2	22	8.4	0		0			
	71		35.5	10.0	38	13.8	24	11.7	18.5	7.8	0			
	72	3	29	7.2	29	8.4	20	7.2	5.5		0			
	73		25		31	9.2	36	13.1	13	5.8				
	74	21.5	18	5.0	14	6.0	16	6.6	11.5		0			
	75	5			3		26	10.1	49	18.1				
	76						13							
	77						6		0					
	78	6	17	5.8	38	14.3	38	16.0	10	5.4	0			
	79													
	1980													
	81													
	82													
	83													
	MEANS		20.0	6.1	36.0	10.0	28.0	9.3	18.0	8.6				

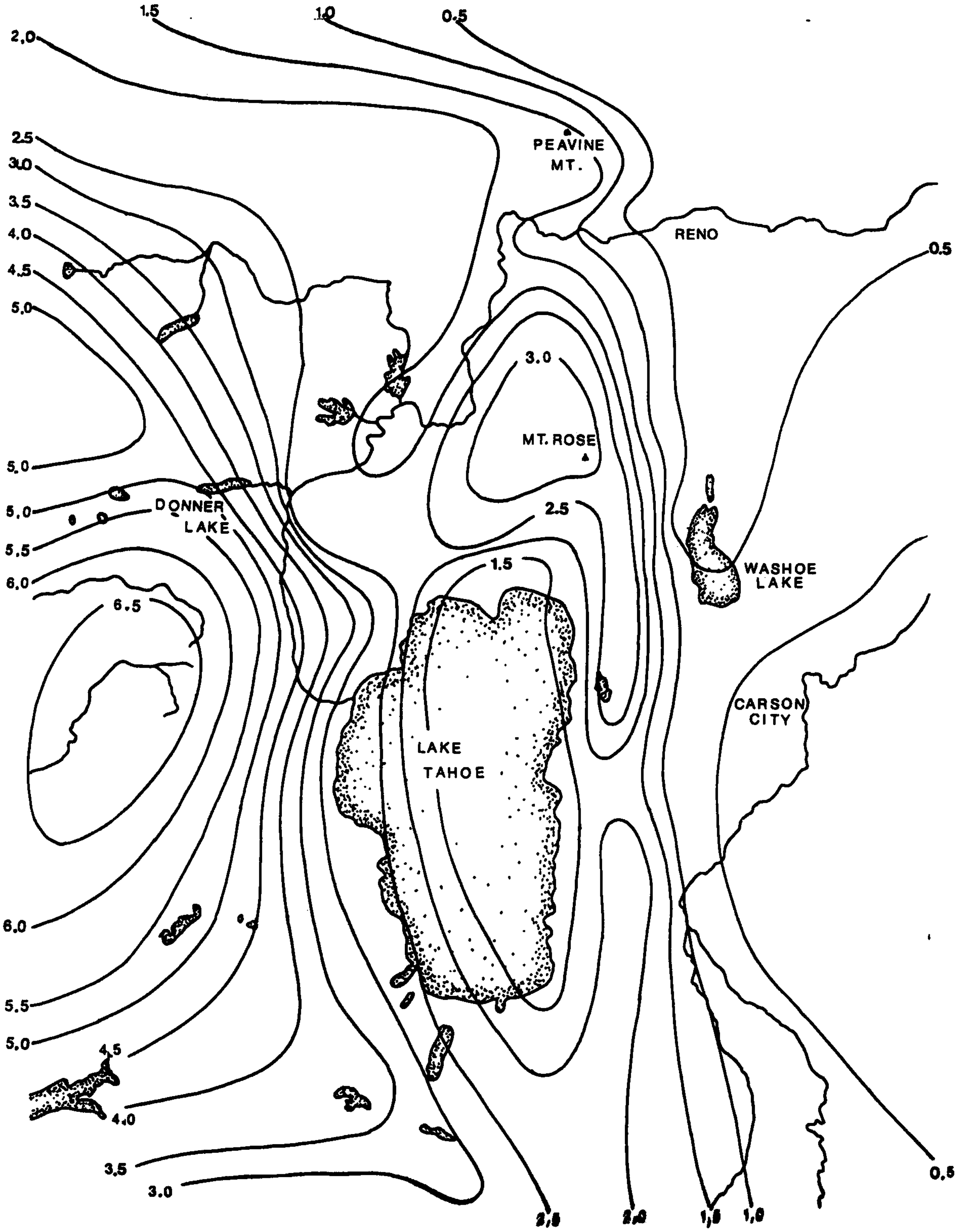

FIGURE 7: Distribution of precipitation in inches of water for storm of 8-10 July 1974.

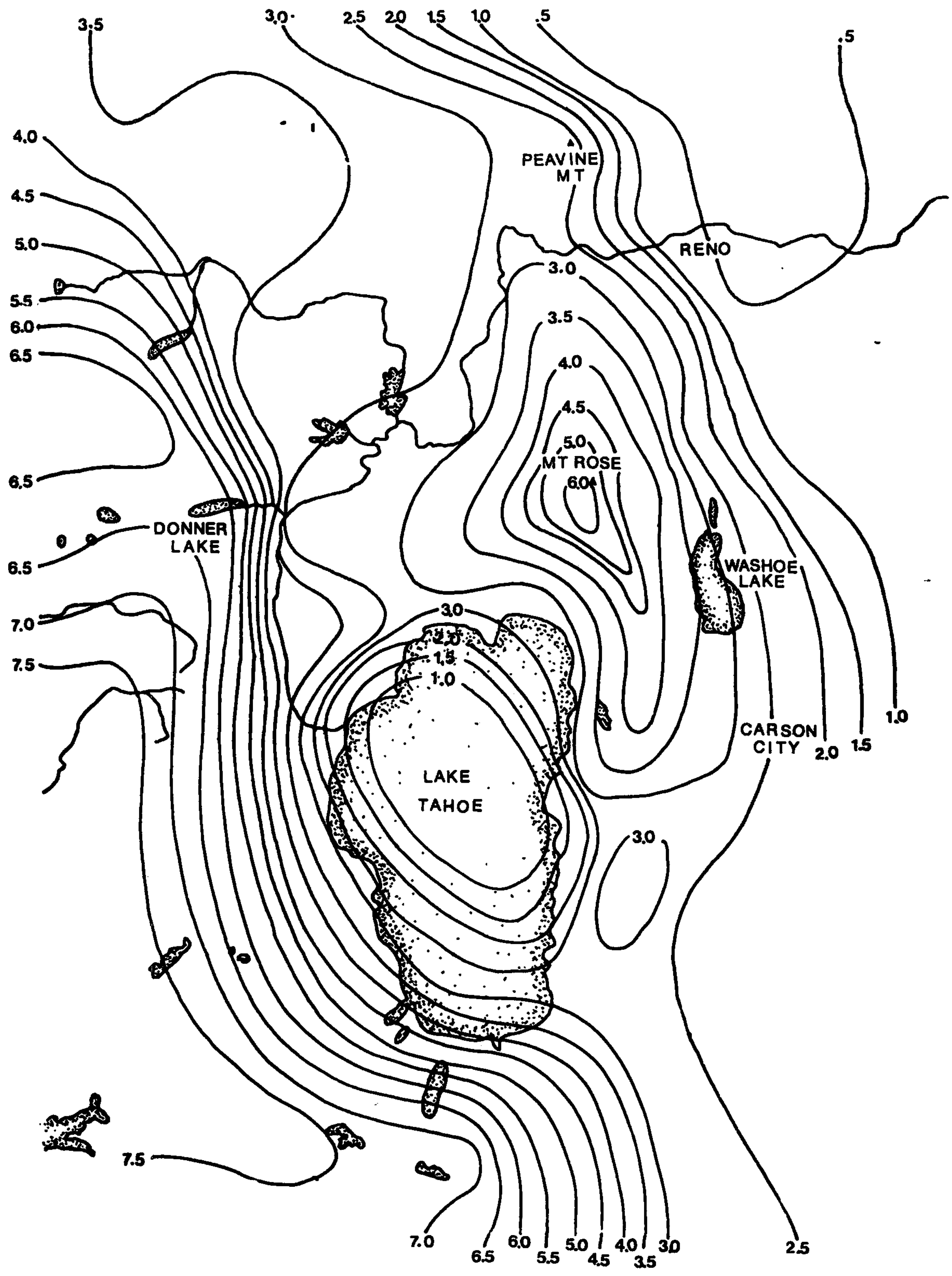

FIGURE 8: Distribution of precipitation in inches of water for storm of 9-12 January 1979.

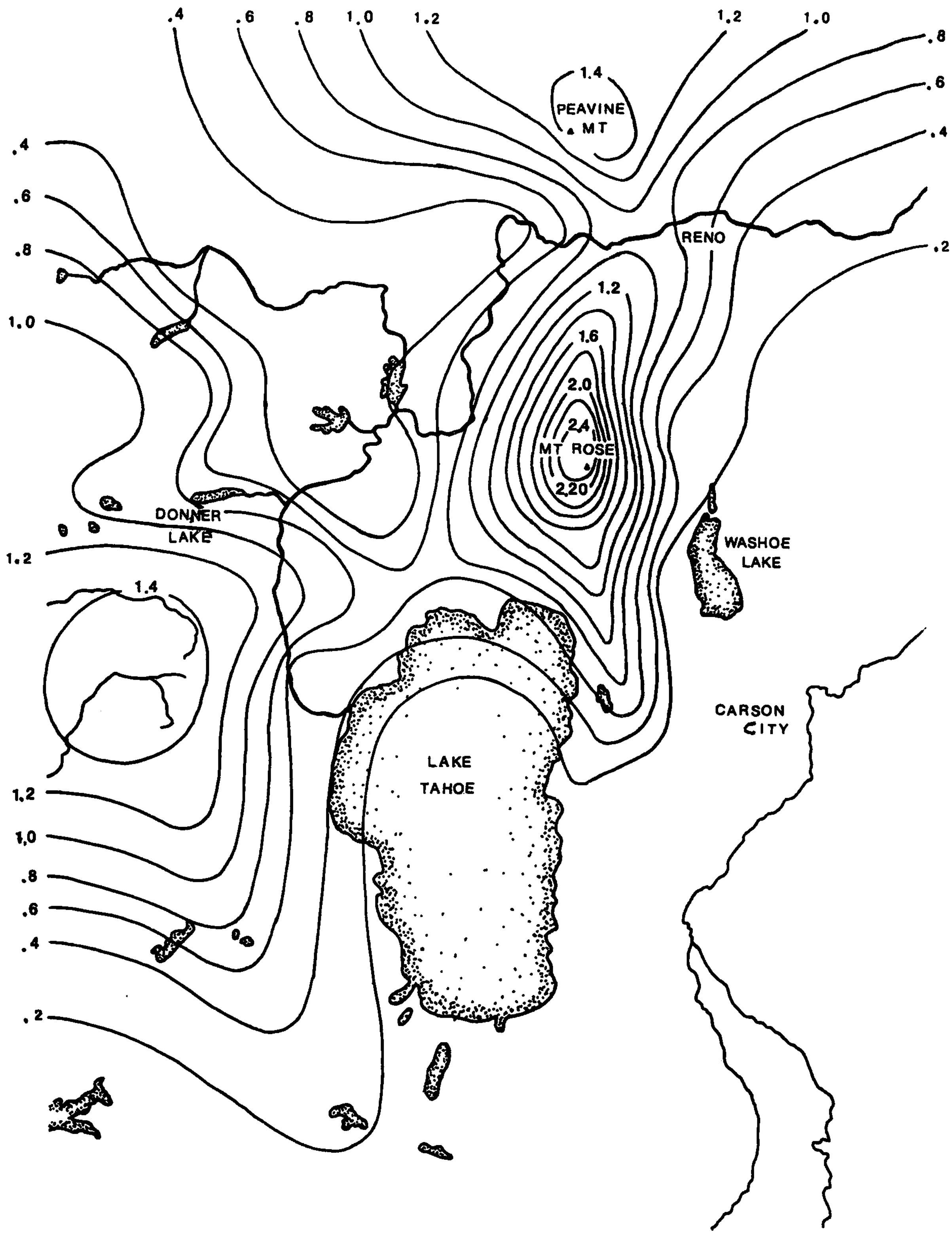

FIGURE 9: Distribution of precipitation in inches of water for storm of 28-29 August 1979.

