

Jan. 24, 1975

Dear Austin:

I hope that you received the last packages and rolled maps. I sent them just as soon as I had enough strength to carry them to our post office. Now that I am back to work, I will try to hunt more data for the Sierra Nevada Project.

Enclosed is a booklet of notes, maps, photos, etc. I started this several years before the flight line that you made. I intended to do the whole Sierra at about this amount of details. Now I can see that better contour base maps are needed, and I also have much more practice to do a better job.

The most important thing in this is the Mt. Stewart Cirque that includes the Liliput Glaciers. I thought that you may want to see the cross section of the Mt. Stewart headwall and the small accumulation glacier at the base. The moraine is sharp. At the steep angle of the headwall, it is easy to see that shadow protects this fine little glacier from sunlight much of the day. Do you think that this cross section would be interesting for the publication? It isn't the greatest cartography, but shows how the southernmost glaciers are headwall huggers due to the high sun angle at that latitude.

Please return after you have glanced at it. I have many more data booklets like this if you ever have time to look at them.

Sincerely

Bill

Bill

GLACIERS ON THE NORTH SIDE OF MT. STEWART

SEQUOIA NAT. PARK, CALIF.

Mt. Stewart is located on the Great Western Divide just north of Kaweah Gap and in the north central part of Sequoia National Park, Calif. This area is severely glaciated and features aretes, horns, deep cirques, lakes and tarns, and several small glaciers. This is the source of the Middle Fork of the Kaweah River. The summit is only 12,205 feet in elevation or 3,722 meters, but it rises high above the timberline in this area.

The largest ice feature (map, No. 2) is called "Lilliput Glacier" by some park personnel of Sequoia Nat. Park (personnel data), but there are two small glaciers, barely separated. Each has a sharp end moraine and lie under steep fluted granitic headwalls, with about a North trend. This high steep headwall furnishes avalanching snow nourishment and helps to protect the small glaciers with shadow which is necessary at this latitude and relatively low altitude.

Some reasons that led me to expect glaciers this far south in the Sierra Nevada follow:

In 1938 I viewed the Kaweah Peaks from Colby Pass and noticed much deep snow. Basins were solidly snow-packed with no rocks showing through on basin (cirque) floors.

Timberline is quite low here and in fact is lower than in many places far to the north in the Sierra.

Below timberline, the forest is dense, green, and there is moss on the north sides of tree trunks, and there is lush undergrowth. This suggests that ample precipitation occurs here and more than is shown on some old precipitation charts (1930).

General timberline near Kaweah Gap and Elizabeth Pass is lower 10,400 ?, than in places near Tioga Pass in the Yosemite Nat. Park. Glaciers are found in the Tioga area and are shown on the present quadrangle maps, but none are shown in all of Sequoia National Park.

Finally, after many field trips into the Great Western Divide Area, with help from Rangers, hikers, photographers, and with the aid of many sets of aerial photographs in stereo pairs and oblique singles, I have been convinced that, though generally small; glaciers and small glacierettes abound in this area. They look the same on aerial photographs as those do to the northward where they are mapped. Some of these small glaciers could be the most southerly in the continental United States.

See aerial photo: FPC-17S-8 (fig. 1) and the photos (fig. 2). These two small glaciers are modifying the giant cirque by eroding sharp, bowl-shaped cirques under the steep headwall. Notice the sharp-crested end moraines. The original FPC photo shows a trace of a bergschrund opening up. Several tones of snow and ice are seen in the photo.

The more easterly glacierette (left) has a "window" showing gray ice to show through the last winters snow, or maybe snow from the winter before. The larger glacier (right) is severely crevassed for so small a glacier. The "rough" bare ice in the lower center suggests a swarm of pedestal rocks. The moraine is steepened here and suggests a slope in excess of 35° , and is probably ice cored.

Mr. Emilio Garcia of San Jose State University led a back pack trip into this area and reported that the bare ice was about the tone or color of granite and caused some discussion about the lower ice area. Many small Sierra glaciers (Raub) have swarms of pedestal rocks or mantle covering the lower parts and thus, the lower ice parts are not immediately recognized from aerial photos by some observers. Many of our Sierra glaciers are not mapped completely on our present 1:62,500 topo maps. The rock mantle has to be seen by "going aboard" the glacier. After this, photo interpretation will come easier in mapping the bare, dirty ice area. Many of our most southerly unmapped rock-mantles glaciers and active rock glaciers contain ice cores, also referred to by some as buried ice cores.

Triple Divide Peak, Calif. 15' quadrangle
 The small glaciers are catalogued by the USGS, Tacoma. Basin numbers: 4321, features 1 and 2
 Photo date: August 14, 1976 (one of driest years on record).
 Photographs are compliments of Mr. Emilio Garcia, San Jose State University, Calif.

William H. Raub

Sept. 30, 1976

Fig. 1



SMALL GLACIERS LOCATED ON THE NORTH SIDE OF MT. STEWART

SEQUOIA NATIONAL PARK, CALIF.
Triple Divide Peak 15' quad.

BASIN	GL	NAME OR ASSIGNED DESCRIPTION	LATITUDE	LONGITUDE	AREA, SQ. KILO.		O	LENGTH, METERS		HEADWALL WIDTH, METERS
					ice	moraine		ice	moraine	
1	1	Lilliput E. Glacierette	36° 34' 22"	118° 32' 54"	.025	.027	N	200	200	200 ?
1	2	Lilliput Glacier	36° 34' 21"	118° 33' 11"	.061	.07	N	200	250	410
1	3	Mt. Stewart N.W. Ice Pocket	36° 34' 17"	118° 33' 27"	.02	.022	N	90	100	300

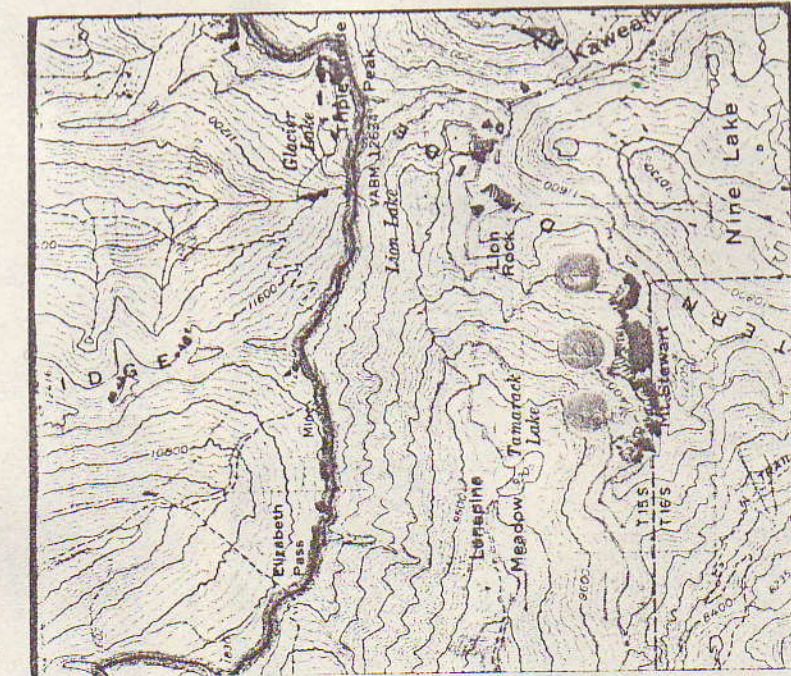


TABLE OF ELEVATIONS						
GL.	top of ice		bottom of ice		moraine crest	
	feet	meters	feet	meters	feet	meters
1	11600	3536	11160	3402	11120	3389
2	11200	3414	10800	3292	10760	3279
3	10900	3292	10640	3243	10640	3243

1. Eastern, probably detached part of "Lilliput Glacier", a name used by Sequoia Nat. Park officials and rangers. USGS photos of 1955 coverage only. Sharp Matthes age moraine, true glacierette. Forest Svc. photos of 1964 flown in July shows total snow cover but moraines are sharp.
2. "Lilliput Glacier" / True small glacier or glacierette, sharp Matthes moraine. Bergschrund shows in photos. USGS photos show several tones of white, from glacial ice to white snow. Probably pedestal rocks. This has a steep headwall and is the result of a large steep accumulation avalanche area.
3. Ice and snow accumulation under steep headwall of Mt. Stewart's N.W. wall. A photo taken by a ranger showed cracks or bergschrund trace.

OCT 4 1976 AP

Mt. Stewart

View south from the Copper Mine area

Fig. 2



GLACIERETTES AND PERMANENT ICE IN THE GREAT WESTERN DIVIDE

SOUTH OF TRIPLE DIVIDE PEAK

William H. Raub

PLATE I



The Great Western Divide from Moro Rock, Sequoia National Park
Photo taken in October. W. Raub

PLATE II



Telephoto view of the Great Western Divide from Moro Rock, Sequoia National Park, California. Photo taken in October. W. Raub

NOTES

LILLIPUT GLACIER AREA

feature

- a From descriptions this must be the ice field referred to as the Lilliput Glacier. It looks like glacial ice in the aerial photos. There is a small recessional type of moraine at the base of it. Part of the headwall is in the dark shadow of the photo but can be seen with certain lighting and a glass. This could be called the "west lobe" of the glacier.
- b This also looks like glacial ice in the photos, the headwall is in the shadow and can be seen the same way as in the main or west lobe. This eastern lobe looks as though it may have been connected to the other until recently. It shows small moraine material at the lower end.
- c The small ice feature is partially in the dark shadow of the aerial photo and may not be properly placed on the map as to area covered. Some guessing and imagination was used to place it in its position.
- d If this is permanent ice it is truly lying at a very near record low elevation for this latitude. It looks permanent in the aerial photos. Again the upper limits were in very dark shadow.

The aerial photos used were purchased from the USGS at Menlo Park, Calif. Flight date completion; 8-27-55. GS-VJZ 4-127 and 4-128.

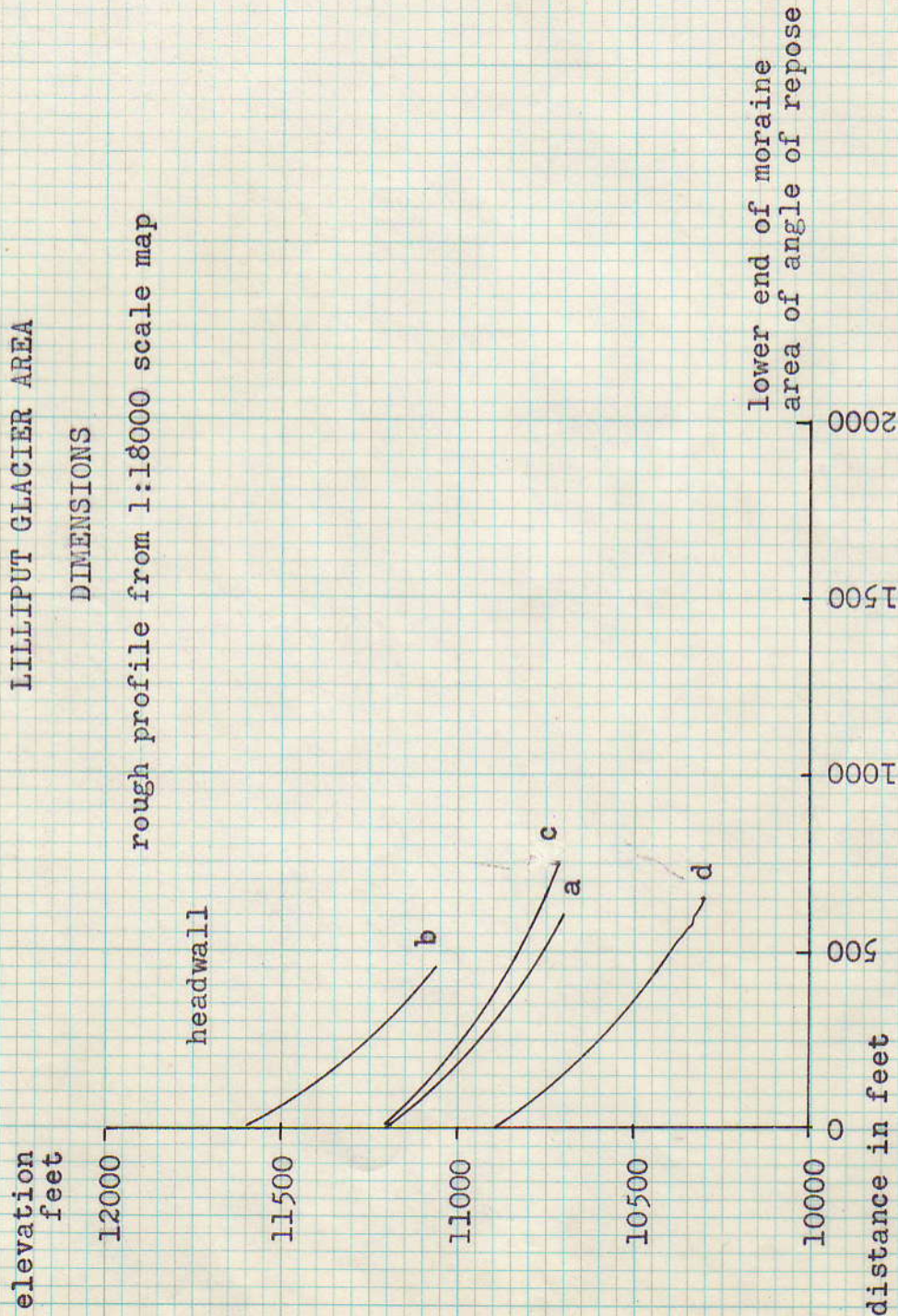
A field visit with photography is necessary to note what glacial features are to be found here. No bergschrund is visible in the shadow of the headwall, but it is possible that a trace of bergschrund exists.

W.R. May 20, 66.

LILLIPUT GLACIER AREA

DIMENSIONS

rough profile from 1:18000 scale map



scale 1:6000

	600 ft. long (map)	775 ft. long (slope)	1100 ft. wide at headwall
a	450-500	700	1300
b	550-600	900 ? (shadow)	750-800 ? (shadow)
c	650-700	900 ?	400
d			

NOTES

THE GREAT MT. STEWART CIRQUE AREA

feature

- a East Mt. Stewart Glacier (glacierette) with its present sharp moraine. The headwall is high and arcuate, thus the glacier is nourished by all of the snow accumulation from this great headwall. This headwall along with its companion (c) to the west is very spectacular when viewed in stereo. The lower edge of the visible ice lies at about 11,150 feet elevation; the upper ice limit at about 11,680 feet elevation. The headwall width is about 800 feet across, with downslope length measuring about 550 feet. The greatest dimension is about 900 feet.
- b Bergschrund seen in the Forest Service aerial photos. It is hard to see in the snow glare. It would probably be more prominent later in the summer.
- c The great central cirque headwall (cross section). It is fluted, arcuate, high and steep. It rises to over 800 feet above the ice at about a 67° slope. This acts as a large receiving area for snow which nearly all slides down to nourish this low-level accumulation type glacier below. This great headwall is the most spectacular feature to be seen on the aerial photos of the area, whether viewed singly or in stereo.
- d The main glacier, called Lilliput by some park personnel; not yet on the topographic maps. This healthy (for the latitude) little glacier owes its existence in part to the great headwall mentioned in feature "c". The lower limits of visible ice lie at about 10,700 feet in elevation and this is very low for this latitude. The upper limit lies at about 11,370 feet in elevation. The main headwall ice measures about 1,200 feet across. The downslope length measures over 1,000 feet, while the freest ice distance is about 1,250 feet.
- e This appears to be a snow or firn pocket. It may be permanent.
- f Rough ice and rock area. The USGS photos which were flown late in August show this area as grayish, rough, and somewhat resembling "badlands topography". The Dana Glacier features this rough ice structure (1965). Several shades of snow to ice are seen.
- g West Mt. Stewart accumulation glacierette. Like the more easterly headwalls, it is high and collects much snow which accumulates to form a snow and ice body lying between about 10,650 at the moraines to about 11,200 feet elevation along the headwall.

The crescent shaped glacial body measures about 750 feet across. Downslope length is shallow, being only about 250 feet. Mr. Kline, ranger at Bearpaw Meadow sent 35 mm color slides which showed cracks and checks where a bergschrund would be expected on a larger body. The slides were dated: September, 1968.

- h Older end moraine; the age not known. It may be between the last Pleistocene and the Little Ice Age, or even an earlier advance of the Little Ice Age. Mr. Birman has made studies of moraines in the Sierra Nevada.
- i The present Little Ice Age end moraine. It has a very sharp crest near the lower areas.
- j Small snow or ice pocket. It shows on the late dated USGS photos, but is "snowed in" on the Forest Service photos. The size is probably variable. Measurements from these photos show it to be not more than 300 feet in width, by 100 feet in downslope length. It is probably just a snow accumulation below a nearly sheer headwall.
- k The westernmost Mt. Stewart Ice-pocket or "mini-glacierette", This body lies at an even lower elevation than those to the east. The lower ice limit lies at about 10,300 feet in elevation; the moraine even a little lower. The uppermost ice heads in a niche-like cirque at about 10,640 feet in elevation. The width is nearly 450 feet wide by 400 feet in downslope length. It appears solid and permanent in all photos seen to date. Few permanent ice bodies exist at a lower elevation at this latitude, so it is important in this respect.
- l Area of grass, flowering plants, low brush, willow thickets, meadow and wet areas. Many springs and discharge stringers appear from under moraine material, from joints, etc. Many small streams and falls are seen in the "l" area, both on aerial photos and the slides furnished by Mr. Kline. Mr. Palmer suggested some of the vegetation types.
- m Small snow or ice pocket; not larger than 150 by 200 feet in extent.
- n Talus, derived from moraine spillage above. The many falls and stringers vanish here to percolate into Tamarack Lake, just off of this map.

Note: The southern part of this large cirque area features a great and nearly sheer triple cirque headwall; with each cirque division having its own accumulation glacial body at the base. The westernmost permanent ice lies at the lowest elevation, while the easternmost lies at the highest elevation. The central headwall rises to over 800 feet above the ice contact area, and slopes downward at about 65-70°. These glacierettes mostly owe their low-level existence to the size and shape of this great snow accumulation area. Nearly all of the snow slides down to nourish the ice body below. One would expect the ice-body to have a great variation in mass between drought and wet periods.

I first saw this area from the vicinity of Elizabeth Pass in

September of 1938; and it was then that a glacier or some sort of permanent ice body was suspected. At that time the maps did not show the ice symbol south of the Palisades. Joint systems criss-cross this area from northeast to southwest; several are seen to cross the headwall to the Hamilton Creek watershed.

The aerial photos used were: GS-VJZ-4-127 and 128 with a flightline completion date of 8-27-55; and FPC-16-24 and 25; 17S-8 and 9 with flightline completion dates of 7-19-64.

USGS Triple Divide Peak 15' quadrangle, Calif.

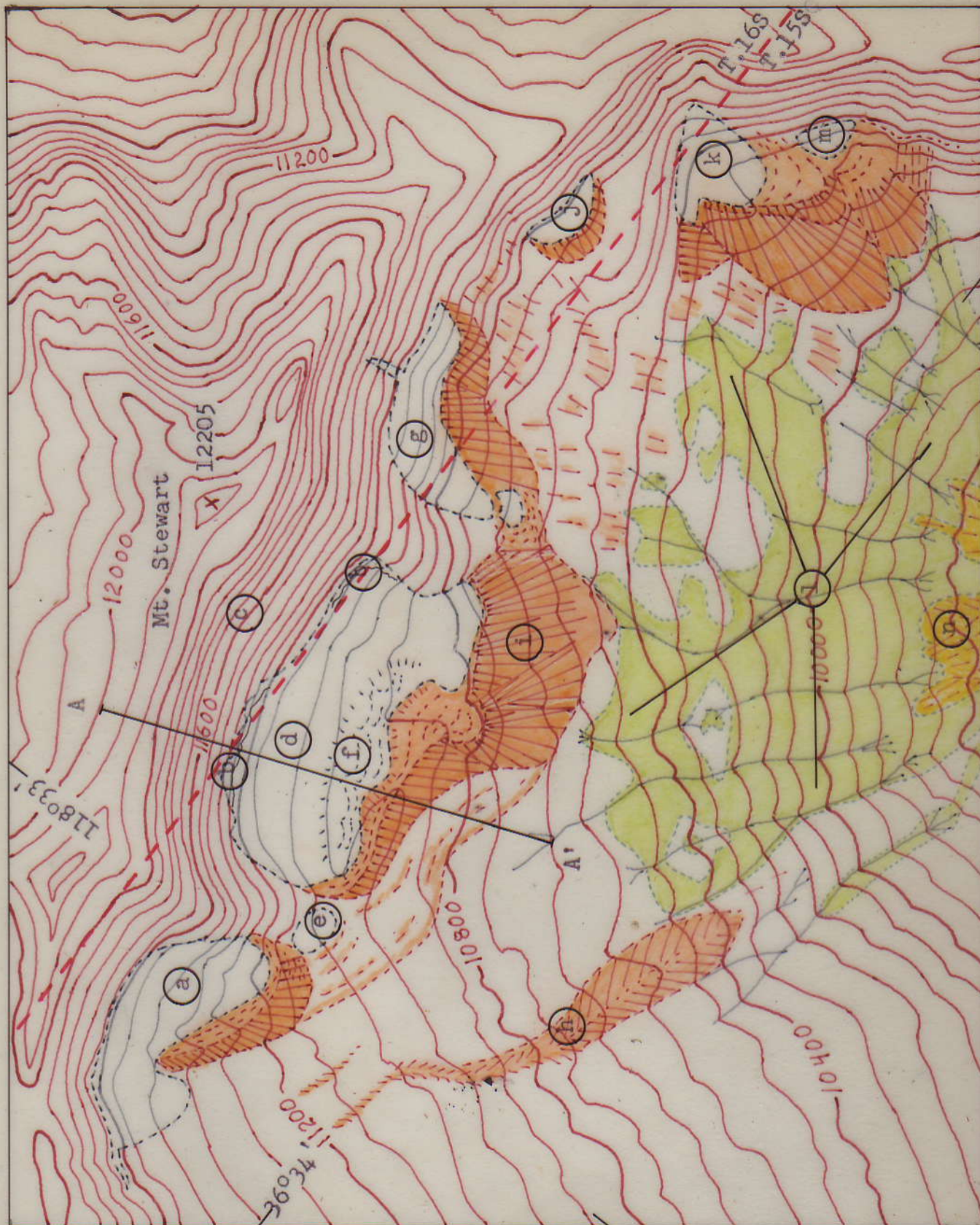
Mr Kline, (ranger at Bearpaw Meadows) donated color slides. Dr. Bell of San Jose State College and partner on a back pack trip into this area identified wild flowers along the High Sierra Trail. Mr. Grater, Chief Park Naturalist at the time of the pack trip gave information.

Mr. Palmer gave suggestions on the types of grasses and bushes in the talus area.

Mr. J. Birman authored GSA paper 75; Glacial Geology Across the Crest of the Sierra Nevada, Calif. This paper contains a gold mine of moraine data, but mostly in the San Joaquin River watershed to the north.