RECORDING GAGES

1. Heated Tipping-Bucket Gages -- The main device used for measuring the temporal distribution of rain and snowfall in the mesoscale precipitation network is a heated 8" diameter, cylindrical gage containing a tipping-bucket mechanism connected electrically to a recorder. Snowfall melts in the heated funnel and drains through the 1/4" diameter orifice at the bottom and into the upper side of a twin-bucket mounted on a fulcrum. When the amount of water (about 8 ml) corresponding to 0.01 inch (0.25 mm) of precipitation drains into a small inner funnel with a narrow constriction at the bottom, thence into the bucket, the bucket tips, raising the empty side for filling and releasing the measured liquid through an outlet at the bottom of the gage. Each time the bucket tips, it activates a mercury switch which sends an electrical signal to the recorder which, as described below, registers 0.01 inch.

Since most recording gages were installed where electricity was available, electrical heating elements are used. Some of the gages have heating coils imbedded in the cylindrical wall of the gage; others have 150 watt heating units mounted either at the base of the gage or near the top, under the funnel. At a few of the higher elevation gages, two 150-watt units are installed to provide more heat for melting snow and preventing ice from forming in the outlet ports. All heating devices are regulated by thermostats which are set for about +3^{o}C (38^{o}F).

At those sites where commercial power is not available, a propane flame is used to heat the gage funnel. For these sites, propane tanks must be put in place (or refilled at the site) in early fall. The consumption of propane for this purpose at each of these sites varies from about 75 to 125 gallons for the eight-month winter season. (Catalytic heaters, used with apparent success in some other projects, may be used at some remote gages in the future.)

The gages are mounted at various heights above the ground depending on elevation and expected maximum snow depth, as well as other considerations such as security from theft or vandalism. The first gages installed were mounted on horizontal supports attached to wooden poles acquired from the local telephone company and placed vertically in the ground. Later additions to the network were mounted on four-legged metal towers some of which, at higher elevations, were placed on platforms supported by steel scaffolding. These units are easier to service than those mounted on poles. (See Fig. 4)

The failures of heated tipping-bucket gages are many and surprisingly varied. Whether the source of artificial warmth is an electrical heater or a propane flame, if a power outage or a flame-out occurs, melting will cease and snowfall will accumulate in the funnel. Depending on the length of time without heat and the duration of the storm, the gage may cap over and thus fail to capture all of the snow that falls. When heating is restored, whether by a return of electrical power, re-lighting of a propane flame or by sunshine, the melting will be recorded as spurious precipitation, different in both time and rate of fall from the actual occurrence some hours or days earlier.

All of the gages acquired after 1966 were painted white. Most were purchased second-hand, having been used on projects elsewhere, so that after a time, the paint begins to weather and chip. When the chips of paint from the outer funnel fall into the inner funnel, they sometimes clog it, causing the water to overflow and by-pass the tipping-bucket. Often organic matter (pine needles, male pine cones, insects, etc.) adds to the paint debris or otherwise blocks drainage from the smaller funnel. Remedies for this type of failure were devised as a result of experience. Among the useful modifications are removal of all paint from gage funnels, enlargement of the orifice of the small funnel (3 mm versus 1mm), and placement of small 1" diameter screens in the large gage funnel.

At a few of the sites, a combination of strong winds and air temperatures much below freezing causes excessive heat loss from the gage so that snowfall accumulates faster than it melts. This always results in a lag in measurement of the time of fall and, in the case of big storms, a great reduction in gage efficiency as a result of unmelted snow blowing out of the gage. Sometimes a single heater is capable of melting the snow in the funnel but provides insufficient warmth to prevent build-up of ice formed from the fallout of the tipping bucket. On some occasions at the highest gage (Site T), this ice layer became thick enough to prevent the bucket from tipping. Remedies for this type of failure include adding a second 150-watt heater, heating the base of the gage and insulating the sides of the gage.

At some gage sites, particularly Sites 8 and T, strong winds sometimes buffet the gage and cause it to vibrate to the extent that the bucket tips. This can occur several times a minute during the strong squalls associated with a frontal passage, giving spurious precipitation traces which sometimes obscure the recording of an actual precipitation trace.

A few miscellaneous accidents occasionally occur to interrupt the measurements. One gage (Site W) was stolen; one was damaged by a truck, and another by a bullet; once a bird built a nest in the gage at Site R.

2. Weighing-Bucket Gages -- At many of the recording gages within the network that are not maintained by DRI, weighing-bucket devices are used. These consist of unheated 8" diameter cylinders without funnels but containing a bucket partly filled with a mixture of antifreeze and oil. Rain or snow falls into the bucket which rests on a mechanical scale. The change in weight is recorded as a measure of precipitation rate. The lack of heating causes certain problems. In big storms snow may build up on the rim or inside of the gage. Chunks of snow

fall into the bucket from time to time, giving a spurious increase in rate of fall. Another problem is the tendency of the bucket mechanism to act as a barometer as the wind speed above the gage varies. The greater the variation, the greater the "pumping," leading to excessive "noise" on the recording as discussed further below. There is also a loss of data when the bucket overflows before it can be emptied and recharged.

3. Precipitation Gage Recorders -- The tipping-bucket gage recorders are housed in small, locked metal shelters. Most are mounted on the supporting pole or tower below the gage. These shelters, some of which are converted mailboxes, protect the instrument from theft, rain, snow and dust. All recorders are operated on Pacific Standard Time (PST) throughout the year. The various electro-mechanical devices used to record the temporal distribution of precipitation in the mesoscale network are described below.

(a) Clock-Driven Weekly Charts: At sites where commercial power is not available, battery-powered event recorders are used. Two "D" cell (1.5 volt) batteries power the clock-driven revolving drum on a weekly rotation. The chart is a grid of horizontal lines in increments of 0.01 inch from 0.00 to 0.50, and curving vertical lines at increments of 2 hours. A 6-volt battery, connected to the mercury switch and the recorder solenoid, actuates the pen arm which traces a line on the revolving chart and advances upward one step at each tip of the gage bucket. When it reaches the top line (0.50), the next bucket tip sends it back to 0.00, whence it repeats the process.

One advantage of these charts is that they permit one to see at a glance when storms occur and at (roughly) what rate precipitation fell. A disadvantage is that their time resolution is no better than ±15 minutes. (It is possible to obtain charts with a daily rotation and finer temporal resolution, or a monthly rotation with coarser resolution; however, neither is more practical in this network where the time interval between site visits is nearer to a week than either a day or a month.) There are several ways in which they can fail to record and thus cause a loss of data:

Clock failure. When the clock fails, the drum stops revolving and when precipitation occurs, it is recorded along a vertical curving line at the indicated time of failure. In such cases, it is often possible to derive the total precipitation amount if it does not exceed about one inch. Usually this is a result of battery failure at low temperatures. (Since battery life is somewhat unpredictable, batteries are routinely replaced at intervals of two or three months.) Sometimes clocks stop because they need cleaning and lubrication. These recorders are normally serviced at the beginning of each winter season.

Pen failure. On rare occasions, the mercury switch or its wiring break so that no signals reach the recorder. Occasionally, the recorder solenoid or the pen-arm linkage fail so that the pen arm fails to move upward. Sometimes the pens fail to leave a legible ink trace on the chart.

(b) Strip-Chart Event Recorders: At four of the sites along the east slope of the Mt. Rose Highway where commercial power is available, strip-chart recorders are used. Each 30-day chart roll advances at the rate of 4 inches per hour. A ballpoint pen traces a line on the chart which is marked at intervals of one minute. Time resolution is thus ±30 seconds. When the gage bucket tips, an electrical pulse triggers the pen holder which inscribes a horizontal stroke for each 0.01 event. These recorders also have 4-digit counters which advance with each bucket tip and thus are used to indicate cumulative totals between site visits as well as for the season.

The advantages of these recorders are their excellent time resolution and their graphic display of changing precipitation rates. Their disadvantages, which caused frequent loss of data, are principally these:

Chart failure. During two seasons, the quality of the strip charts received from the manufacturer had seriously declined. The main effect was in the change of shape of the sprocket holes on either side of the chart; instead of neat, circular holes as formerly, they became nearly oval and many were not punched cleanly. The result was that they "jumped the track," moved at a faster speed or jammed, making time resolution difficult.

Pen failure. In the cold dry climate of the eastern Sierra the ballpoint pens dry out after a week or two and have to be replaced. Often event marks on the strip charts are nearly illegible. Because of the tendency of charts to jam and pens to dry, and the constant advancement of the charts which compounds both types of failure, frequent visits have to be made to these gages between storms to ensure acquisition of useful data.

(c) Time-Stamp Recorders: In 1967 Michael S. Owens of DRI concluded that an office-type time-date stamp machine would make an excellent event recorder for use at sites where commercial power was available. He subsequently modified a number of these by using rolls of 1" wide pressure-sensitive paper tape which advances only when the stamping mechanism is activated. With each tip of the gage bucket, the date, month and time are stamped on the tape. It was found that single-ply paper was often torn by the stamp but this problem was eliminated by applying a backing of inch-wide transparent mending tape. Each tape roll is about 35 feet long and has the capability of recording about 10 inches of liquid precipitation.

The advantages of these recorders are their excellent time resolution (±30 seconds) and their minimal maintenance requirements. It is only necessary to visit the gage to correct the indicated time in the event of an infrequent power outage, to replace the paper tape, or to set the date near the first of each month.

The disadvantages of the time-stamp recorder are relatively minimal. Electrical failures are infrequent; repairs to each gage are made about once every two or three years. At the highest and most remote site (T), a prolonged wind storm of gale force, which sometimes precedes or follows a precipitation period, can cause the bucket to tip a few hundred times and so use up the paper. When the tape roll comes to the end of the spool, it reverses, causing data to be printed over that which was recorded earlier. On one occasion, when there was a long interval between site visits and precipitation was heavy, the tape passed under the stamp three times and was nearly impossible to decipher. However, such occurrences are rare and clearly this is the best recorder so far. Its cost is about the same as those of the other two types but maintenance costs are much lower.

(d) Mechanical Clock-Driven Recorders: At some sites where weighing-bucket gages are maintained by the Forest Service, e.g., Sierraville and Soda Springs, a spring-wound clock rotates the chart on a daily rotation while a pen leaves an ink trace of time and precipitation amount. Similar recorders on weekly rotation are used at most of the gages that are maintained by other agencies in the watersheds of the central Sierra.

Advantages of these recorders are their simplicity and economy. The main disadvantages are their uncertain time resolution (±15 minutes at best, and often ±30 minutes), and the frequent fuzziness of "noise" in the trace caused by wind-related pressure changes. The vertical scale represents 6.00 inches with horizontal lines at intervals of 0.05 inch. While the total precipitation for a storm can usually be determined with satisfactory resolution (±0.02 inch), the temporal distribution can be interpreted quite differently by different individuals. The many hours and days of missing data frequently found in the NOAA Hourly Precipitation Data for such sites can be ascribed to this difficulty in interpreting the charts.

(e) Remote-Recording Instruments: At two sites, the Truckee Ranger Station and Mt. Rose-Christmas Tree, weighing bucket gage data are received by telephone line at the N.W.S. office in Reno. These data have a coarse resolution in precipitation events; the increments are 0.10 inch. Particularly at Mt. Rose-Christmas Tree, there seems to be a lag effect where events are sometimes indicated a few hours after those at surrounding sites. This may be caused by snow falling belatedly into the bucket from the rim or, in some cases, it may be a spurious response triggered by the interrogation system.

At Truckee Ranger Station, where there is a non-recording gage, the data can often be interpreted clearly, but that from Mt. Rose-Christmas Tree (where there is no non-recording gage) is sometimes not usable.

4. Reduction of Data -- The field meteorologist's trip log includes the following information: date, time, site, can and board measurements, snow depth, water content of snow cores, air temperature, observations of clouds and weather, mileage and miscellaneous notes. After each field trip, a few hours are required to annotate recorder data, measure melted snow and ice and refurbish equipment. Information from each site is transcribed to a separate ledger for that site and tabulated in chronological order. Precipitation measurements recorded in milliliters are converted to inches and cumulative totals entered. At the end of each season, the total precipitation, snowfall, gage efficiency, maximum snow depth, etc. are calculated.