Mr. Tom Ross mentioned the low elevations of these glacial ice features.

Wm. H. Raub Aug. 11-70



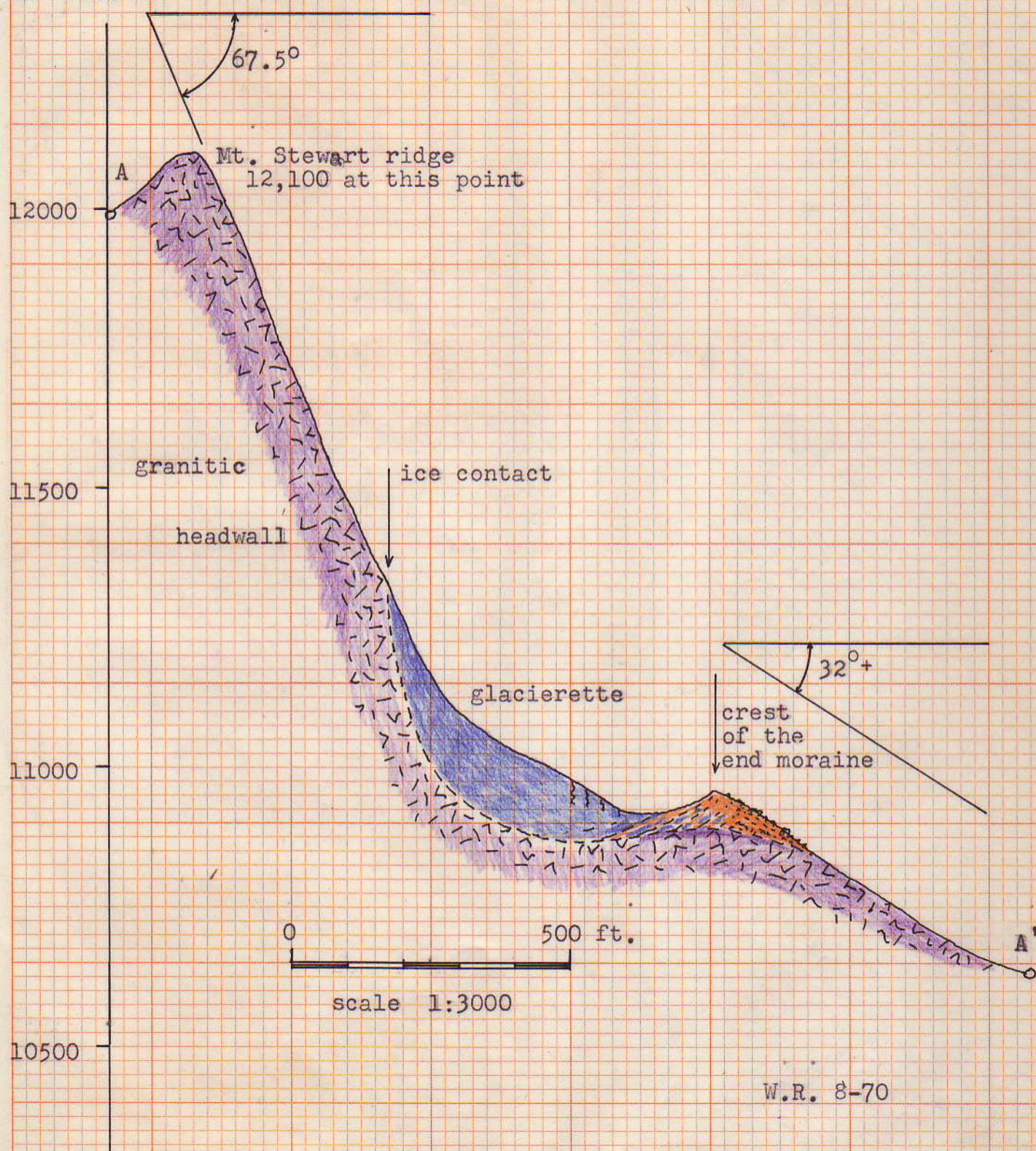
THE GREAT MT. STEWART CIRQUE AREA
Triple Divide Peak 15' quad., Calif.
scale 1:6000

feet 0 500 1000
contour interval 80 ft.

Glacial features plotted from aerial photographs taken and completed by 7-19-64 and 8-27-55. Various photogrammetric methods. USGS topo base, 1956 W.R. 1970

CROSS SECTION (A to A') OF MT. STEWART HEADWALL, GLACIER,
AND END MORaine

elevation
in feet



W.R. 8-70

NOTES

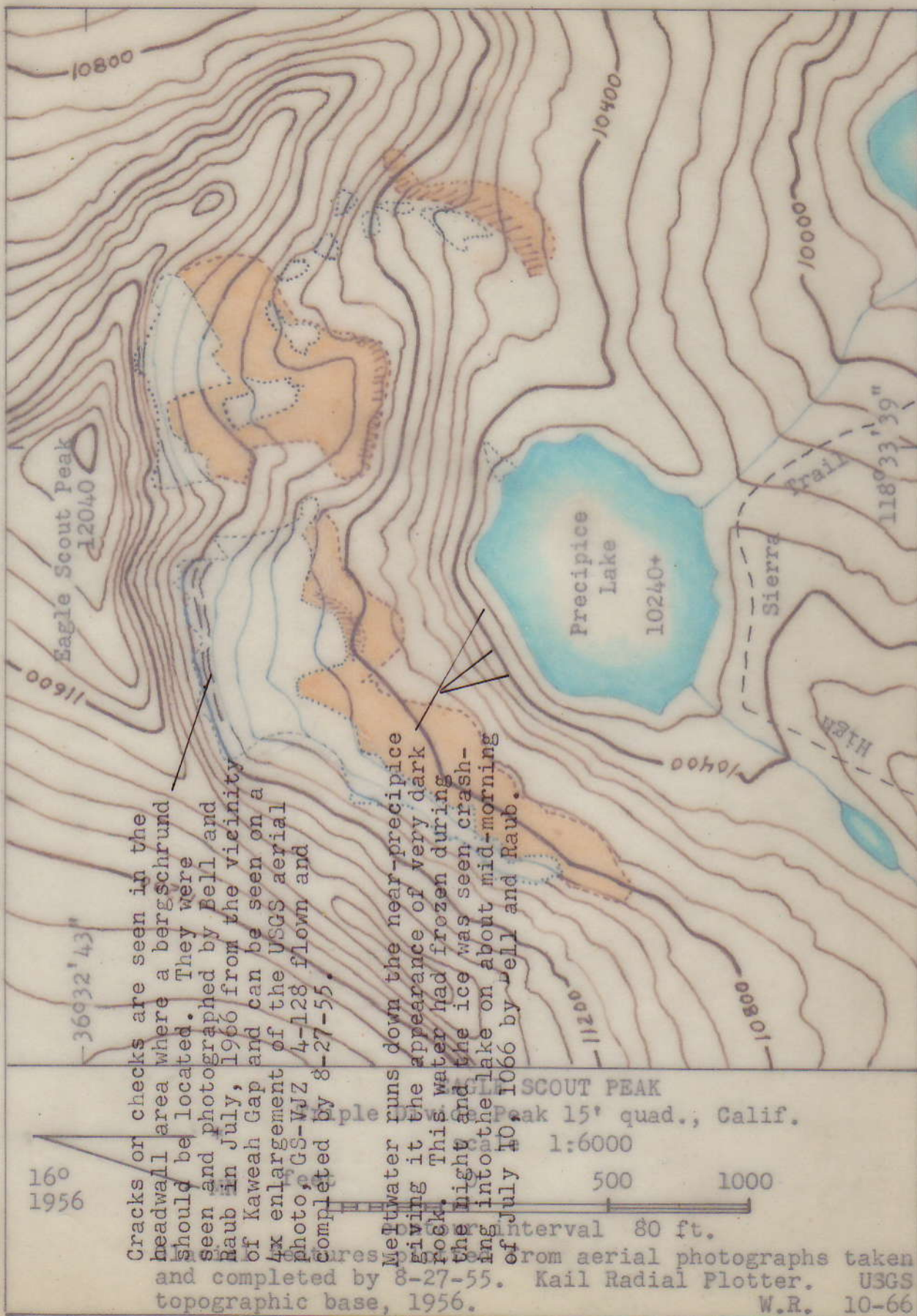
EAGLE SCOUT PEAK AREA

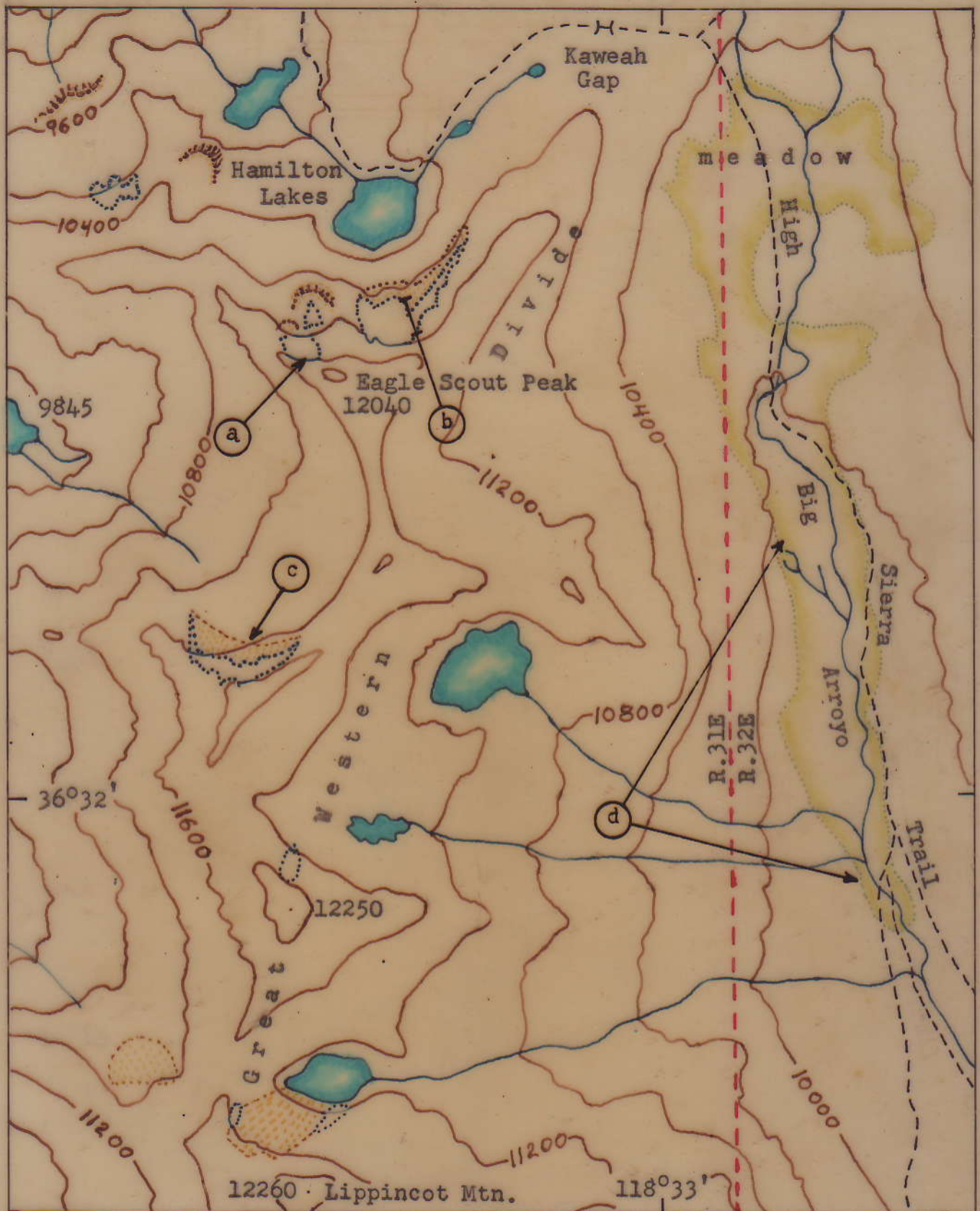
feature

- a The small ice field lies mostly in the shadow of the headwall at the time of aerial photography. It may be permanent.
- b Measurements may not be accurate due to the upper part of the ice field lying in the shadow of the cirque headwall. This is the main ice body in this area. It shows two tones or shades of light gray. The darker interpreted as more compacted firn or ice; the lighter as a snow cover. It measures about 400 feet in down-slope length underneath the highest part of the headwall, and tapering to about 100 feet at the northern end. The headwall width measures about 1600 feet.
- c The upper limits of the ice or firn field lies in the shadow. Some tone difference is noted. The outline on the map was partially sketched in by free hand and is possibly not correct due to shadow. This small ice field measures about 1200 feet across in its greatest dimension.
- d These dark areas on the photos are mostly meadow and possibly boggy areas lined with willows or other high altitude vegetation bordering streams or springs.
- e Two tiny snow or firn fields are noted on the northern high slopes of peak "12250". They are not important.