The data from the various precipitation gage recorders are transcribed by hourly amounts in hundredths of an inch on monthly forms for each site. When no power outages or other failure has occurred, this is a relatively straightforward task; it is easiest for the time-stamp tapes, more time-consuming for the strip charts, and most difficult for the weekly charts.

When various instrument failures or spurious effects have occurred, experience is required to interpret the data and to select that which is valid. Some notes on interpretation follow:

(a) Wind Events: When strong wind gusts cause false event marks to be recorded, these can almost always be disregarded by using the following criteria:

- If more than one event mark per minute was registered, it probably indicates a wind effect. Heavy winter precipitation rarely exceeds 0.30 or 0.40 inch per hour. Precipitation rates of the order of 1.00 or 2.00 inches per hour occur in summer thunderstorms and are possible in winter convective rain showers, but these cases can be determined by the methods below.
- The meteorologist's weather diary notes periods of precipitation and periods of strong surface winds and can thus be used to distinguish between these two cases.
- Since only one or two gages are subject to such buffeting, spurious precipitation periods are usually conspicuous when the hourly data from all sites are tabulated in adjacent columns in chronological order.

(b) Bouncing Bucket: At a few sites, the tipping-bucket occasionally causes two identical event marks to appear at alternate intervals. This is interpreted to be a bounce of one side of the bucket. For these, only 0.01 inch is counted for each duplicate time mark.

(c) Melting: When a gage heater fails, the accumulated snowfall melts either when power is restored or as a result of solar heating. The latter is often indicated by its time of occurrence (the warm, mid-day period) and, in either case, a conspicuous lag is evident when compared with the temporal distribution at nearby sites.

(d) <u>Chart Time Errors</u>: The complexity of these errors and of the problem of salvaging recorded data from such periods varies with:

- the duration of the error period;
- whether it was caused by a power outage or a progressive time discrepancy;
- whether or not precipitation was occurring and in what form (i.e., rain or snow);
- the type of recorder.

Since these factors are somewhat interrelated, a few examples will suffice: (1) If the chart had jammed but the counter total is known, the latter can be prorated according to the temporal distribution at a nearby site; (2) If the power outage occurred before precipitation began, the time correction can be easily applied; and (3) The progressive type error can be mentally accounted for when transcribing data from weekly (revolving drum) charts where the error is of the order of one or two hours in a week. Where the error amounts to several hours as in the case of some strip charts during the 1973-75 seasons, the data are listed as indeterminate.

5. <u>Calibration of Recording Gages</u> -- A comparison of the non-recording estimate of precipitation derived from a snow board and a can with the summation of the hourly precipitation derived from a heated tipping-bucket recording gage over the same period at the same location shows almost invariably that the non-recording gage reads a few tens of percent higher. Thus, either the recording gages consistently underestimate precipitation, or the non-recording gages overestimate it. There seems no reason for these non-recording gages to systematically overestimate precipitation, while there are many reports in the literature concerning the tendency of recording gages to underestimate it.

One reason for a recording gage efficiency of less than 100% is loss of precipitation catch caused by exposure of the gage to wind. The stronger the wind speed, the more precipitation particles are deflected away from the gage, and the less the catch. All of the gages in the network, except two in relatively well-sheltered sites, are equipped with Alter shields to reduce wind effects.

In the case of heated tipping-bucket gages, thermal effects combine with wind exposure to reduce gage efficiency. First, the warmth of the gage can be a source of a rising air current which may modify the trajectory of precipitation particles. This can be expected to be most disruptive when the particles are small or light and the wind speed is low. Second, heating causes some of the captured rain or snow to evaporate, especially when the precipitation rate is small. In the case of weighing bucket gages, thermal effects are absent, and weighing bucket gages seem to have a much higher efficiency.

In the case of tipping bucket gages, the magnitude of these effects is obviously much too large to be ignored. The effects described above are obviously likely to be more important at higher elevations, where winds are usually stronger and temperatures are lower, so that the gage needs to be heated more strongly. However, it is also obvious that it depends both on the gage site, and on the nature of the precipitation which is being measured. The wind strength and the precipitation are continually varying, and it is impossible to arrive at a gage calibration on an hour-by-hour basis. The available data does, however, permit a comparison of the two gages over periods between visits, and such comparisons can be used to derive an average calibration for each recording gage at sites where a non-recording gage is also installed.

For each storm a gage efficiency is determined by dividing the precipitation amount measured by the recording gage by the "true" amount measured by the non-recording gage (can or snowboard). By this means more nearly accurate hourly amounts or other rates of fall can be tabulated.

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SITE	LOCATION	ELEVATION FT	YEARS OF RECORD	PERIOD OF RECORD
BLU	Blue Canyon Airport	5280	42	1940-1983
SO	Soda Springs 1E	6885	38	1945-1983
DO	Donner Memorial Park	5937	28	1955-1983
SV	Squaw Valley Fire Station	6240	20	1962-1983
TA	Tahoe City	6230	72	1910-1983
BS	Brockway Summit	7200	15	1968-1983
4TA	Truckee-Tahoe Airport	5900	15	1968-1983
TRS	Truckee Ranger Station	5995	99	1883-1983
HM	Hobart Mills	5850	13	1970-1983
SA	Sagehen Creek	6340	28	1955-1983
SI	Sierraville Ranger Station	4975	72	1910-1983
BO	Boca	5575	92	1890-1983
HK	Northwest Reno	4600	15	1968-1983
RNO	Reno Airport	4404	112	1870-1983
VI	Virginia City	6340	41	1941-1983
CC	Carson City	4651	85	1897-1983
SS	Spooner Summit	7260	14	1969-1983
GL	Glenbrook	6350	39	1943-1983
LV	Little Valley	6540	14	1969-1983
3I	Cliff Ranch	5265	15	1968-1983
FT	Franktown, Cliff Ranch	5250	15	1968-1983
DC	Davis Creek Park	5160	15	1968-1983
8	Jct.U.S. 395 & NV 27	4590	15	1968-1983
7	Sage Bend	4820	15	1968-1983
6	Lancer	5110	15	1968-1983
4	Whites Creek	5670	15	1968-1983
R	Evergreen Hills Road	5700	15	1968-1983
2	Jones Creek	6000	15	1968-1983
O	RNR Test Site	6400	15	1968-1983
MK	Mount Rose Bowl	7400	15	1968-1982
K	Sky Tavern	7620	15	1968-1983
G	Mt. Rose Resort	8280	15	1968-1983
A	Tahoe Meadows	8540	15	1968-1983
U	Upper Incline	8000	15	1968-1983
V	Apollo Way	7300	15	1968-1983
W	Eagle Drive	6860	10	1968-1978
Z	Third & Incline Creeks	6235	15	1968-1983

Nixon Marlette
Mt. Rose Big Meadow

TABLE 1: Sites for which average monthly and annual precipitation data are tabulated in Appendix A.

SITE *BLU--Blue Canyon Airport*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.03	2.97	.07	5.87	9.99	13.62	32.41	17.79	2.24	5.08	.53	.49	91.09
69-70	.15	0	.11	6.96	3.60	19.38	33.86	4.73	4.82	3.59	.76	1.46	79.42
1970-71	0	0	.18	2.98	18.94	18.24	8.11	2.16	11.19	3.64	3.44	2.01	70.89
71-72	.03	.26	1.35	1.25	7.46	13.67	6.38	9.34	4.31	6.76	1.12	.62	52.55
72-73	0	.08	3.28	4.74	11.68	9.69	19.37	12.03	7.19	1.55	1.37	0	70.98
73-74	.05	.26	2.79	4.83	28.36	13.00	13.62	7.10	18.66	7.06	.12	.39	96.24
74-75	5.86	.14	0	4.36	3.13	4.84	7.50	17.30	16.32	7.45	1.29	.73	68.92
75-76	.23	3.10	.02	9.69	4.49	2.49	1.27	7.55	2.56	2.52	.43	.40	34.75
76-77	.01	3.68	1.51	.87	2.32	.36	4.38	4.44	3.55	1.04	4.74	.08	26.98
77-78	.06	1.26	1.30	.45	7.16	18.76	20.64	10.10	15.06	11.12	1.50	.46	87.87
78-79	.02	.01	5.77	.20	5.61	3.32	12.91	16.31	6.53	5.48	3.82	.12	60.10
79-80	.54	.42	.07	7.44	7.14	11.82	23.91	19.14	6.56	4.21	3.70	.82	85.77
1980-81	1.02	.11	0	1.51	3.13	4.63	12.45	4.50	9.71	1.79	3.37	.08	42.30
81-82	0	0	1.29	8.54	22.56	24.82	11.16	11.90	20.10	13.38	.54	1.31	115.60
AVERAGE:	.57	.88	1.27	4.26	9.68	11.33	14.86	10.31	9.20	5.33	1.91	.64	70.24

SITE *SO--Soda Springs 1E*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.05	3.01	.44	4.11	7.98	11.34	25.05	14.09	2.09	4.35	.50	1.71	74.72
69-70	0	0	.21	5.31	3.06	14.60	23.48	4.32	3.96	4.19	.80	2.66	62.59
1970-71	.07	0	.26	3.12	14.13	16.60	6.17	2.96	6.67	4.31	3.87	1.85	60.01
71-72	.13	.33	1.60	1.51	6.98	13.09	5.10	8.80	3.97	6.33	.97	1.16	49.97
72-73	0	.08	4.11	3.42	9.18	9.50	17.05	10.26	6.26	1.30	2.65	.35	64.16
73-74	.18	1.15	1.60	4.40	20.89	11.97	11.69	6.48	14.48	5.00	.55	.19	78.58
74-75	4.81	.97	0	2.79	3.24	5.72	7.20	15.78	14.11	7.05	1.84	1.13	64.64
75-76	.15	1.75	.16	9.50	3.94	2.51	1.91	8.50	3.87	2.20	.29	.68	35.46
76-77	.06	3.21	1.70	1.08	1.82	.37	4.46	4.66	4.64	.73	6.37	.98	30.08
77-78	.32	.66	1.24	.68	5.88	15.29	15.57	9.95	9.00	8.10	1.61	.45	68.75
78-79	.22	0	3.77	.10	4.11	3.62	10.16	13.20	2.44	3.21	3.71	0	44.54
79-80	0	.91	0	6.49	5.49	11.52	20.49	11.68	7.46	4.31	2.52	1.22	72.09
1980-81	1.38	0	.11	2.41	3.35	4.62	9.94	5.41	7.54	2.21	3.64	.11	40.72
81-82	0	0	1.26	7.45	22.32	20.00	11.75	9.29	18.50	11.79	.54	1.07	103.97
AVERAGE:	.53	.86	1.18	3.46	6.95	9.32	11.62	8.93	6.58	4.26	2.13	.97	56.79

SITE *DO--Donner Memorial Park*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.08	1.69	.32	1.76	5.06	9.11	17.13	12.50	2.34	3.13	.36	2.79	56.27
69-70	.13	0	0	3.07	1.29	5.72	16.25	2.09	3.70	2.61	.27	2.98	38.11
1970-71	0	0	.14	1.72	10.37	10.67	4.38	1.56	7.29	2.45	2.23	1.12	41.93
71-72	.25	.23	1.16	1.03	4.36	11.97	2.92	5.06	2.02	3.96	.71	.59	34.26
72-73	0	T	2.35	2.17	5.55	6.94	11.50	6.76	2.66	1.12	1.10	.45	40.60
73-74	.26	.77	.57	2.49	12.73	9.09	8.54	3.10	10.97	2.82	.30	0	51.64
74-75	3.93	.46	0	1.32	2.91	3.83	3.21	12.30	10.81	4.64	1.34	.70	45.45
75-76	.03	1.20	.42	7.31	2.29	1.10	1.01	5.33	4.61	1.25	.23	.37	25.15
76-77	.20	3.09	.97	.03	1.08	.30	2.71	3.52	2.42	.20	3.35	.91	18.78
77-78	.03	.20	.27	.21	2.02	9.94	11.49	5.07	4.24	3.10	1.38	.12	38.07
78-79	.38	.40	1.58	T	1.76	2.35	7.81	7.61	3.32	2.68	1.85	.42	30.16
79-80	.08	.74	.03	4.48	2.65	6.00	16.94	12.75	4.78	2.89	1.10	.47	52.91
1980-81	1.60	.29	.43	1.36	1.67	3.04	6.82	3.46	3.18	.95	2.15	.04	24.99
81-82	0	.05	.81	5.26	16.65	12.70	13.26	7.43	12.21	8.79	0	1.23	78.39
AVERAGE:	.50	.65	.65	2.30	5.03	6.63	8.86	6.24	5.33	2.90	1.17	.87	41.13

SITE *SV--Squaw Valley*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65	.46	.25	.26	.97	9.77	27.00	5.35	.90	1.03	3.39	.53	2.25	52.16
65-66	2.64	3.43	1.90	1.00	10.86	4.75	3.68	5.70	4.66	2.64	.68	.28	42.22
66-67	.10	0	.63	.15	14.14	15.74	14.28	.77	18.57	10.01	2.91	2.82	80.12
67-68	.02	.69	1.54	2.14	4.78	6.79	10.47	10.80	5.46	.79	1.44	.81	45.73
68-69	1.11	2.59	.40	3.07	7.57	12.56	29.74	13.70	3.93	3.14	.09	1.45	79.35
69-70	.05	0	.27	4.28	1.93	13.75	24.59	3.36	3.93	2.58	.27	2.12	57.13
1970-71	0	.10	.30	2.25	10.99	15.23	6.77	2.21	10.50	2.87	2.71	2.13	56.06
71-72	T	.48	.72	1.88	6.14	12.01	4.51	6.66	3.29	5.96	.62	1.55	43.82
72-73	0	.70	3.34	2.90	7.55	10.00	14.64	9.00	3.92	.81	1.55	.92	55.33
73-74	.18	.86	1.07	3.12	18.27	11.27	12.35	4.61	13.06	4.51	.17	T	69.47
74-75	5.71	1.19	T	2.21	3.51	5.60	4.96	18.76	12.32	5.95	1.61	1.05	62.87
75-76	.11	1.97	.31	10.93	2.81	1.44	1.30	4.81	4.67	1.64	.13	.26	30.38
76-77	.20	4.37	1.76	1.05	1.44	.47	3.52	4.21	4.27	2.00	3.88	.76	27.93
77-78	.25	.05	.69	.35	5.16	15.41	17.61	8.94	6.48	5.75	1.63	.32	62.64
78-79	.06	.24	2.86	0	3.91	3.87	9.58	11.62	5.48	4.13	2.34	.47	44.56
79-80	.61	1.02	.05	5.54	4.37	9.22	23.00	16.94	5.78	3.96	3.81	.80	75.10
1980-81	1.64	.01	.16	1.81	1.63	5.20	10.34	5.61	6.43	1.15	3.40	.09	37.47
81-82	0	0	.65	8.02	19.88+	20.37	14.43	11.21	14.70	14.24	.71	1.61	105.82
AVERAGE:	.71	.97	.90	3.39	6.80	9.74	12.67	8.69	7.05	4.19	1.64	1.09	57.84

SITE *TA--Tahoe City*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	T	1.18	.20	1.74	4.32	7.99	22.82	9.28	1.96	1.56	.15	2.50	53.70
69-70	.10	0	.17	2.14	1.40	9.26	15.27	2.45	1.93	1.60	.24	2.17	36.73
1970-71	T	0	.20	1.59	7.83	8.03	2.20	.91	6.18	1.67	1.76	.88	31.25
71-72	.17	.30	.88	.75	3.71	6.89	2.88	3.13	1.19	3.05	.50	1.36	24.81
72-73	.02	.17	1.32	2.07	4.77	4.45	7.51	3.89	1.97	.96	.96	.58	28.67
73-74	.02	.47	.27	1.33	4.72	2.86	4.16	2.03	7.26	2.24	.12	T	25.48
74-75	2.66	.30	.02	1.14	2.07	2.65	2.15	7.26	5.70	2.26	.29	.83	27.33
75-76	.04	1.16	.72	6.67	1.30	.28	.50	2.01	1.11	.25	.07	.21	14.32
76-77	.15	1.96	1.07	1.05	.67	.29	1.07	2.96	.62	.41	1.50	.41	12.16
77-78	.06	.04	.15	.53	3.91	8.89	7.05	4.35	1.04	1.88	.55	.26	28.71
78-79	T	.38	.57	T	1.58	2.76	2.90	5.25	2.65	1.32	1.76	.20	19.37
79-80	.49	.41	.06	3.60	1.16	6.75	14.89	11.07	3.39	2.57	1.10	.44	45.93
1980-81	1.01	.04	.39	1.40	.93	2.91	6.75	2.08	3.80	.76	2.42	T	22.49
81-82	0	T	.51	5.03	13.55	11.76	9.54	4.84	9.58	6.71	.44	2.09	64.05
AVERAGE:	.34	.46	.47	2.07	3.71	5.41	7.12	4.36	2.98	1.58	.85	.85	30.20

SITE *BS --Brockway Summit*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69					2,17	9.87	23,47	10.41	1,69	1.31	.20	3.06	
69-70			0	2.60	1.27	10.47	12.74	3.32	3.01	2.40	0	2.22	38.03+
1970-71	0	0	.04	1.02	5.60	16.64	5.01	.66	10.59	3.11	3.67	.53	46.87
71-72	.01	.40	0	2.30	3.23	10.66	3.01	3.64	.68	3.98	.59	.85	29.35
72-73	0	0	1.39	2.07	5.86	6.57	11.88	7.05	2.74	.56	.32	.46	38.90
73-74	0	.12	0	1.97	11.34	4.97	6.48	1.96	5.16	6.55	0	0	38.55
74-75	2.18	0	0	0	3.23	3.98	2.18	12.44	11.95	4.57	.97	1.34	42.84
75-76	.01	1.56	.90	1.99	1.28	.54	.74	2.89	.54	.24	~.30	~0	10.69+
76-77	.13	1.14	1.50	1.23	.83	0	3.06	4.38	1.88	*	2.89	1.89	18.93
77-78	.15	.02	.12	.20	4.06	9.25	10.80	8.15	5.29	1.82	.63	.11	40.60
78-79	.66	.02	1.07	0	2.47	2.57	6.09	11.16	3.24	1.77	1.74	.20	30.99
79-80	.67	.71	0	2.56	.97	10.23	6.81	12.74	5.32	2.08	*	2.07+	44.16+
1980-81	~1.10	~.50	~3.50	1.73	.76	3.46	9.95	1.69	5.43	.91	1.31	0	30.34
81-82	0	0	.19	3.49	11.49	*	24.82	4.81	13.33	5.10	.30	2.09	65.62
AVERAGE:	.35	.36	.43	1.63	3.90	6.86	7.86	6.09	5.06	2.65	1.12	1.06	37.37

SITE *4TA --Truckee/Tahoe Airport*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69					2.09	6.46	7.43	8.71	.85	1.26	.66	3.66	31.12+
69-70	0	0	0	1.96	.80	7.05	11.44	2.00	1.93	1.13	0	1.67	27.98
1970-71	0	0	0	.61	4.20	9.77	4.35	.75	5.97	.23	2.50	.20	28.58
71-72	.15	.21	0	1.61	3.10	5.84	2.69	2.51	.54	2.25	.52	.37	19.79
72-73	0	.01	2.79	1.61	3.74	4.84	8.80	4.99	1.42	.54	.14	.56	29.44
73-74	.44	.20	.47	1.60	9.25	3.96	5.21	*	3.13	3.34	0	0	27.60
74-75	2.26	0	0	0	2.40	1.91	2.37	6.52	11.26	2.76	.55	.34	30.37
75-76	*	.96	*	2.58	.53	*	.69	2.64	2.87	0	0	.10	10.37
76-77	.83	.95	.90	.98	1.20	0	2.72	2.30	1.52	*	.93	0	13.33
77-78	0	0	0	0	2.99	7.53	6.80	4.66	2.47	.29	.52	.17	25.43
78-79	.30	.17	.38	T	1.42	2.82	3.53	3.13	1.48	1.44	1.51	.23	15.91
79-80	.47	.36	.06	1.92	.82	3.56	10.36	7.44	2.41	1.64	1.50	.37	30.91
1980-81	1.09	.30	2.60	.53	.59	1.50	4.43	2.11	2.31	.66	1.27	T	17.39
81-82	0	0	0	2.94	11.76	*	15.76	4.16	8.35	4.52	.45	.68	48.62
AVERAGE:	.46	.18	.60	1.21	3.21	4.22	5.43	3.99	3.34	1.54	.74	.60	25.52

SITE *TRS--Truckee Ranger Station*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	T	1.06	.34	1.22	3.52	7.92	19.69	9.57	1.56	1.92	.69	2.62	50.11
69-70	.98	0	.10	2.30	1.17	7.93	14.41	2.18	1.98	1.87	.19	2.47	35.58
1970-71	0	T	.09	1.01	6.30	8.89	4.12	1.17	6.08	2.26	2.49	1.02	33.43
71-72	.48	.22	.75	1.05	3.28	7.76	2.51	3.25	1.26	2.79	.83	.54	24.72
72-73	0	.10	2.24	2.03	4.48	4.85	8.84	5.09	1.78	.79	1.08	.04	31.32
73-74	0	.59	.09	1.99	7.51	6.21	5.01	2.11	6.71	1.68	.15	.01	32.06
74-75	2.10	.59	0	1.03	1.89	2.74	2.39	7.65	8.01	3.82	.82	.52	31.56
75-76	0	.88	.12	4.81	1.41	.71	.80	4.21	3.64	.71	T	.13	17.42
76-77	.14	2.28	1.38	1.71	.86	.18	2.32	2.97	1.92	.15	3.09	.91	17.91
77-78	.14	.11	.11	.32	3.58	8.32	8.71	4.72	3.86	2.46	.87	.27	33.47
78-79	.16	.51	.91	.01	1.61	2.40	4.85	6.35	3.06	2.18	1.70	.06	23.80
79-80	1.01	.55	.04	2.43	1.41	5.06	~11.0	9.13	~3.00	2.16	1.50	.33	37.62
1980-81	1.38	~.15	.76	1.00	.99	2.35	5.49	2.22	3.50	1.04	1.83	.02	20.73
81-82	~0	.04	.52	4.00	12.17	8.46	8.20	4.19	8.68	5.93	.48	.83	53.50
AVERAGE:	.46	.53	.53	1.78	3.58	5.27	6.72	4.66	3.61	1.83	1.12	.70	30.79

SITE *HM --Hobart Mills*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69													
69-70													
1970-71					5.01	10.82	5.36	.52	7.24	1.80	1.71	.32	32.78+
71-72	.40	~.30	0	.47+	3.08	9.64	2.41	3.34	.63	3.43	*	.17	23.87
72-73	0	*	3.34	1.50	4.06	5.40	8.71	5.28	1.71	.25	*	.50	30.75
73-74	0	0	0	1.98	7.37	5.15	6.15	*	5.09	4.34	.08	0	30.16
74-75	2.48	0	0	1.27	1.47	2.19	2.80	9.10	6.63	3.70	0	.42	30.06
75-76	0	1.00	*	2.42	.99	.49	.50	2.40	3.11	0	0	~.20	10.91
76-77	.30	1.23	.92	.90	1.05	*	4.94	*	1.17	*	.62	0	11.13
77-78	0	0	0	0	4.09	6.43	8.10	5.22	3.54	.88	0	~.25	28.51
78-79	0	0	.48	0	.86	1.49	5.29	7.02	1.85	1.08	1.60	0	19.67
79-80	.91	.27	0	1.59	1.67	4.46	~11.00	7.71	3.91	1.37	~1.50	~.40	34.79
1980-81	~1.10	~.30	.86	.23	2.80	2.80	4.92	1.70	2.53	.17	.70	0	18.11
81-82	0	0	.46	3.90	13.34	*	16.69	4.82	9.67	3.17	.29	.82	53.16
AVERAGE:	.41	.31	.67	1.30	3.82	4.88	4.92	4.71	4.08	1.84	.65	.19	27.78