The aerial photos used were purchased from the USGS at Menlo Park, Calif. Flight date completion was 8-27-55. Photo numbers; GS-VJZ 4-127 and 4-128. Triple Divide Peak 15' quadrangle, California.

W.R. May 27, 1966





* MN
16°
1956

EAGLE SCOUT PEAK AREA
Triple Divide Peak 15' quad., Calif.
scale 1:18000

feet 0 1 2 3000
contour interval 400 ft.

Glacial features plotted from aerial photographs taken
and completed by 8-27-55. Kail Radial Plotter. USGS
topographic base, 1956. W.R. 1966



Fig. : Left, -avalanche chute seen from the High Sierra Trail across from Bearpaw Meadow. This plunges into River Valley, Middle Fork Kaweah River.



Fig. : Right, View from High Sierra Trail above Big Hamilton Lake showing part of the Eagle Scout Glacierette with waterfall descending from the cirques containing the two upper lakes. Notice marmot on rock. Photos by W.R. 7-66.



Fig. Arcuate end moraine above Hamilton Lake number three located to the west of the main glacierette on Eagle Scout Peak. This cirque contains only snow. W.R. 7-66.



Fig. Glacial polish near the outlet of the big Hamilton Lake showing striations. The ice movement was from left to right. Crescentic gouges were seen in this area. W.R. 7-66.



Fig. : Telephoto view of the head of Big Arroyo looking southeast from Kaweah Gap. The Great Western Divide is to the right and ahead. The Kaweah Peaks are to the left and out of the photo from the broad U-shaped valley.



Fig. : Upper Hamilton or "Precipice" Lake which lies under the Eagle Scout Peak glacierette. The meltwater runs down the face of the cliff in ribbons and freezes at night. Sheets of ice were crashing into the lake during the morning thaw. Photos by W. Raub. 7-66.

PLATE



Eagle Scout Peak in the Great Western Divide showing the small ice fields which lie on the north side above Precipice Lake, the highest of the Hamilton Lakes. Photograph taken from the High Sierra Trail in Kaweah Gap, 10700 feet elevation. W.R. 7-66.

PLATE



Telephoto view of the glacierette above Precipice Lake showing a trace of the bergschrund, red snow cover, vertically jointed dark sheer headwall, and part of a small arcuate end moraine to lower right. Photo taken from west of Kaweah Gap. W.R. 7-66.



Fig. , left: Dr. C. Bell with back pack on the High Sierra Trail near Mehrten Creek, Sequoia Nat. Park. C.B. 7-11-66



Fig. , right: Bill Raub with back pack on the High Sierra Trail near Mehrten Creek, Sequoia Nat. Park. C.B. 7-11-66



Fig. , left: Waterfall along High Sierra Trail between lower and Big Hamilton Lakes. C.B. 7-11-66



Fig. , right: Big Hamilton Lake (8235) taken from the trail at an elevation of about 10000 feet. C.B. 7-11-66



Fig. , left: Cascade between the 9900 ft. Hamilton Lake and the Big Hamilton Lake at 8235 ft. elevation. C.B. 7-10-66

Fig. , right: The shallow Hamilton Lake above timberline just below 10000 feet. Notice the moraine above. C.B. 7-10-66



Fig. , left: Precipice Lake or Upper Hamilton in the Alpine-Arctic zone. The elevation is just about 10300. Ice still floats on the water. There is a glacierette above and on the north side of Eagle Scout Peak (12040) C.B. 7-10-66

Fig. , right: Precipice Lake with sheer wall and ice above on the far side. C.B. 7-10-66

NOTES SUPPLEMENT AUG. 6-71

EAGLE SCOUT PEAK AREA

A field trip into the Nine Lakes Basin by myself and six Geology majors from San Jose State College furnished new glacial data for the region. The trip was back-pack via the High Sierra Trail including the dates: August 1-7, 1971. The following new observations are given.

- 1 The glacierette above Precipice Lake did not look much different than it did on a previous visit to the area with Dr. Bell on July 10, 1966.
- 2 The discharge was about the same as on the previous visit, although there was a little more snow in the area this year. A snowfield covered the lower or outlet area of the lake.
- 3 The glacierettes were viewed from places in the Nine Lake Basin and it took on a different appearance. The observations were by 7 x 50 binoculars and noted.
 - a The glacierettes are more extensive in vertical appearance area (appear shortened when close and underneath).
 - b They are steep and fairly shallow, probably protected from the sun's rays by their steep angle and high headwalls.
 - c The small moraine (above the lake) is probably accounted for by the steepness. I do not believe that the moraine can grow; it just dumps the rocks over the precipice and into the lake below.
 - d The view from the Nine Lake Basin gives a resemblance to the Minarettes area with their small glacierettes or ice pockets perched in steep clefts, niches, and cirques.
 - e Three or four parallel horizontal cracks were seen in the snow-covered ice. They were not very prominent from the low angle view from the trail near Precipice Lake, but I am sure that if they could have been observed from higher on the shoulders of Mt. Stewart, that the cracks would have appeared in much more contrast.
- 4 This glacierette probably has not been much different in area since the height of the Little Ice Age due to its steep and shallow confining area.
- 5 There were still a few small "ice-bergs" floating in the clear cold waters of Precipice Lake.

William H. Raub Aug. 10, 1971

CRESCENT MEADOW TO KAWEAH GAP, 20 MILES

HIGH SIERRA TRAIL

WATER TEMPERATURES July 9-11, 1966 (fehrenheit)

	AM	PM
Panther Creek		50° 7.15
Mehrten Creek	49° 6.00	
Mt. Stewart Creek	38° 8.30	
Precipice Lake	40° 9.30	
Bearpaw Meadow Creek	49.5° 10.00	

AIR TEMPERATURES

Big Hamilton Lake	40° 6.00
Kaweah Gap	49° 10.30

SAN JOAQUIN VALLEY TEMPERATURES ENCOUNTERED

Fresno	92° 4.30 PM	July 11, 1966
Los Banos	78° 6.00 PM	

NOTES

MT. EISEN AREA

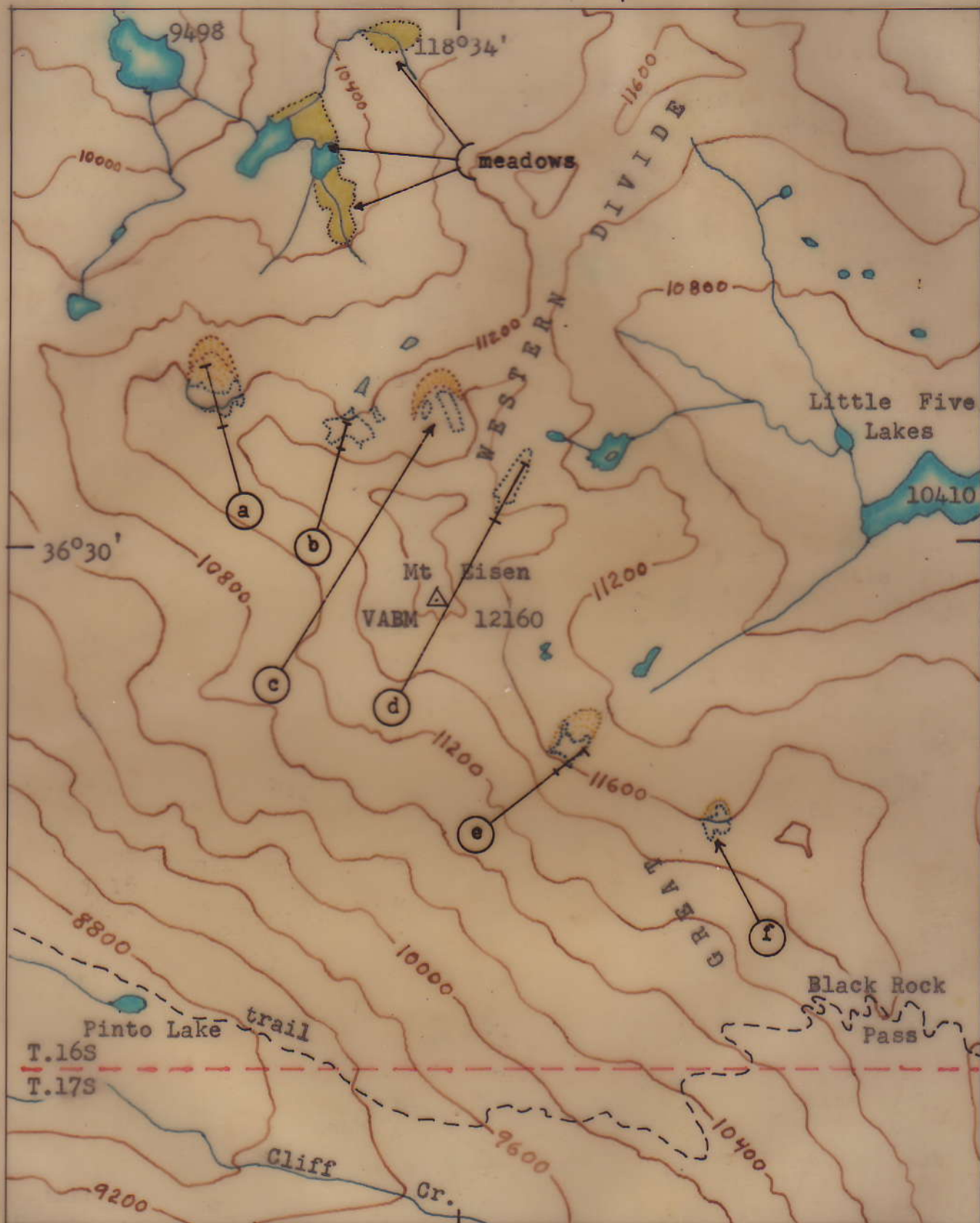
feature

- a Stereoscopic viewing of aerial photos suggests a compact little glacierette with an arcuate end moraine. This moraine stands out beautifully and can be viewed from Bearpaw Meadow on the High Sierra Trail.
- b Appears permanent and can be viewed from Bearpaw Meadow camp.
- c This has a good moraine but the glacier appears to be vanishing. Two firn or ice bodies show in stereo viewing.
- d Long and slender, probably permanent and appears to occupy a notch or chute. It has several smaller companion snow or ice bodies between it and the larger lake below. There is a dark shadowed cirque to the east that may contain more firn or ice.
- e Probably is permanent. It has a moraine. It is at the contact of light and darker rocks.
- f Probably permanent. It shows dirty shades of ice suggesting that most of the past winters snow has gone. This also lies on the contact of light and dark rocks.

A small ice body occupies a niche just to the west of feature "a".

The aerial photos used were purchased from the USGS at Menlo Park, Calif. Flight date completion was 8-27-55. Photo numbers: GS-VJZ 4-129 and 4-130. Triple Divide Peak 15' quadrangle, California.

W.R. July 15, 1966



* MN
16°
1956

MT. EISEN AREA
Triple Divide Peak 15' quad., Calif.

scale 1:18000

feet 0 1 2 3000

contour interval 400 ft.

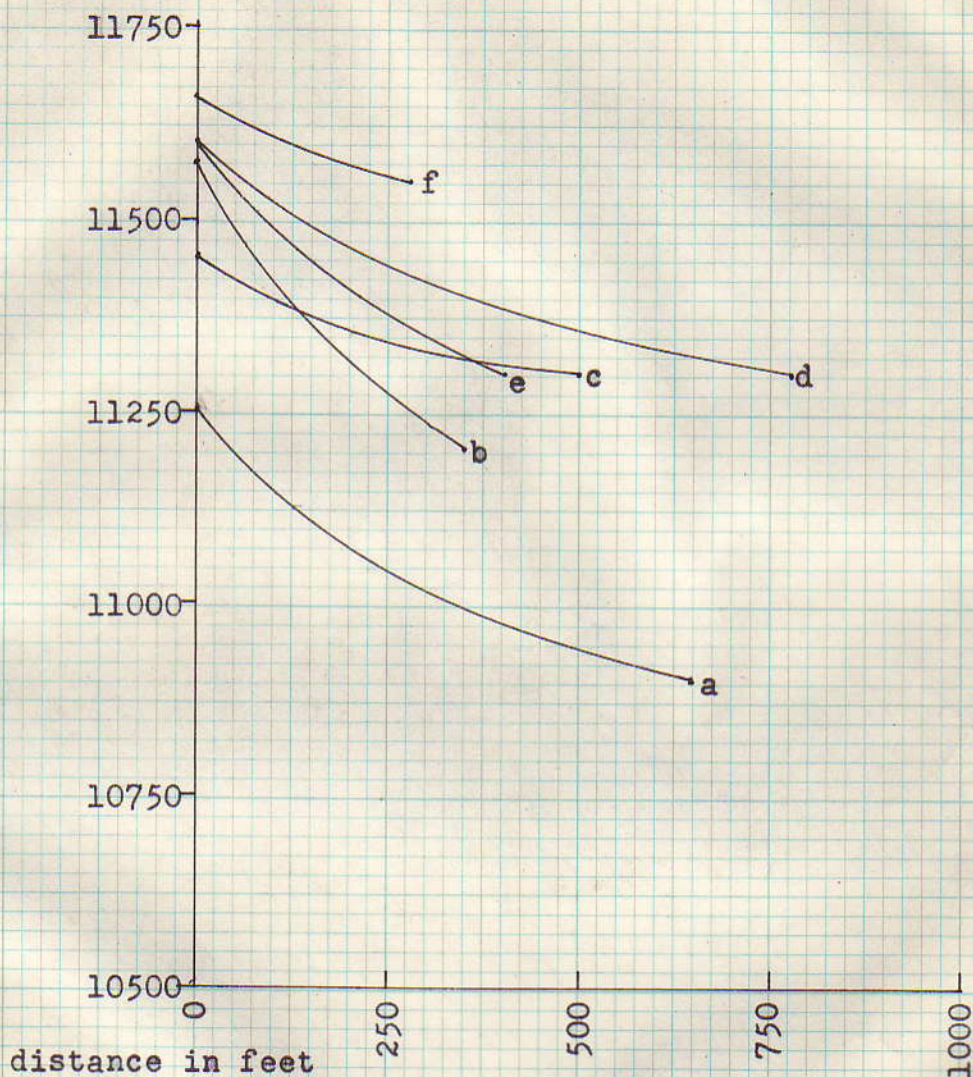
Glacial features plotted from aerial photographs taken and completed by 8-27-55. Kail Radial Plotter. USGS topographic base, 1956. W.R. 1966

MT. EISEN AREA

DIMENSIONS

elevation
in feet

Rough profile from 1:18000 scale map



scale 1:3000

UNIT	MAP LENGTH	SLOPE LENGTH	WIDTH OF HEADWALL
a	700 ft.	750 ft.	600 ft.
b	350+	500	550
c	500	525	
d	775	825	200
e	400	500	250+
F	250-300	300+	250+

NOTES

SAWTOOTH PEAK AREA

feature

- a Most of this snow or ice field lies in the sunlight at the time of aerial photography. Some end moraine material plunges over a steep slope and forms a talus cone down to timberline. This small ice field lies between about 10800 and 11200 feet in elevation, and measures about 775 feet in width by about 350 feet length (map).
- b This has the appearance in the photos of a permanent ice field. The upper part of the ice cannot be seen because of the dark headwall shadow. It has well developed end moraines showing loops due to recessions. This ice field lies between about 11100 and 11700 feet in elevation, and measures about 1000 feet in width by about 500 feet in length. It may be even wider in the cirque headwall hidden by shadow.
- c A small chute heads near the top of the narrow cirque. This has the appearance of permanent ice and shows the type of arcuate moraine that larger known glacierettes show. This ice field lies between about 11350 and 11600 feet in elevation, and measures over 1000 feet in width by from 350 to 600 feet in length (irregular shape).
- d Not important and not certain of its really being permanent. It lies entirely in the sunlight at the time of aerial photography. More information is needed. It lies between about 11400 and 11750 feet in elevation, and measures about 400-550 feet in width by nearly 400 feet in length.

The writer has visited Columbine Lake twice, both times in early July and both times it was still frozen over with much snow still filling the cirque. It is possible that another small ice field exists under Sawtooth Peak. Talus is emitted from a shadow zone high under the Peak.

The aerial photos used were purchased from the USGS at Menlo Park, Calif. Flight date completion: 8-27-55: prints, GS-VJZ 4-53, 4-54, 4-130, and 4-131.

These interpretations are not final, more field data is needed in order to provide revision data.

W.R. Sept. 21, 1966.

REVISED NOTES

August, 1972 direct observations

SAWTOOTH PEAK AREA

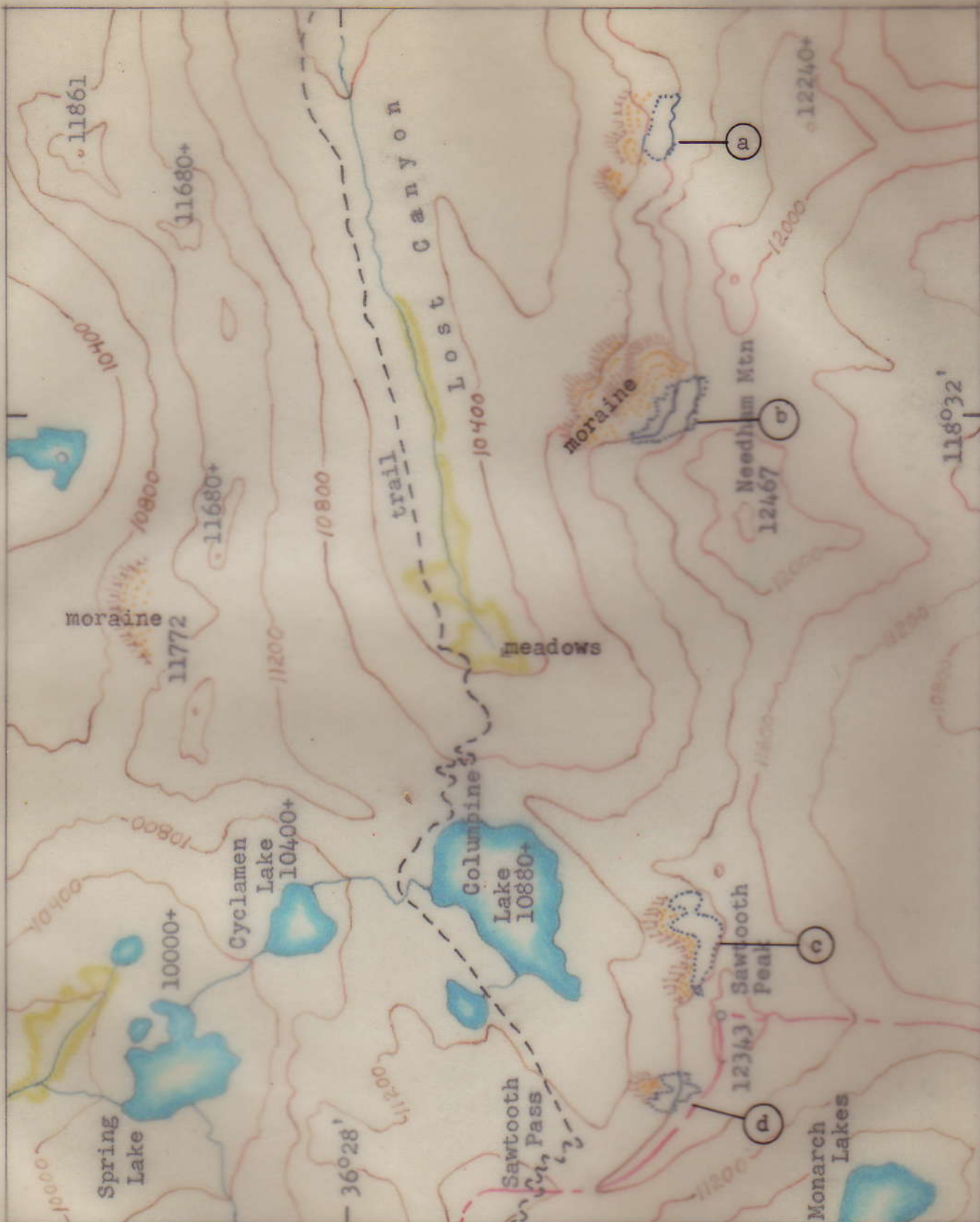
feature

- a This could not be seen from any point on the trail, however Mr. Nakata climbed a peak near Columbine Lake and took an oblique telephoto shot into this shallow cirque. A shallow sheet of ice or snow hugs the headwall. Little else is known as yet.
- b This could be seen from the trail up Lost Canyon. Mr. Nakata and myself, Bill Raub climbed a few hundred yards up the opposite slope and took observations. As this is a very dry snow year, I must say that this feature is definitely a permanent snow-ice feature. Many crevasses could be seen. I counted 8, one above the other, but a high sharp-crested end moraine may have blocked the view of lower ice limits and more crevasses due to our low viewpoint. Cliff ice accumulations lie under the cliff to the east of this permanent feature. It was noticed that most of the water of Lost Canyon has its source here, the stream having about two thirds of the water above this point. A lateral moraine covered with trees lies between the canyon bottom and this glacierette.
- c This tiny glacierette-like feature was viewed from a peak above Columbine Lake through 7 x 50 binoculars, and both regular lens and telephoto shots taken. A well-formed end moraine lies in front of the main snow-ice body (eastern) and a waterfall descends from near the crest of the moraine front. About midway down it splits into a double or forked fall. It's midday roar can be heard across Columbine Lake. In the morning one fork is dry. This is the true headwaters of Cliff Creek and its entrance into the Lake can be seen emerging from under much loose rock. A small cliff-ice accumulation (with a few pedestal rocks) lies to the west of the main body.
- d As stated in the original notes of 9-21-66, this is just snow and not a solid body, though some permanent snow patches may remain. A fairly large snowfield did persist below this and terminated near the narrow arm of the Lake. Several "low order" pedestal rocks were seen through 7 x 50 binoculars on it's surface.