SITE *SA--Sagehen Creek*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.67	1.45	.15	1.82	4.40	8.17	20.33	9.11	.94	2.00	.22	2.71	51.37
69-70	.18	0	.11	3.27	1.09	10.38	15.96	2.44	2.58	1.86	.21	2.55	40.63
1970-71	0	.02	.11	1.41	11.32	10.04	3.61	.79	7.71	2.42	3.16	.49	41.08
71-72	1.59	.27	.66	.69	4.01	9.08	2.74	3.30	.66	3.36	1.20	.54	28.10
72-73	.01	1.24	1.96	2.61	5.30	5.73	9.10	5.17	1.99	.75	1.41	.14	35.41
73-74	.30	.64	.45	2.40	9.67	5.77	5.64	2.34	7.83	1.52	.35	0	36.91
74-75	2.83	.32	0	.92	2.11	3.22	2.15	9.70	8.51	3.37	.72	.78	34.63
75-76	T	1.02	1.84	6.09	1.59	1.06	.85	4.02	2.53	.43	.27	.43	20.13
76-77	.59	2.80	.96	.93	.86	.20	2.32	3.06	2.21	.09	2.25	1.22	17.49
77-78	.35	.32	.48	.58	2.68	4.31	10.85	6.28	4.02	2.01	.95	.34	33.17
78-79	.29	0	1.46	.32	1.17	1.48	6.18	11.12	2.79	2.53	2.21	.26	29.81
79-80	.80	.43	.30	4.14	1.26	6.68	13.34	11.37	3.53	2.17	2.03	.51	46.56
1980-81	1.19	.07	.64	1.30	1.34	2.73	~5.60	~2.30	3.52	.90	2.28	.11	21.98
81-82	0	.10	.68	4.83	16.59	9.56	6.16	5.13	10.49	6.53	.45	.88	61.40
AVERAGE:	.63	.62	.70	2.24	4.53	5.60	7.63	5.73	3.76	1.80	1.27	.78	35.29

SITE *SI--Sierraville Ranger Station*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.01	.77	0	1.82	3.26	5.31	16.68	5.89	.64	1.76	.49	2.78	39.41
69-70	.25	0	.01	2.28	.85	7.54	14.07	2.04	1.30	1.72	.10	1.30	31.46
1970-71	0	.28	.36	1.19	8.21	8.09	3.55	.79	6.55	1.95	3.88	.66	35.51
71-72	.06	.11	.59	.38	2.80	5.54	1.80	1.84	1.02	2.17	1.44	.31	18.06
72-73	T	.19	1.74	1.85	3.44	3.95	7.14	4.02	1.31	.23	.72	.80	25.39
73-74	.24	.91	.25	1.83	8.70	6.15	5.07	1.09	7.72	1.23	.35	.07	33.61
74-75	2.23	.70	0	.97	2.42	1.92	1.64	6.99	6.93	2.05	.97	.43	27.25
75-76	T	.81	.48	5.51	1.66	1.28	.23	2.83	2.08	1.04	.44	.47	16.83
76-77	.27	2.55	1.10	.60	.74	.05	3.05	2.85	1.47	.23	1.87	.64	15.42
77-78	.01	.16	.06	.13	4.19	7.83	8.88	3.71	2.80	.51	1.04	.24	29.56
78-79	.23	.02	1.84	T	1.18	1.34	4.63	4.54	1.80	.94	1.38	.22	18.12
79-80	.45	.37	0	4.13	.91	5.15	10.80	7.52	2.68	1.34	.98	.36	34.69
1980-81	.55	.10	.08	.39	.84	2.91	~5.40	~2.00	~3.40	.56	1.08	0	17.31
81-82	0	0	.53	3.77	14.79	9.23	5.02	5.31	4.54	5.14	.24	.57	49.14
AVERAGE:	.31	.50	.50	1.78	3.86	4.74	6.35	3.68	3.03	1.21	1.07	.63	27.66

SITE *BO --Boca Dam*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	0	.74	.30	.57	2.41	5.21	13.02	5.33	.73	1.35	.20	4.07	33.93
69-70	.35	0	.15	1.78	.73	6.25	10.28	2.06	1.10	1.88	0	2.00	26.58
1970-71	.35	0	.12	.80	5.62	5.38	3.36	.51	4.32	1.76	2.60	.40	25.22
71-72	1.65	.21	.50	.75	1.74	5.23	1.05	2.03	.43	1.55	2.25	.43	17.82
72-73	0	.29	1.11	1.96	2.98	3.26	5.89	3.53	.37	.59	1.16	.48	21.62
73-74	0	.65	T	1.50	5.17	4.42	3.51	.60	5.21	.98	T	0	22.04
74-75	1.83	.47	0	1.03	1.56	1.74	1.58	5.90	6.86	1.69	.29	.51	23.46
75-76	0	1.30	.93	3.19	.80	.27	.39	2.35	2.08	T	.18	.21	8.90
76-77	.25	1.86	1.20	1.05	.57	T	1.78	2.24	.98	T	2.25	1.08	13.26
77-78	.15	.12	.30	.32	3.17	6.45	6.25	3.12	2.40	1.05	.20	.36	23.89
78-79	.42	.75	1.27	0	1.03	1.84	3.91	4.39	2.10	1.27	1.07	T	18.05
79-80	1.55	.67	T	1.51	.32	3.80	7.93	6.31	2.31	.80	2.02	.32	27.54
1980-81	1.56	.17	.90	.77	.52	1.70	3.81	.99	2.66	.77	1.13	0	14.98
81-82	0	0	.57	3.00	8.98	4.80	5.43	3.44	5.37	2.97	.15	1.71	36.42
AVERAGE:	.58	.52	.53	1.30	2.54	3.60	4.87	3.03	2.43	1.05	.96	.83	22.24

SITE *HK--Northwest Reno*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69													
69-70												.80	
1970-71	.06	.03	.03	.04	2.34	1.70	1.13	.07	1.93	.53	2.01	.09	9.96
71-72	.41	.97	.14	.25							1.16	.20	
72-73	.13	.55	.32	1.66	1.25	1.53	1.69	1.66	.81	.17	.23	.87	10.87
73-74	.05	.28	T	.68	1.66	1.45	2.28	.20	1.14	.37	.03	.06	8.20
74-75	.39	.13	0	.61	.56	.52	.52	2.90	2.26	.73	.17	.36	9.15
75-76	.03	1.56	1.32	.48	.29	.10	.16	1.16	.90	.18	.25	.01	6.44
76-77	.32	.87	1.22	.53	.14	.02	.85	.87	.36	.02	1.23	1.60	8.03
77-78	.12	.14	0	.14	.50	3.06	1.68	1.24	1.40	.37	.81	.10	9.56
78-79	.31	.39	.57	.03	1.37	.68	1.09	1.16	.57	.57	.34	.02	7.10
79-80	1.02	.95	.01	.52	.25	1.36	4.42	2.71	.69	.65	.66	.34	13.58
1980-81	.57	.36	.86	.37	.43	.64	1.36	.43	.79	.23	1.17	T	7.21
81-82	0	T	.05	.85	2.40	1.92	1.74	.90	1.34	.93	.12	1.90	12.15
AVERAGE:	.28	.52	.38	.51	1.02	1.18	1.54	1.21	1.11	.43	.68	.49	9.35

SITE *RNO--Reno Airport*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.05	.13	.15	.01	.73	1.03	4.13	1.74	.07	.10	.20	1.29	9.63
69-70	.17	T	.01	.40	.04	2.07	1.73	.32	.19	.60	T	.88	6.41
1970-71	.05	.02	.01	.03	1.47	1.65	.75	.33	1.54	.59	2.38	.09	8.91
71-72	1.06	.09	.10	.44	.24	2.97	.37	.14	.03	.14	1.02	.18	6.78
72-73	.01	.14	.30	1.30	1.00	.89	1.54	1.66	.73	.13	.75	.07	8.52
73-74	.27	.48	.01	.56	1.74	1.27	1.60	.34	1.16	.23	.01	T	7.67
74-75	.33	.19	0	.69	.27	.56	.32	1.74	1.59	.62	.21	.21	6.73
75-76	.03	1.03	.92	.15	.12	.01	.16	1.20	.36	.20	.10	T	4.28
76-77	.96	.62	1.10	.28	.07	.01	.67	.71	.19	T	1.24	1.03	6.88
77-78	.07	.01	.01	.14	.23	2.54	1.66	.98	1.49	.20	.31	.07	7.71
78-79	.19	.15	.68	.08	1.30	.82	.66	.82	.52	.41	.16	T	5.79
79-80	.58	.38	T	.31	.17	2.02	2.77	1.90	.76	.51	.78	.12	10.30
1980-81	.54	.32	.48	.14	.28	.60	.85	.21	.58	.21	.57	T	4.78
81-82	.01	.36	.07	.64	2.13	1.05	1.20	.41	1.14	.34	.10	1.07	8.52
AVERAGE:	.34	.32	.31	.40	.80	1.04	1.11	.94	.91	.31	.56	.29	7.33

SITE *VI --Virginia City*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	T	.89	.14	.19	1.59	2.02	9.78	4.16	1.47	.14	.24	2.55	23.17
69-70	.13	0	.05	1.45	.12	4.44	3.77	.97	.44	.89	T	2.05	14.31
1970-71	.02	.04	.10	.21	2.92	3.60	2.55	1.20	2.04	.82	3.38	.10	16.98
71-72	.28	.62	.20	1.33	.49	4.03	.89	.67	.15	.93	1.30	1.39	12.28
72-73	.03	.31	.36	3.29	1.23	3.30	3.67	2.25	2.53	.63	.41	.65	18.66
73-74	.15	.24	T	.59	3.95	2.09	2.14	1.06	2.61	.73	0	T	13.56
74-75	.86	.16	0	1.70	1.34	1.62	.92	4.51	4.56	1.00	1.38	.78	18.83
75-76	0	1.28	.51	1.14	1.06	.21	.32	2.00	3.07	.67	.28	.54	11.08
76-77	.79	1.66	2.15	.38	.25	.04	1.10	1.50	.55	.02	2.02	1.90	12.36
77-78	T	.05	.55	.06	2.12	4.37	2.89	3.98	1.43	.61	.40	T	16.46
78-79	.14	T	1.65	T	1.75	1.85	1.53	2.37	1.18	.39	.32	T	11.18
79-80	.42	.23	T	.66	.37	2.69	6.77	3.41	1.85	1.09	1.47	.28	19.24
1980-81	.17	.24	.24	.27	1.18	1.23	1.83	.44	1.97	.75	.34	T	8.66
81-82	.02	.49	.13	1.17	3.05	2.81	4.57	1.42	1.43	2.65	.20	1.34	17.58
AVERAGE:	.22	.44	.43	.89	1.53	2.45	3.05	2.14	1.80	.81	.84	.83	15.43

SITE *CC--Carson City*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.02	.32	.39	.15	.83	2.16	7.31	2.52	.42	.29	.23	2.01	16.65
69-70	.27	0	.05	.89	.01	3.36	5.16	.78	.11	.22	0	.35	11.20
1970-71	T	T	.02	.14	4.03	2.62	1.22	.14	1.69	.50	1.49	.18	12.03
71-72	.30	.14	.18	.19	.89	2.99	.45	.44	.03	.76	.65	.36	7.38
72-73	0	.50	.72	1.74	1.28	1.66	2.29	1.61	.42	.04	.75	.02	11.03
73-74	T	.80	0	1.19	2.47	4.27	1.50	.33	1.59	.37	T	0	12.52
74-75	.45	.07	0	.80	.75	.82	.67	2.64	3.36	1.38	.26	.13	11.33
75-76	T	1.45	.87	.83	.31	T	.57	1.42	1.35	.06	.01	.05	6.92
76-77	.66	.62	1.49	.64	.11	.03	.62	1.52	.30	0	.96	.41	7.36
77-78	.06	.12	.03	.06	1.83	4.44	2.30	1.45	.75	.34	.08	.12	11.58
78-79	.06	.01	.67	.17	1.09	.57	2.89	1.80	.90	.31	.34	T	8.81
79-80	.47	T	.01	.85	.39	2.13	5.91	3.48	.87	.78	.74	.06	15.69
1980-81	.19	.10	.57	.24	.66	.82	2.24	.22	.82	.36	.63	0	6.85
81-82	.03	0	.21	1.13	3.07	2.24	3.61	1.71	1.01	1.41	.21	.81	15.44
AVERAGE:	.18	.30	.37	.64	1.27	2.01	2.62	1.43	.97	.49	.45	.32	11.05