It was noticed that on an exceptionally dry year such as this one, that these small unmapped ice pockets or mini-glacierettes are very important. The larger-flow streams are seen to be directly associated with these small glacial features, thus their importance during times of low-water flow in the Kern and Kaweah Rivers is seen.

These views and notes are from an August 6-7, 1972 visit.

W.R.



MN
16°
1956

*

SAWTOOTH PEAK AREA
Mineral King 15' quad., Calif.
scale 1:18000
feet 0 1 2 3000
contour interval 400 ft.

Glacial features plotted from aerial photographs taken
and completed by 8-27-55. Kail Radial Plotter. USGS
topographic base, 1956. W.R. 9-66

NOTES

FLORENCE PEAK AREA

feature

- a From evidence available to date, these apparently separate ice bodies are permanent. They belong to the same moraine that plunges its talus into the upper end of Upper Franklin Lake. As seen in stereo, the moraine appears to still contain an ice core, and may be slightly active, but a field visit late in the season will be necessary. This part of the cirque is at the contact between light and dark rocks. This moraine with its talus cone is made up entirely of the dark rock of the Mineral King Valley metamorphics.
- b Measures about 550 feet in width by about 450 or more feet in length.
- b Measures over 600 feet in width and length. This is the part that appears to have an ice core running down for about 1100 feet below the upper part of the ice.
- c Snow definitely occupies this part of the cirque at the time of aerial photography, but due to dark shadow, no interpretation was possible. Wide moraines over 2000 feet wide lie below the shadow zone on the north side of Florence Peak, so it is possible that more permanent snow or ice occupies the shadow zone. The extent is unknown.
- d This small basin contains a small headwall or cliff with a band of snow around a few tiny ponds.
- e This large basin contains a network of joints, each seems to contain marrow bands of probable meadow grass and tiny streams. The lake, 10880+ must be very shallow as all of the rocks on its bottom show in stereo. It may be filling in and converting to meadow. This basin may contain other ponds in the network of dark areas.

The writer has visited the Franklin Lakes and Pass several times, each time in July with much snow still filling the cirque. The snow or ice field above Upper Franklin Lake seemed to be more than just winter snow.

The aerial photos used were purchased from the USGS at Menlo Park, Calif. Flight date completion: 8-27-55: prints, GS-VJZ 4-131, and 4-132.

These interpretations are not final, more field data is needed in order to provide revision data.

W.R. Sept. 27, 1966.

REVISED NOTES

August, 1972 direct observations

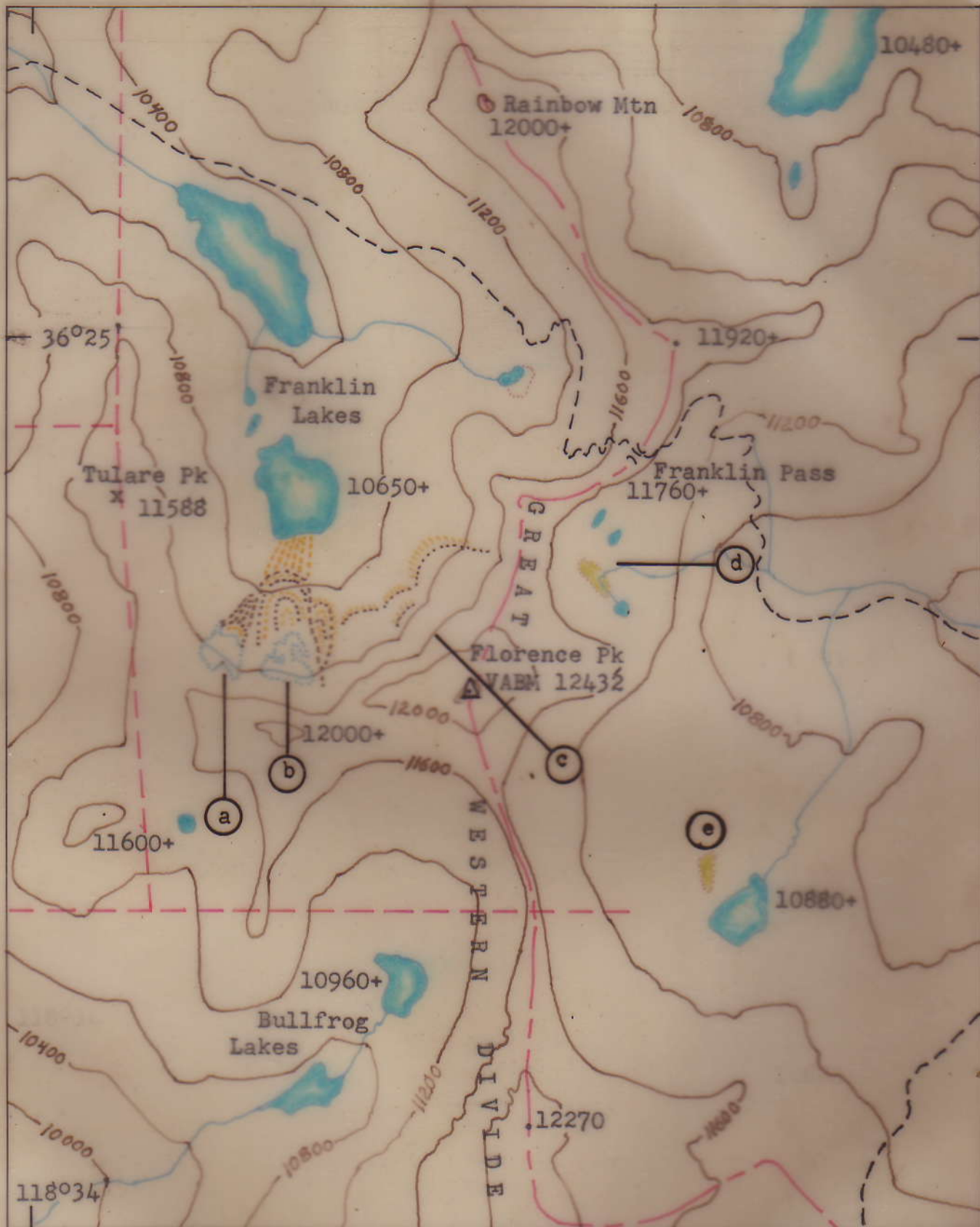
FLORENCE PEAK AREA

feature

- a This dry year found most snow gone at this time, however this snow-ice pocket must be a permanent feature. It has it's own moraine-like rock accumulation. It is associated with feature b in sharing the same headwall, but does not contribute to the main front.
- b No measurements were made while on a visit here. Some notes follow: Surface ice or hardened snow held many rocks and surface cover. Upon removing rocks, ice was seen below. Mr. Rymer reported several small pedestal rocks near the upper ice areas. Dirty ice lie in the mid areas, some limonitic and extremely dirty. Streams cut icy-snow into tiny canyons, meandered for a ways, then plunged into tiny discharge tunnels. When near the inner moraine crest, water could be heard, still just below the rocky surface. The front measured 35° , and the western side, 38° . A snow-ring persisted at the western base near the front. The front of this feature terminates into the Upper Franklin Lake. It was noticed that this is the true and reliable source of Franklin Creek water, playing an important role on a dry summer such as this one.

These views and notes are from an August 2-3, 1972 visit.

W.R.



* MN
16°
1956

FLORENCE PEAK AREA
Mineral King 15' quad., Calif.
scale 1:18000
feet 0 1 2 3000
contour interval 400 ft.

Glacial features plotted from aerial photographs taken and completed by 8-27-55. Kail Radial Plotter. USGS topographic base. 1956. W.R. 9-66

NOTES

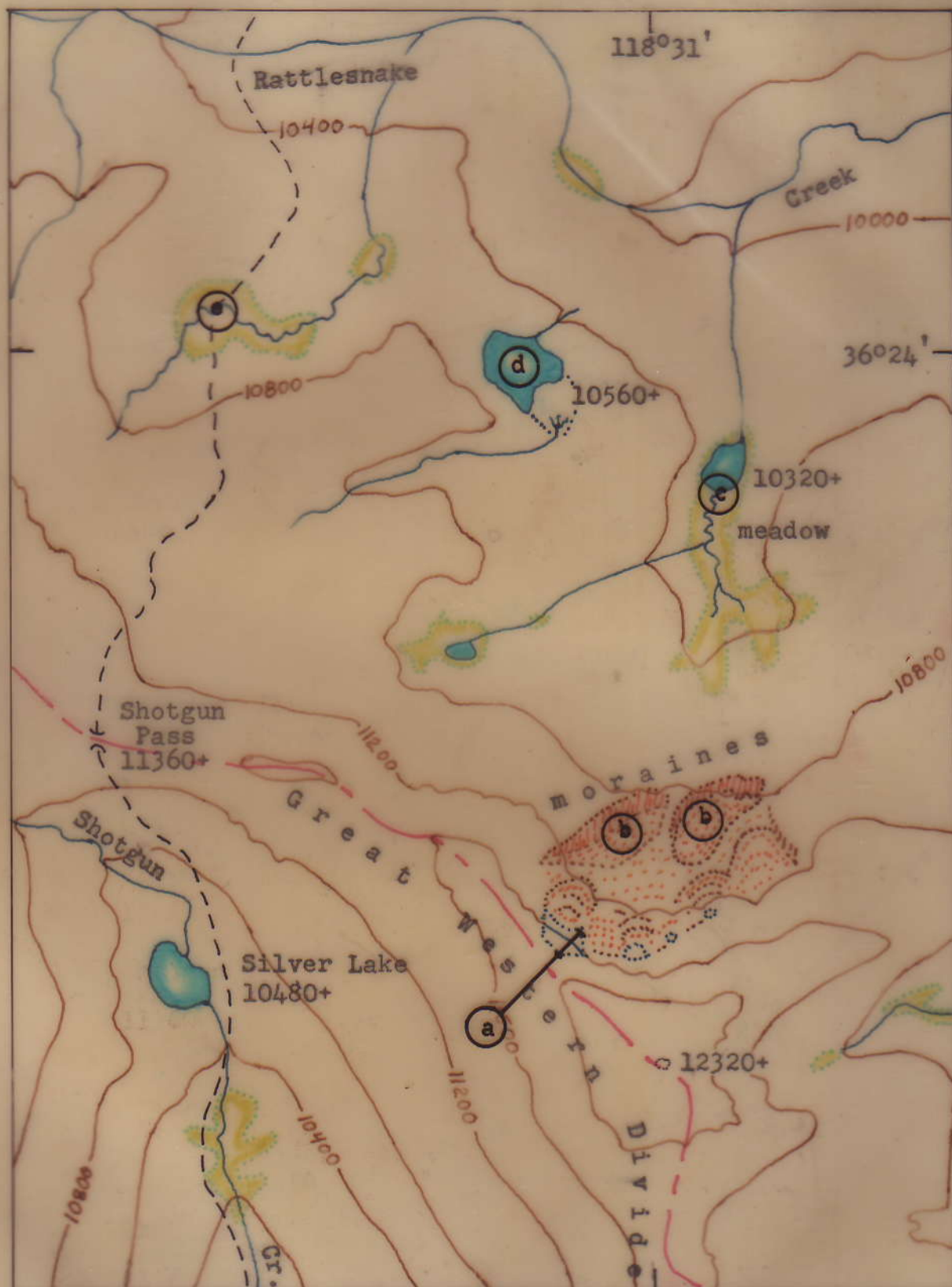
SHOTGUN PASS AREA, SOUTHERN GREAT WESTERN DIVIDE

feature

- a Possibly just snow, but appears quite solid on the aerial photographs. Several smaller snow bodies are seen in the shadow of the headwall. The low elevation for this snow or ice body lies at about 11500 feet in elevation and the high at about 11800 feet. It is a little more than 350 feet in downslope length by about 600 feet in width.
- b These two moraines are detached from the snow or ice body above so probably have no ice core. A glacier appears to have occupied this cirque until recently. This cirque with its moraines and small snow or ice field is worthy of investigation with photographs in order to see how fresh the moraine is and if it is free of lichens. If this ice body is permanent it could be about the southernmost except possibly several tiny snow bodies at the head of Laurel Creek.
- c The lake does not show in the set of aerial photos used in this study, however they were printed quite dark but the lake was shown as per topographic map. A meadow does show with a tiny meandering stream within. This looks like a lake that is slowly being filled in and being converted to a meadow.
- d This lake has been partially filled in by silt or a light colored sand. About two thirds of the lake persists and the rest shows as a light sandy fill. The outlet creek was not clearly shown on the photos so the lower part was not shown.
- e A small outwash delta is seen entering this meadow that looks to be active mostly during the spring run-off. A tiny meander is seen in the meadow which looks very flat, suggesting that it was a lake until quite recently. Others in this area show the conversion from lake to meadow.

The aerial photos used were purchased from the USGS at Menlo Park, Calif. Flight date completion: 8-27-55: prints, GS-VJZ 4-55, 4-132 and 4-133.

W.R. July 27, 1966



* MN

SHOTGUN PASS AREA

Mineral King 15' quad., Calif.

Scale 1:18000

feet 0 1 2 3000

contour interval 400 ft.

Glacial features plotted from aerial photographs taken and completed by 8-27-55. Kail Radial Plotter. USGS topographic base, 1956

W.R. 1966

NOTES

THE HEADWATERS OF LAUREL CREEK

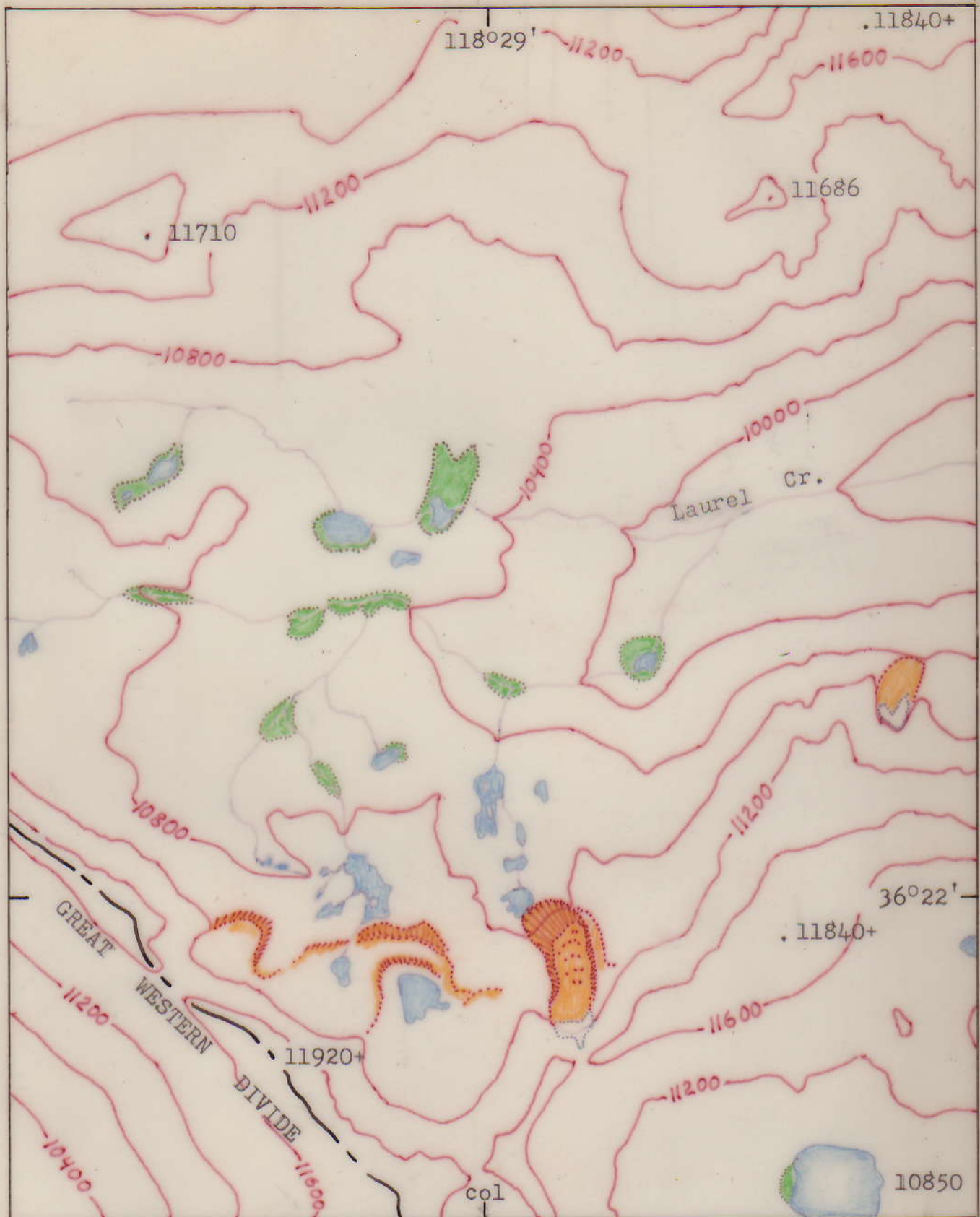
feature

- a Lakes, some very shallow in various stages of filling-in; being converted to new meadows. Tiny stream braids and meanders are seen, along with the streamside vegetation showing up in contrast to the green meadows.
- b Meadows that are older, some suggest that lakes once occupied their areas, but now show dark (green) on the photos.
- c Moraine deposit older than that of the "Little Ice Age".
- d More recent moraine, but maybe also older than that of the "Little Ice Age".
- e Active Rock Glacier? This little feature is the most southerly of its type that I have noticed so far in the Sierra Nevada and its spur, The Great Western Divide. (I show on my "Shotgun Pass Area map, feature a", a body that I mapped as possibly permanent snow or firn, but it is not of this type). Feature e shows some probable permanent ice on both sets of aerial photos used. The whole body appears inflated and is convex upward as is shown on the special map; "Glacial Feature, Headwaters of Laurel Creek".
From the top of visible firn or ice just below the Col and down to the crest (angle of repose) of the moraine front, it measures about 1,402 feet, map length. Headwall ice or firn area measures about 425 feet across. This body does suggest that it has at least interstitial ice within the inflated rock body. Notice that the small lake at the foot of the front lies at 36° 22' N. Lat.
- f Col, probably the result of the continuing headwall gnawing of feature e.
- g Both sets of aerial photos show this firn or snow pocket along with one more just to the east of it. Later investigations and interest of the area may warrant a map to include them.

Note: Both sets of aerial photos used were flown in summers following drought winters of near record snow minimums. The aerial photos used were:GS-VJZ 4-55 with a flight line completion date of 8-27-55, and FPC-19-55 and 56 with a completion date of 7-19-64.

Kern Peak 15' quadrangle, Calif.

W.R. Oct 15, 1968



* MN

16°
1956

THE HEADWATERS OF LAUREL CREEK
Kern Peak 15' quad., Calif.
scale 1:18000

feet 0 1 2 3000
contour interval 400 ft.

Glacial features plotted from aerial photographs taken and completed by 7--19--64. Various photogrammetric methods. USGS topographic base, 1956. W.R. 1968