SITE *SS --Spooner Summit*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69													
69-70				1.68						1.83	0	.23	
1970-71	.59	0	0	0	4.19	15.94	4.73	1.33	5.98	2.02	2.53	0	37.31
71-72	0	0	0	1.05	1.93	9.84	1.49	2.20	.40	2.57	.51	.60	20.59
72-73	0	.21	1.30	1.12	3.33	3.27	7.91	4.64	1.36	.33	1.02	.18	24.67
73-74	0	.34	.08	2.46	9.58	1.63	4.21	1.11	4.13	3.39	.33	0	27.26
74-75	1.70	0	0	1.42	1.76	2.02	2.48	9.87	7.31	3.76	.65	.39	31.36
75-76	0	2.24	.60	3.47	1.19	.71	1.34	3.11	2.85	.19	0	0	15.70
76-77	1.42	1.30	1.84	1.46	.43	.05	1.91	3.65	1.59	0	2.80	.65	16.40+
77-78	.11	0	.42	.25	3.54	6.67	6.70	4.80	3.16	2.78	.20	0	28.71
78-79	.13	.05	.53	2.23	2.72	3.85	3.83	3.41	3.09	1.52	1.68	.01	23.05
79-80	1.16	.10	0	1.28	1.05	5.59	8.42	10.16	4.86	.99	1.39	0	35.00
1980-81	.20	.46	0	1.04	.92	1.59	5.08	1.62	2.60	1.75	.66	0	15.92
81-82	0	0	.03	3.77	8.30	5.52	8.65	4.30	8.50	3.20	.50	.69	43.43
AVERAGE:	.44	.39	.40	1.63	3.25	4.72	5.48	4.19	3.82	1.87	.94	.21	27.34

SITE *GL--Glenbrook*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.28	.15	.32	.41	2.86	4.64	10.16	5.32	2.14	1.93	.26	1.90	30.37
69-70	.04	0	.16	1.18	.86	4.48	7.82	1.67	1.64	2.48	0	1.32	21.65
1970-71	.07	0	.22	.21	2.06	4.85	2.54	.17	3.08	.77	3.31	.41	17.69
71-72	.23	.41	.02	.69	1.00	4.15	.23	.51	.19	.91	.55	.34	9.23
72-73	T	.03	1.16	2.63	2.05	1.41	3.60	2.69	.36	T	1.00	.13	15.06
73-74	T	.70	T	.84	3.36	3.06	1.63	.44	1.90	.15	.06	T	12.14
74-75	1.40	.04	T	.82	1.16	1.56	1.25	3.91	3.41	1.19	.46	.06	15.26
75-76	T	1.96	.91	4.25	1.26	.63	.41	1.52	.71	.37	.20	.09	12.31
76-77	.76	2.37	2.23	.41	.22	.38	.57	1.78	.63	0	2.41	.83	12.59
77-78	.19	0	.19	.04	1.63	3.57	4.29	2.74	2.84	1.28	.20	.31	17.28
78-79	.47	.35	1.56	.28	2.05	1.33	2.27	3.21	1.65	.61	.36	.10	14.24
79-80	.87	.22	0	1.20	.46	5.73	5.64	3.73	1.81	1.05	.82	.11	21.64
1980-81	.52	.01	.21	1.11	.62	1.25	3.45	.65	2.65	1.07	.82	T	12.36
81-82	T	0	.51	2.29	6.61	2.92	5.43	3.24	6.46	2.05	.59	1.49	31.59
AVERAGE:	.35	.45	.54	1.17	1.87	2.85	3.52	2.18	1.77	.91	.79	.51	16.91

SITE *LV --Little Valley*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69													
69-70	.08	0	0	2.69	1.03	.77	*	27.0		1.60	0	1.70	34.87+
1970-71	0	0	0	1.24	8.42						2.52	.38	
71-72	.01	.52	.64	.76	3.34	3.05	1.66	2.49	.91	2.30	.78	.58	17.04
72-73	.15	.22	2.67	3.23	4.77	6.21	6.89	4.19	2.81	.25	.37	.81	32.57
73-74	.21	.13	.19	2.12	7.86	8.42	6.38	.30	6.60	5.24	.07	.02	37.54
74-75	2.72	.19	0	1.93	1.71	2.28	3.62	10.30	8.40	3.20	.45	.26	35.06
75-76	0	2.61	.82	4.47	2.56	.48	1.04	2.73	2.74	.43	.01	0	17.89
76-77	0	4.20	2.14	1.71	1.46	.30	1.89	3.17	1.60	.04	1.53	1.18	19.22
77-78	.11	.17	.30	.31	2.99	7.21+	9.59	4.77	4.64	1.37	.64	.05	32.26
78-79	.18	.25	1.67	0	1.29	4.51	6.13	*	6.20	~.80	.54	~0	21.57
79-80	.77	.70	0	1.21	2.11	4.55	8.94	7.58	3.40	2.47	.08	.25	32.06
1980-81	.38	*	.65	.95	.78	2.57	5.28	1.45	2.60	.38	1.80	0	16.84
81-82				6.10	15.34							.64	(57.47)
AVERAGE:	.38	.82	.76	1.72	3.19	3.67					.73	.50	29.53

SITE *31--Cliff Ranch*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	*	*	*	*	*	5.13	9.80	7.55	.61	.69	.03	1.48	25.29
69-70	.98	0	0	2.31	.45	7.00	15.96	1.54	.57	.35	0	.81	29.97
1970-71	0	0	0	1.80	7.82	8.11	2.57	.92	5.96	.55	1.39	.40	29.52
71-72	.01	.26	.77	.56	1.02	4.73	1.59	1.96	.38	1.27	.84	.08	13.47
72-73	0	.13	1.46	2.72	2.89	4.18	6.67	3.17	.88	0	.17	.53	22.80
73-74	0	.08	.01	2.06	9.24	4.93	5.55	.74	3.59	4.18	0	0	30.38
74-75	1.20	0	0	1.24	1.58	2.28	2.71	6.15	6.30	1.75	.56	.58	24.35
75-76	0	1.92	.62	3.97	2.02	.28	.68	2.24	2.49	~.06	~0	~0	14.28
76-77	.68	2.81	1.66	.90	1.37	.14	1.85	3.00	1.05	0	1.10	1.18	15.74
77-78	0	0	.16	0	6.21	8.37	5.14	3.71	1.54	.12	.14	.07	25.46
78-79	.02	.83	0	0	2.69	.48	9.00	3.77	*	.70	.43	0	17.92
79-80	.68	.23	0	1.31	1.91	5.58	8.62	6.38	1.82	.39	.17	0	27.09
1980-81	.17	0	.38	.66	.60	2.32	3.49	1.28	2.05	.37	.98	0	12.30
81-82	0	0	.30	3.32	12.72	*	14.70	7.00	4.45	3.12	0	.52	46.13
AVERAGE:	.29	.48	.41	1.60	3.89	4.12	5.66	3.53	2.44	1.04	.48	.40	24.34

SITE *FT --Franktown/Cliff Ranch*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69						.71	10.20	7.82	.62	.55	0	1.75	
69-70	1.00	0	0	2.18	.42	7.00	12.03	1.35	.49	.25	0	.75	25.53
1970-71	0	0	0	.93	7.52	7.37	2.72	.81	5.32	.46	1.32	.35	26.80
71-72	.01	.18	.82	.49	2.18	4.34	1.46	1.62	.39	1.09	.77	.07	13.42
72-73	.04	.31	1.31	3.51	2.57	4.04	5.98	2.56	1.75	.09	.23	.52	22.91
73-74	0	.13	.07	1.96	8.40	4.33	5.80	.68	3.28	3.73	.05	0	28.43
74-75	1.26	.01	0	1.15	1.55	2.09	2.51	6.62	6.18	1.75	.55	.48	24.16
75-76	0	1.48	.77	4.42	1.94	.40	.63	2.69	2.65	.07	0	0	15.05
76-77	.06	2.34	1.23	.77	1.27	.14	1.74	2.90	1.02	.05	1.00	1.21	13.73
77-78	.02	.01	.25	.13	5.92	7.90	4.73	3.61	1.89	.26	.27	.05	25.04
78-79	.09	.24	1.85	0	2.63	1.94	5.29	3.98	.78	.94	.39	0	18.13
79-80	.50	.16	0	1.58	1.92	5.65	8.52	5.73	1.36	.15	.11	0	25.68
1980-81	.12	0	.38	.65	.60	2.15	3.23	1.22	1.93	.53	.82	0	11.63
81-82	0	0	.59	3.17	12.11	*	16.29	7.00	4.35	3.09	0	.48	47.08
AVERAGE:	.24	.37	.56	1.61	3.77	3.95	4.99	3.47	2.29	.93	.42	.40	23.00

SITE *DC--Davis Creek Park*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69							10.47	6.68	.35	.57	.07	1.60	
69-70	0	0	0	1.95	.05	7.96	12.34	1.17	.30	.19	0	.64	24.60
1970-71	0	0	0	.49	6.00	6.21	2.91	.51	3.86	.54	2.11	.30	22.93
71-72	.10	.32	.82	.42	.70	4.06	1.62	1.03	.39	1.03	1.03	0	11.52
72-73	.40	.72	1.03	2.02	2.21	3.82	4.87	1.96	1.51	.08	.32	.79	19.73
73-74	.07	.12	.05	1.64	7.70	3.62	4.96	.49	2.81	3.21	0	0	24.67
74-75	.58	.09	0	.89	1.18	1.65	1.84	6.42	5.49	1.67	.62	.68	21.11
75-76	.01	1.46	.55	4.04	.92	.26	.45	2.26	2.10	0	~0	~0	12.05
76-77	.74	.88	.99	.38	.77	.11	1.22	2.59	.31	0	.83	.62	9.44
77-78	.01	0	.01	.02	4.69	6.95	4.79	2.98	1.60	.21	.30	.04	21.60
78-79	.17	*	.17	0	2.02	2.08	5.04	3.57	.65	.43	.41	0	14.54
79-80	.43	.44	0	1.56	1.10	5.03	8.41	5.90	1.31	.45	.15	.47	25.25
1980-81	.20	.34	.59	.43	1.12	2.68	2.71	.44	1.66	.55	.76	0	11.48
81-82	0	0	.20	2.18	10.46	8.37	6.13	7.0	3.97	2.77	0	.58	41.66
AVERAGE:	.21	.36	.34	1.23	2.99	4.06	4.84	3.07	1.88	.84	.55	.41	20.78

SITE 8 -- *Junction U.S. 395 & NV 27*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.05	.21	.14	.11	.89	2.07	9.01	2.47	.20	.17	.55	2.17	18.04
69-70	.12	0	0	.32	.12	2.76	4.31	1.04	.38	.72	0	1.05	10.82
1970-71	0	.31	0	.12	2.09	3.17	1.09	.18	1.78	.95	2.97	.07	12.73
71-72	.30	.04	.22	1.34	.73	3.16	.36	.42	.02	.87	1.38	.32	9.16
72-73		.08	.30	1.77	1.37	1.42	2.67	1.97	1.14	.12	.49	.81	12.14
73-74	.06	.12	0	1.03	2.17	1.60	2.40	.36	1.48	.42	0	0	9.64
74-75	.35	.15	0	.50	1.25	1.45	.33	2.15	2.43	.63	.10	.54	9.88
75-76	.03	.89	.61	1.01	.71	.05	.46	1.69	1.52	.13	.09	0	7.19
76-77	.77	.40	1.21	.25	.10	0	.93	1.55	.52	.02	1.40	2.82	9.97
77-78	0	.09	.01	.29	1.20	3.48	2.79	2.05	1.19	.10	.10	.12	11.42
78-79	.44	.22	.81	0	1.46	1.03	1.28	2.17	1.10	.14	0	0	8.65
79-80	.36	.63	0	.40	.10	2.04	3.54	2.77	.33	.50	.65	.20	11.52
1980-81	.43	.32	.52	.34	.38	1.86	1.40	.20	.48	.39	.28	0	6.60
81-82	0	.07	.04	1.17	3.05	3.52	2.39	.47	1.72	.55	.13	1.23	14.34
AVERAGE:	.21	.25	.28	.62	1.12	1.97	2.35	1.39	1.02	.41	.62	.67	10.91