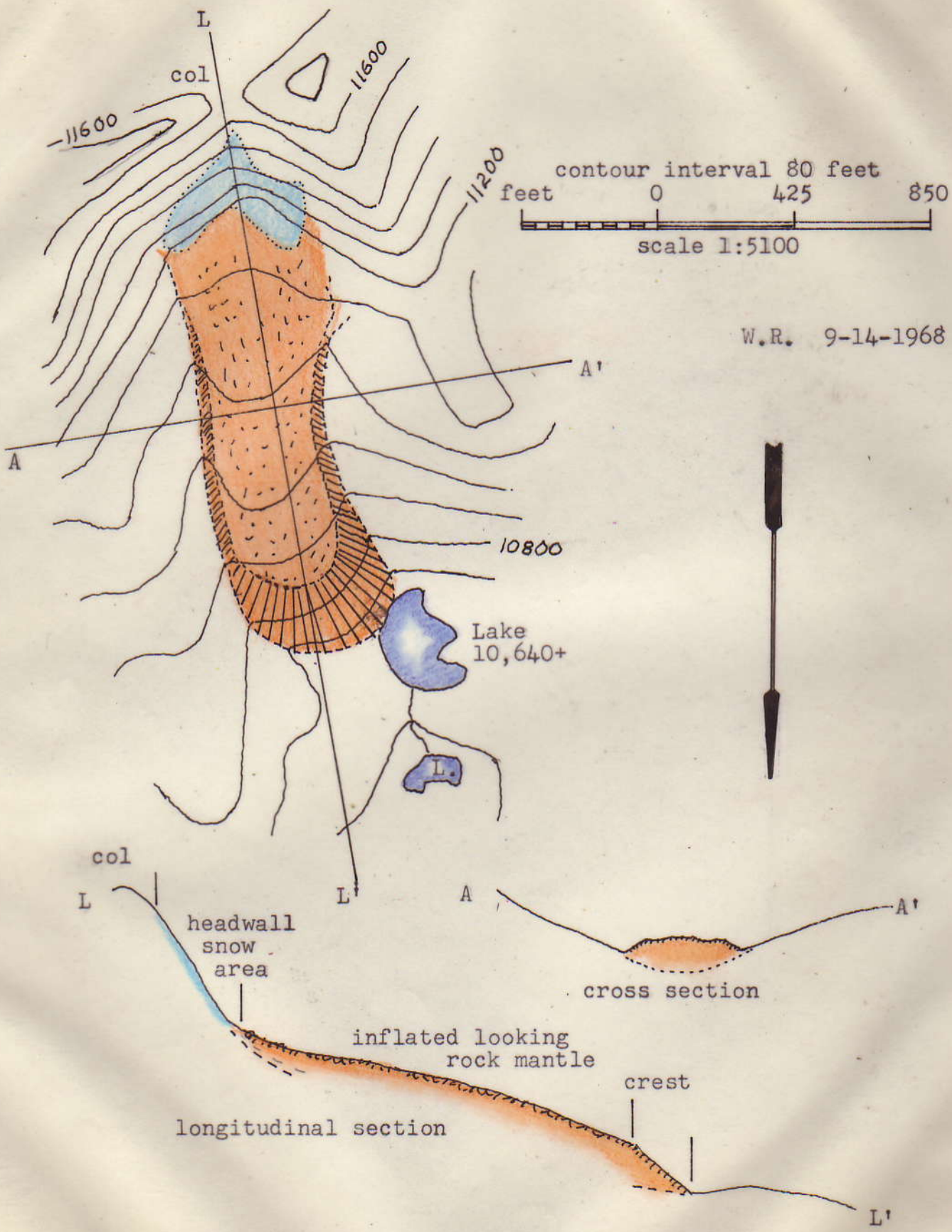


* MN

THE HEADWATERS OF LAUREL CREEK
Kern Peak 15' quad., Calif.
scale 1:18000

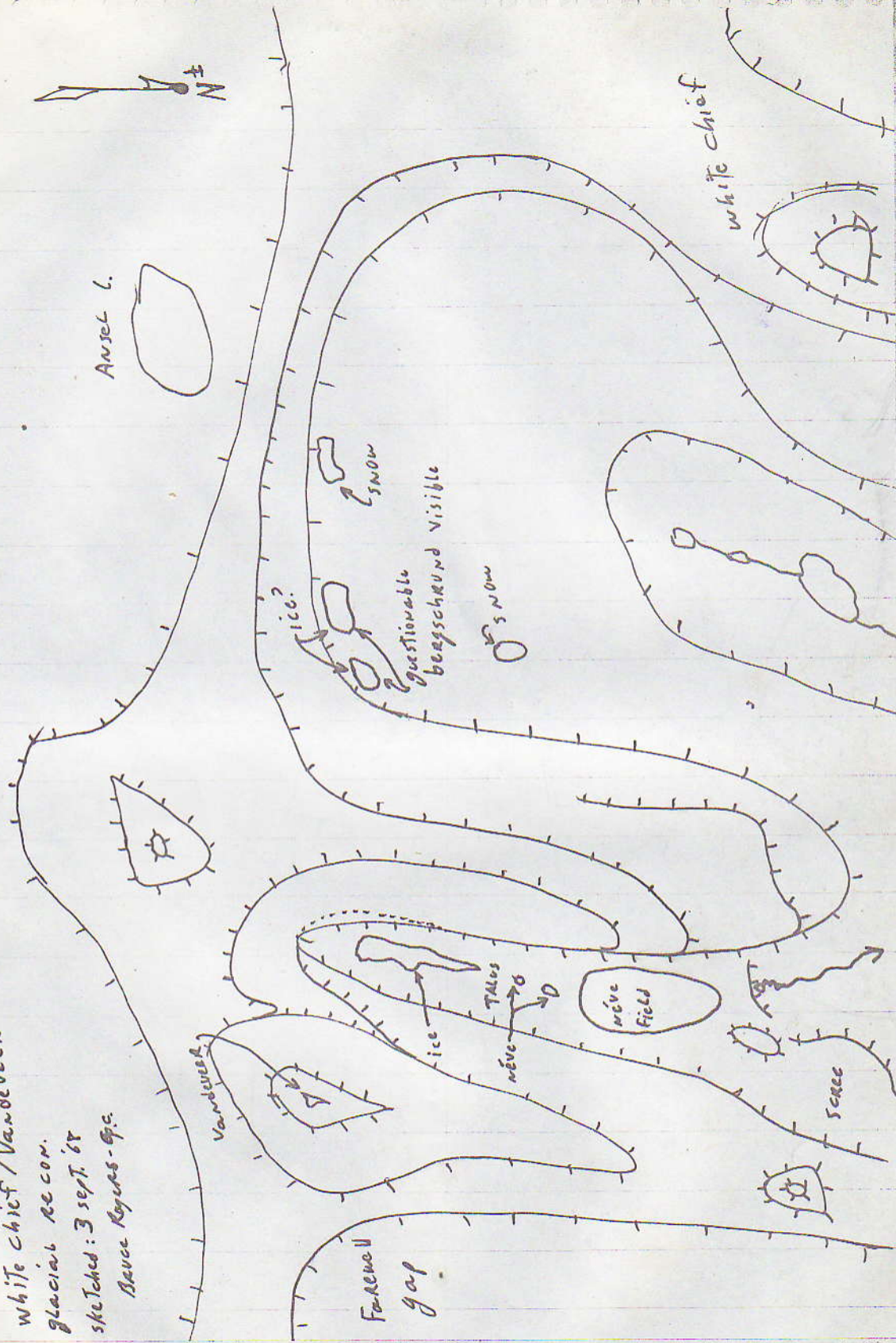
feet 0 1 2 3000
contour interval 400 ft.

Glacial features plotted from aerial photographs taken and completed by 7--19--64. Various photogrammetric methods. USGS topographic base, 1956. W.R. 1964

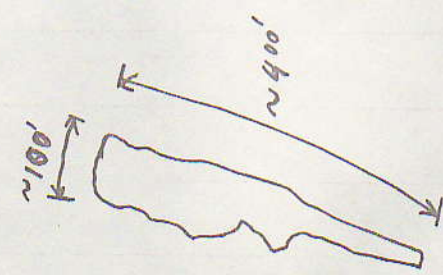
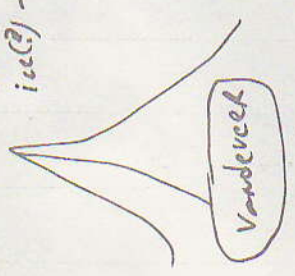
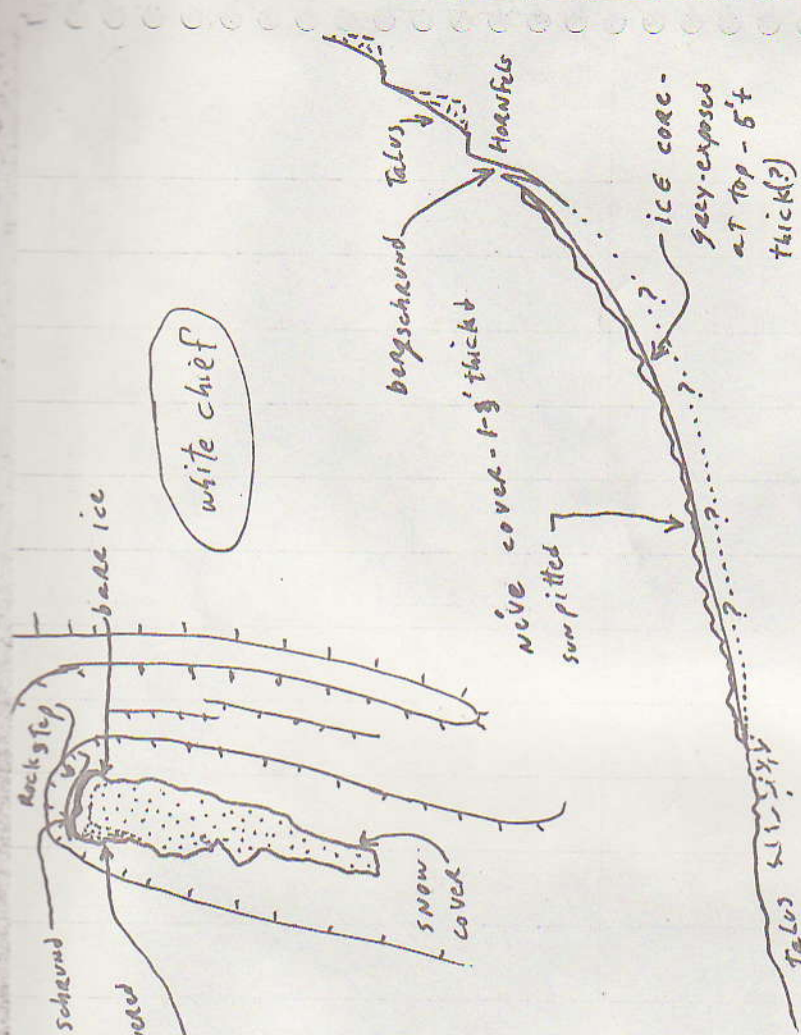


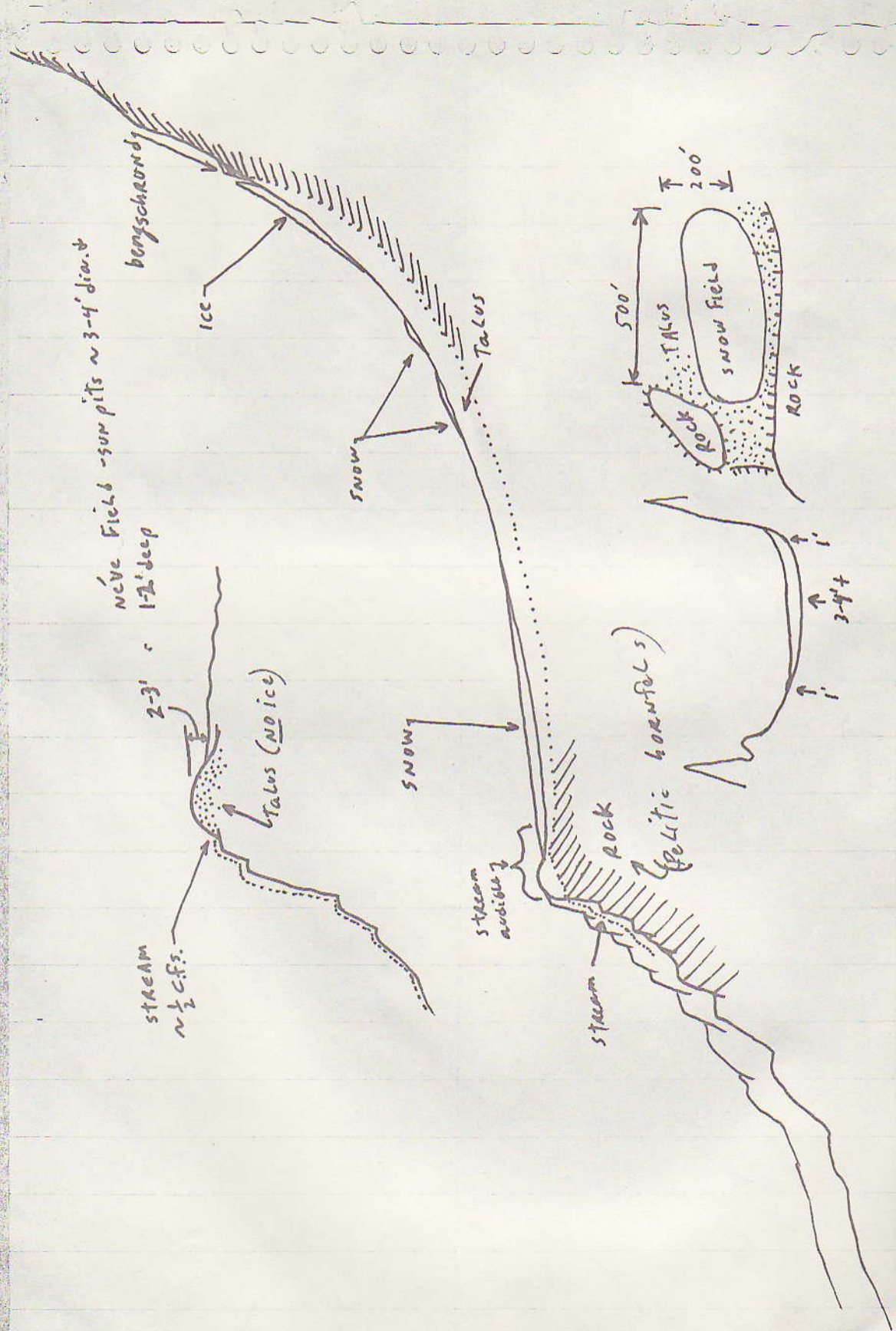
GLACIAL FEATURE, HEADWATERS OF LAUREL CREEK
Kern Peak 15' quad., Calif.

White Chief / Vandaveer
 glacial recon.
 sketched: 3 sept. 68
 Bruce Rogers - G.C.



BRUCE ROGERS report on the Mineral King area permanent snow, firn, or ice. 9-11-68
 Mineral King 15' quad., Calif.





Sawtooth Peak across Columnine Lake, Mineeal King 15' quad., Calif.

Notice: "Mini-glacierette," end moraine with waterfall descending into two forks. This is the source of Cliff Creek.

Aug. 6, 1972

J. Nakata, photo



Telephoto view of the ice, with moraine and waterfall on
the east side of Sawtooth Peak, Mineral King 15' quad.

J. Nakata, Aug 6, 1972