Oct → Mar

78%

SITE 7--Sage Bend

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.01	.20	.05	.08	.88	2.34	10.19	3.06	.15	.09	.70	2.15	19.90
69-70	.17	0	0	.39	.15	3.00	4.68	1.07	.43	.28	0	.68	10.81
70-71	0	.60	0	0	2.75	3.36	1.25	T	1.99	.94	3.25	0	14.14
71-72	.08	.02	.28	.57	.75	4.06	.43	.49	0	1.02	1.40	.30	9.40
72-73	0	.13	.10	1.67	1.83	1.83	2.65	2.11	.95	0	0	.94	12.21
73-74	0	0	0	.92	3.43	1.03	2.66	.37	1.42	.24	0	0	10.07
74-75	.37	0	0	.47	1.10	1.52	.48	1.89	2.77	.65	.18	.52	9.95
75-76	0	1.08	.54	1.15	.16	.05	2.04	2.13	1.05	.05	0	0	8.25
76-77	.73	.23	1.03	.40	.20	0	1.35	1.80	.65	0	.90	1.50	8.79
77-78	.10	0	0	.16	1.68	3.15	3.51	2.53	1.27	0	.05	.21	12.56
78-79	.04	0	0	0	1.40	1.14	1.86	2.56	1.11	.05	0	0	8.16
79-80	.46	.26	0	.30	.08	3.57	5.26	3.97	.43	.53	.02	0	15.00
1980-81	.27	.29	.33	.05	.37	1.18	1.88	.19	.47	.35	.10	0	5.48
81-82	0	0	0	.94	3.45	4.53	2.77	.80	2.13	.58	.02	1.34	16.56
AVERAGE:	.16	.20	.17	[.51	1.31	2.20	2.93	1.64	1.06]	.34	.51	.54	11.57

Oct → Mar

83%

SITE 6-- *Lancer*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.03	.24	.10	.10	1.00	2.94	11.13	4.05	.23	.15	.62	2.32	22.91
69-70	.27	0	0	.45	.08	3.43	5.00	1.30	.49	.39	0	.62	12.03
1970-71	0	.40	0	0	3.05	3.93	2.15	.24	2.34	.99	2.79	0	15.89
71-72	.07	.04	.28	.58	1.02	4.37	.76	.57	0	1.34	1.48	.35	10.86
72-73	0	.17	.07	1.58	1.84	2.23	3.56	2.38	.74	0	0	.90	13.47
73-74	0	0	0	1.10	4.14	1.37	3.06	.37	1.86	.42	0	0	12.32
74-75	.35	0	0	.50	1.40	1.79	.61	3.55	3.36	.74	.16	.49	12.95
75-76	0	1.14	.54	1.27	.22	.05	.40	2.50	1.03	.05	0	0	7.20
76-77	.67	.41	1.19	.44	.10	0	1.42	1.93	.70	0	.95	1.27	8.98
77-78	.12	0	0	.13	1.61	4.96	3.68	2.58	1.59	.07	.04	.04	14.82
78-79	0	0	.48	0	1.59	1.19	2.07	3.77	1.12	.03	0	0	10.25
79-80	.52	.38	0	.32	.25	4.23	5.15	4.79	.55	.73	.66	0	17.58
1980-81	.27	.22	.32	.23	.38	1.80	2.72	.21	.61	.34	.18	0	7.28
81-82	0	0	0	1.07	4.01	4.12	2.97	.83	2.40	.50	.03	1.74	17.67
AVERAGE:	.16	.21	.21	.56	1.48	2.60	3.19	2.08	1.22	.41	.53	.55	13.20

Oct → Mar

84%

SITE 4 -- *Whites Creek*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.06	.43	.10	.23	1.32	3.37	10.25	5.82	.64	.19	.41	2.25	25.07
69-70	.13	0	0	.74	.09	4.28	5.69	1.33	.67	.30	0	.52	13.75
1970-71	0	.04	0	.13	4.01	5.72	2.39	.62	2.06	.72	2.19	.02	17.90
71-72	.09	.03	.28	.39	1.34	4.48	1.05	.64	.01	1.56	1.48	.40	11.75
72-73	0	.51	.27	1.83	2.43	1.90	3.98	2.66	.94	0	0	.78	15.30
73-74	0	0	0	1.40	5.44	1.67	3.63	.49	3.32	.84	0	0	16.79
74-75	.36	0	0	.39	1.19	1.88	.61	5.51	4.68	1.06	.18	.45	16.31
75-76	0	.80	.68	1.29	.18	.12	.46	2.20	.98	.15	0	0	6.86
76-77	.20	.93	1.12	.45	0	0	1.64	1.78	.72	0	1.02	1.24	9.10
77-78	.05	0	0	.19	2.19	5.19	5.24	3.44	1.40	.05	.06	.02	17.83
78-79	0	0	.40	0	1.91	1.22	3.69	3.18	1.50	0	0	0	11.90
79-80	.54	.32	0	.35	.27	4.39	6.10	5.36	.82	.73	.08	0	18.96
1980-81	.13	.31	.70	.12	.38	1.98	2.77	.34	.51	.53	.36	0	8.13
81-82	0	0	0	.94	5.34	4.23+	3.98	1.74	3.56	.96	.03	1.55	22.33
AVERAGE:	.11	.24	.25	.60	1.86	2.89	3.68	2.51	1.56	.51	.44	.52	15.17

8690

SITE *R--Evergreen Hills Road*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.19	.34	.10	.42	1.77	4.17	14.39	5.69	.36	.48	.41	2.17	30.49
69-70	.43	0	.02	1.29	.34	6.31	8.73	1.83	.90	.87	0	.77	21.49
1970-71	0	.03	.05	.51	5.26	5.45	2.38	.54	3.82	.82	2.84	.23	21.93
71-72	.67	.23	.51	.45	1.24	5.16	1.44	1.15	.10	1.77	1.55	.48	14.75
72-73	.01	.59	.58	2.17	2.71	1.28	4.68	2.93	1.14	.14	.22	1.38	17.83
73-74	.22	.15	.01	1.41	6.50	2.85	5.51	.99	3.28	2.05	.02	0	22.99
74-75	.64	.19	0	.60	1.49	2.44	1.12	5.92	4.79	1.69	.47	.69	20.04
75-76	.02	1.13	.58	2.34	.97	.18	.45	2.39	2.11	.22	.04	0	10.43
76-77	1.12	.71	1.40	.46	.31	0	1.75	2.12	1.17	0	1.33	1.17	11.55
77-78	.04	.01	.02	.04	2.89	6.74	5.96	3.21	2.35	.22	.18	.12	21.78
78-79	.22	T	1.38	0	1.99	1.77	4.86	4.71	1.49	.37	.33	.08	17.20
79-80	.43	.41	.01	.70	.65	5.72	9.49	6.68	1.07	1.32	1.21	.36	28.05
1980-81	.12	.21	.74	.48	.47	2.21	3.38	.68	1.56	.56	.93	0	11.34
81-82	0	0	.20	2.01	8.60	7.65	3.72	3.35	4.78	2.17	.12	2.34	34.94
AVERAGE:	.29	.29	.40	.92	2.51	3.71	4.85	3.01	2.07	.91	.73	.70	20.39

SITE *2--Jones Creek*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.18	.47	.09	.42	1.93	5.21	10.60	5.82	.87	.46	.29	2.63	28.97
69-70	.04	0	0	1.26	.37	5.90	8.29	1.70	1.05	.42	0	.66	19.69
1970-71	0	0	0	.33	5.45	7.13	2.22	.53	4.34	.57	2.40	.22	23.19
71-72	.30	.18	.35	.43	2.03	5.17	1.56	2.31	.03	1.96	1.55	.37	16.24
72-73	0	.54	.45	2.07	2.99	2.59	5.00	2.78	.85	0	0	1.44	18.71
73-74	0	0	0	2.15	7.05	3.18	4.36	.67	4.70	1.46	0	0	23.57
74-75	.92	0	0	.62	1.66	2.60	1.01	6.58	5.64	1.67	.27	.70	21.67
75-76	0	1.11	1.26	1.48	.07	.12	.37	2.26	1.18	.20	0	0	8.05
76-77	.35	1.42	1.72	.48	.27	0	2.04	1.89	.73	0	1.11	.91	10.92
77-78	.08	0	0	0	2.69	6.64	7.54	2.39	1.81	.07	.09	0	21.31
78-79	.15	0	1.25	0	2.20	1.86	5.34	4.81	1.98	.12	.14	0	17.85
79-80	.59	.69	0	.54	.71	4.60	8.17	7.33	1.22	.99	.67	0	25.51
1980-81	.13	.27	1.02	0	.48	2.85	3.56	.56	1.05	.52	.75	0	11.19
81-82	0	0	0	2.29	10.49	7.68	3.77	3.70	6.06	2.94	.09	2.17	39.19
AVERAGE:	.20	.33	.44	.86	2.74	3.97	4.56	3.10	2.24	.81	.56	.65	20.46

SITE *0--RNR Test Site*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.59	.74	.15	.65	2.31	5.97	15.59	6.98	.78	.87	.69	2.88	38.20
69-70	.33	0	0	1.75	1.12	8.04	10.93	2.32	1.43	1.11	0	1.12	28.15
1970-71	0	.10	.07	.58	7.20	9.12	3.82	.72	6.85	1.18	3.13	.46	33.23
71-72	.80	.42	.46	.60	2.58	7.33	2.22	1.41	.26	2.38	1.77	.56	20.79
72-73	.02	.75	1.03	2.90	3.92	4.14	5.76	4.04	1.59	.06	.50	1.01	25.72
73-74	.27	.26	.04	2.11	9.64	3.46	6.38	1.50	5.16	2.80	.02	0	31.64
74-75	1.37	.27	0	.73	2.07	3.14	1.48	9.75	7.34	2.26	.50	.76	29.67
75-76	.12	1.47	.62	3.25	1.35	.33	.85	2.95	2.48	.17	.14	0	13.73
76-77	1.63	1.58	2.13	.70	.49	0	2.32	2.20	1.80	.02	2.28	1.62	16.77
77-78	.08	.02	.08	.18	2.98	7.66	7.93	4.73	2.57	.64	.27	.10	27.24
78-79	.30	.02	1.55	0	2.85	2.79	5.85	5.65	2.13	.81	.27	.13	22.35
79-80	.71	.77	0	1.60	.82	7.48	10.78	10.09	1.79	1.69	1.48	.50	37.71
1980-81	.10	.28	1.09	.86	.62	3.17	4.75	1.38	2.20	.86	1.57	0	16.88
81-82	0	0	.46	3.33	12.42	9.20	5.38	4.94	7.56	4.93	.26	3.26	51.74
AVERAGE:	.45	.48	.55	1.37	3.60	5.13	6.00	4.19	3.14	1.41	.97	.81	28.10

SITE *MK--Mt. Rose Bowl*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69			.20	.26	2.65	4.74	15.64	12.92	3.26	.87	.61	2.71	43.86+
69-70	.18	0	0	2.25	.62	3.29							
1970-71				.34	7.92	8.45	5.51	.86	4.06	1.14	2.78	.68	31.74+
71-72	.42	.45	.20	.77	2.49	7.70	1.43	2.25	.24	2.14	.97	.85	19.91
72-73	.09	.90	1.28	2.90	3.84	3.38	5.68	4.09	1.81	.52	.45	.57	25.51
73-74	.17	.39	.07			5.96	6.80	1.32	12.32	6.62	T	0	33.65+
74-75	2.46	.24	0	.79	.63	3.44	1.60	12.42	11.86	2.60	.10	.46	36.60
75-76	T	2.20	.76	1.75	1.36	.35	.52	3.28	2.87	.31	.02	.10	13.52
76-77	.35	4.13	3.04	1.02	.40	.45	2.39	2.00	1.24	T	2.55	1.82	19.39
77-78	.27	.03	.19	.29	1.62	6.47	8.22	4.54	3.20	1.51	.32	.05	26.71
78-79	.28	.04	2.12	.62	2.13	2.44	6.76	6.68	2.84	1.31	.89	T	26.11
79-80	.87	1.14	.02	1.88	.81	5.31	8.94	9.37	2.40	2.33	.98	.27	34.32
1980-81	.51	1.35	1.77	.80	.87	2.90	6.55	1.07	2.76	.90	2.19	0	21.67
81-82	0	0	.58	3.75	11.92	8.86	6.83	5.09	9.32	3.59	.28	2.49	52.71
AVERAGE:	.47	.91	.79	1.34	2.87	4.55	5.91	5.07	4.48	1.83	.93	.77	29.92

SITE *K--Sky Tavern*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.28	.72	.30	.82	3.49	9.74	16.50	9.66	1.94	1.21	.37	3.01	48.04
69-70	0	0	0	2.85	1.53	8.94	13.11	4.87	.50	2.96	0	1.85	36.61
1970-71	0	0	0	.66	6.33	16.82	5.19	2.35	6.97	.91	3.88	.63	43.74
71-72	.45	.37	.78	.96	3.61	10.64	2.94	3.99	.32	4.05	1.81	1.14	31.06
72-73	.09	.99	1.74	2.94	4.85	6.90	7.47	5.43	2.65	.18	.54	.03	33.81
73-74	.18	.19	.15	2.28	14.80	4.25	6.59	2.53	6.51	5.70	.10	0	43.28
74-75	2.40	.28	0	.04	3.00	4.26	2.74	13.37	9.20	4.11	.47	.65	40.52
75-76	0	2.16	.73	3.60	1.50	.61	.91	3.73	3.22	.27	.20	0	16.93
76-77	2.23	2.56	2.98	.99	.69	.07	4.59	3.66	2.43	0	2.85	1.59	24.64
77-78	.25	.03	.21	.27	2.71	9.58	12.09	7.17	4.96	3.07	.43	T	40.77
78-79	.28	.07	1.56	0	3.43	3.35	7.60	9.11	3.83	1.64	1.12	.08	32.07
79-80	1.02	1.37	0	1.95	1.09	7.90	12.60	15.94	4.00	2.64	.75	0	49.26
1980-81	.20	.38	2.40	1.55	.67	1.78+	8.27	2.50	3.61	1.05	1.59	0	24.00+
81-82	0	0	.49	3.82	11.74	8.71	7.81	4.97	11.75	9.17	.50	2.71	61.67
AVERAGE:	.53	.65	.81	1.62	4.25	6.90	7.74	6.38	4.42	2.64	1.09	.85	37.88

SITE *G--Mt. Rose Resort*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.24	.96	.28	1.13	3.82	11.83	33.50	10.25	2.58	1.86	.44	3.57	70.46
69-70	0	0	0	3.23	2.01	6.25	14.42	3.36	3.61	4.13	0	2.01	39.02
1970-71	0	0	0	.97	7.20	18.26	5.77	1.61	9.29	1.38	3.19	.77	48.44
71-72	1.05	.49	.86	.98	3.62	12.81	3.79	3.56	.95	6.81	1.65	1.68	38.25
72-73	.07	.59	2.07	3.25	6.25	7.41	10.82	7.11	3.43	.45	1.08	1.01	43.54
73-74	.11	.29	.08	2.68	16.00	5.45	8.61	3.29	9.00	7.73	.02	.01	53.27
74-75	2.61	.22	0	.02	4.05	5.96	3.36	14.79	12.74	5.24	1.09	.87	50.95
75-76	.01	2.30	.72	3.89	2.17	.88	1.30	4.17	5.24	.44	.10	0	21.22
76-77	1.37	2.58	2.92	1.20	.88	.06	4.53	4.14	3.82	0	3.79	1.44	26.73
77-78	.15	.05	.21	.54	4.76	10.95	15.40	9.01	6.10	3.37	.64	0	51.18
78-79	.40	0	1.16	0	3.75	4.01	9.10	10.66	5.21	3.31	1.68	0	39.29
79-80	1.15	1.63	.02	2.48	1.84	13.59	14.44	14.28	3.80	4.04	2.24	.11	59.62
1980-81	.49	.33	2.51	.91	.90	5.59	10.32	2.22	5.75	1.22	1.96	0	32.20
81-82	0	0	.51	4.59	15.11	13.57	8.44	5.45	16.11	8.11	.62	2.87	75.38
AVERAGE:	.55	.67	.81	1.85	5.17	8.33	10.27	6.71	6.26	3.44	1.38	1.02	46.46

SITE *A--Tahoe Meadows*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.22	1.05	.33	1.19	4.95	14.13	(37	12	3.03	2.86	0	3.68	80.00
69-70	.02	0	0	2.17	2.39	11.51	11.44	3.79	4.99	5.51	0	2.69	44.51
1970-71	.02	0	0	1.64	7.83	19.50	4.91	1.38	10.27	3.06	4.94	.79	54.34
71-72	.18	.73	.92	1.78	4.78	12.37	3.56	5.24	.84	7.65	1.42	1.23	40.70
72-73	.26	.12	2.16	4.45	8.36	9.26	13.19	7.40	4.40	.65	1.16	.94	52.35
73-74	0	.05	.19	2.86	13.64	7.06	7.85	3.90	7.87	10.55	.07	0	54.04
74-75	2.32	.37	0	.03	5.24	6.80	4.80	17.26	14.14	5.93	1.46	.59	58.94
75-76	.04	2.01	.73	3.65	2.50	.80	1.93	4.50	4.49	1.36	.15	.09	22.25
76-77	2.01	2.91	1.80	1.16	1.40	.10	5.65	5.17	4.19	T	5.12	1.85	31.36
77-78	.27	.02	.35	.53	7.01	13.68	16.59	10.07	6.12	4.36	1.48	.06	60.54
78-79	.38	.08	2.65	0	4.08	4.24	10.03	14.92	5.66	3.09	1.87	.31	47.31
79-80	1.22	1.74	.02	3.53	3.00	16.13	15.37	11.77	5.19	4.15	2.64	.84	65.60
1980-81	.60	.36	1.15	1.02	1.27	5.78	11.46	2.49	5.06	1.49	3.03	0	33.71
81-82	.01	0	.43	6.00	17.32	16.72	9.88	7.99	17.84	10.60	.59	3.57	90.95
AVERAGE:	.54	.67	.77	2.14	5.98	9.86	10.98	7.72	6.72	4.15	1.71	1.19	52.42

SITE *U--Upper Incline*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.15	.57	.29	.82	4.09	12.61	28	9	2.80	.75	.30	1.33	60.71
69-70	0	0	0	2.33	1.67	8.23	11.74	2.93	2.23	3.54	0	1.92	34.59
1970-71	0	0	0	1.63	5.68	15.07	3.00	1.68	8.69	2.26	4.19	.51	42.71
71-72	.07	.49	.86	.72	2.73	9.26	2.61	3.41	.23	4.17	1.18	1.15	26.88
72-73	0	0	1.79	4.23	5.23	3.81	10.01	6.79	2.07	0	0	0	33.93
73-74	0	0	.05	1.38	7.17	7.17	5.02	2.00	4.52	7.72	0	0	35.03
74-75	1.99	0	0	0	3.17	5.45	3.46	11.01	12.49	5.49	.54	.39	43.99
75-76	0	2.14	.64	1.50	1.73	.40	1.35	3.79	2.46	.32	0	0	13.66
76-77	.22	2.52	.98	1.00	1.03	.05	3.53	3.60	2.30	0	1.55	1.30	18.14
77-78	.02	0	0	.57	5.30	9.52	11.12	7.06	4.12	.77	1.00	.03	39.51
78-79	.20	0	1.32	1.01	1.70	2.82	7.04	13.13	4.98	2.88	1.43	0	36.51
79-80	1.19	1.50	0	1.85	2.02								
1980-81	.60	.21	.61	.49									
81-82	0	0	.22	3.83	11.22	10.65	9.08	4.09	10.68	6.00	.45	2.55	58.77
AVERAGE:	.30	.46	.48	1.53	4.06	7.09	8.00	5.71	5.02	2.79	.92	.77	37.13

SITE *V--Apollo Way*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69													
69-70	0	0	0	2.58	.98	9.71	13.57	3.20	2.70	2.60	0	1.85	37.19
1970-71	0	0	0	1.33	4.88	14.65	3.68	1.96	6.63	2.08	5.08	.39	40.68
71-72	.41	0	.72	.57	2.48	10.45	2.77	2.41	.39	3.39	.94	.79	25.31
72-73	0	0	1.74	3.55	4.69	5.25	12.38	5.51	1.43	0	*	.56	35.11
73-74	0	0	0	1.44	7.57	6.61	5.19	1.79	5.53	4.97	0	0	33.10
74-75	1.92	0	0	0	2.12	3.48	2.57	11.94	12.33	3.93	.41	.67	39.37
75-76	.04	2.46	.64	2.96	.81	.30	.98	2.71	2.24	0	0	0	12.84
76-77	1.84	2.30	.82	1.16	.81	.03	2.83	2.75	1.62	0	3.47	.73	18.33
77-78	.25	.04	.24	.58	4.24	9.46	12.02	7.17	3.87	1.13	.27	0	39.27
78-79	.23	0	1.21	0	2.74	2.62	5.23	7.72	4.63	1.81	1.04	.30	27.53
79-80	1.03	1.27	0	1.56	1.88	8.75	5.91	8.21	4.74	1.30	2.23	0	36.88
1980-81	.56	.18	.54	.69	.82	2.15	8.78	.99	3.68	.83	1.47	0	20.69
81-82	0	0	.30	3.37	9.45	10.05	7.93	3.39+	10.92	4.91	.38	2.30	53.00
AVERAGE:	.48	.48	.48	1.52	3.34	6.42	6.45	4.60	4.67	2.07	1.24	.58	32.33

SITE *W --Eagle Drive*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.07	.40	.17	.58	3.39	8.53	13.00	7.19	2.10	1.84	.53	2.58	40.38
69-70	0	0	0	2.48	.88	8.49	11.28	2.99	1.87	2.21	0	1.67	31.87+
1970-71	0	0	0	1.19	4.57	9.99	3.35	.64	6.95	1.51	3.96	.35	32.51
71-72	0	.28	.73	.48	2.08	6.67	2.92	2.58	.28	2.41	.72	.61	19.76
72-73	0	T	1.65	2.81	3.80	5.64	8.16	4.98	1.08	0	*	.41	28.53
73-74	0	0	0	1.65	8.77	4.67	4.60	2.58	2.89	5.19	0	0	30.35
74-75	1.86	0	0	0	2.13	2.77	2.85	10.77	9.36	2.75	.44	.43	33.36
75-76	0	2.42	.63	3.20	.68	.10	.69	2.19	1.74	0	0	0	11.65+
76-77	1.92	1.55	.74	1.16	.73	0	2.28	2.26	2.07	0	2.54	.69	15.94
77-78	0	0	0	.43	3.71	7.65	9.73	4.94	3.20	.29	.27	0	30.22
78-79													
79-80													
1980-81													
81-82													
AVERAGE	.39	.47	.39	1.40	3.07	5.45	5.89	4.11	3.15	1.62	.94	.67	23.42

SITE *Z--Third and Incline Creeks*

MONTHLY AND ANNUAL PRECIPITATION

(Inches of Water)

YEAR	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	ANNUAL
1964-65													
65-66													
66-67													
67-68													
68-69	.05	.03	.06	.27	3.26	5.24	7.49	6.09	1.55	.76	.10	2.28	27.18
69-70	0	0	0	1.62	.79	6.24	8.95	1.15	.89	1.42	0	1.14	22.10
1970-71	.01	0	0	.46	3.13	7.19	1.00	.35	2.95	.64	3.19	.46	19.38
71-72	0	.32	.43	.28	1.55	4.90	2.37	1.82	.09	.80	.29	1.08	13.93
72-73	0	.11	.99	3.03	3.23	3.36	6.93	3.48	.21	0	0	.41	21.75
73-74	0	0	0	1.31	7.38	3.53	3.39	1.09	2.53	2.93	0	0	22.16
74-75	1.56	0	0	0	2.20	2.48	1.98	6.59	6.43	2.75	.15	.26	24.40
75-76	0	2.41	2.85	.93	.88	.10	.66	1.94	1.73	0	0	0	11.50
76-77	1.83	1.09	.75	1.20	.63	0	2.00	2.61	.84	0	2.40	.75	14.10
77-78	0	0	0	.56	3.62	6.01	5.70	3.05	2.51	.07	.09	0	18.91
78-79	.10	0	1.02	.57	1.03	1.51	4.50	5.84	2.68	1.06	.31	.03	18.65
79-80	.41	.77	0	1.00	1.36	6.97	7.01	6.55	2.53	.94	.06	0	27.70
1980-81	.31	T	0	1.08	.73	1.63	5.07	.79	2.36	.80	1.20	0	13.97
81-82	0	0	.10	2.60	8.83	6.65	6.91	3.76	6.40	2.72	.20	1.98	40.15
AVERAGE:	.31	.34	.44	1.07	2.76	3.99	4.57	3.22	2.41	1.08	.42	.57	21.21

Maps available through
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Snowplow on Mt. Rose Highway