

Dear Sir:

This office has recently been interested in and cooperating with the Bureau of Agricultural Engineering, Division of Irrigation, in organizing a national system of snow surveys for forecasting flow of streams.

In this connection Dr. ~~xxxx~~ J.E. Church accompanied by Carl Elges this summer made an extensive trip thruout the western states studying watershed problems. On this trip ~~xxxxxxKxxxxxxKxxxxxxKxxxxxxKxxxxxx~~ discussion was had with many Forest Service men on the problems of establishing snow surveys in their districts. In the past the Forest Service has rendered important service to the snow surveys. In the Humboldt Basin in Nevada the ~~xxxxxxKxxxxxxKxxxxxx~~ taking of snow surveys is in charge of the Forest Service.

We find it increasingly important to keep in touch with the Forest Service in our work, and for that reason, also because members of the personnel have been moved about within the last few years, we are anxious to have an up to date mailing list. Could you then send us a list of the men under your supervision in your ~~xxxxxxx~~ Region?

A complete list of Forest Service personnel is not issued from Washington. We shall be greatly obliged if you will assist us in making up our own.

Yours very truly,

Emily Richards, Assistant
Department of Meteorology

J. E. Church
Meteorologist In Charge

[Handwritten notes and scribbles at the bottom of the page, including a large bracket and some illegible text.]

- Circuit Trip -
To Study Western Water Sheds
No. 1

Stenographic Notes

No.

DATE

From Reed - June 21 1935

To Grand Canyon, July 22 1935

No. G426

Resolyn Hotel
Nine in Sleep

Friday June 21 - To Mono Inn.

Out at noon.

On road 9:30 am, 60 mi. per hour.

Snow in canyons. Palms far to west
of them in desert as rare as a dodo

Carson Basin

Perfect site for meteor station on
East Carson in canyon at head of Carson Valley.

Trees fleecy. Much cypress. Pines also,
much live fir trees in canyons.

Walker Basin

Topaz here within 4 feet or less of top
and rising.

Antelope Valley near Topaz ^{on E. Walker} like Big Meadows
and Gunnison Basin, Colo. Here grass in
water-soaked meadows. But alfalfa farther
up the valley. [Too much water kills
alfalfa. Hillsides green. Cattle contented.

Road everywhere traversable at 55-60 miles

West ~~Carson~~ ^{Walker} bank full and muddy.

[Later: George Lewis says that the sand
comes from only one branch of West Walker.
Others clear.] Several fishermen.

Snow $2\frac{1}{2}$ times that in Truckee Basin,
Walker Basin higher. Max. flow later.

Roads. Old and new lines old Roman
and modern roads in the alps; the first

steep and narrow, the second broad and gradual. Straighter also. Sonora Road still closed by "Sunset".

Fales Hot Springs, Rock Gates as usual but better road.

Martin Meadows all dark green. Buckypass?

Big Meadows

Cattle as thick as mosquitoes on meadows. Meadowgrass too coarse. Water everywhere. abundant. Attractive toms

"Fullon at home" but missed the place.

Old scenes of 1895 on Virginia Creek.

→ Snow more widespread than farther north.

Site for snow course in ^{open} forest north of Mono Grade Summit and up slope West. This Conway Pass is 8138 Ft.

Mono Lake.

Mono! Grandeur, colors, blues.

Volcanic landscape - a Pyramid lake but with meadow fringe. Tioga Lodge is a fine lookout. Lake level fairly high. 12:20pm!

Noon. June 21 -

Sped by Marco Jim. to Tioga Lodge.

On time but back 1:30. Hunting for Lewis. Jimmie Jones and Lewis both waiting. Easily expected. Visit by her promised, as today, a bog of large impressive *scopolia*.

More must dry up. Evap. 5 ft. all water to be trapped by Los Angeles. 4 mile tunnel. See it now. It will soon be an Owens Lake. a chemical flat. Too high a price for city water. Venture plane with movable bottom.

Rain and snow gage combined. 8 in. faucet in the bottom.

Circuit trip to June, Grant, etc. down.

To both ends of tunnel. Triangulation.

Stream gaging ideal and complete.

Down Owens - Long Valley (Owens size of little Truckee). Valley to become narrower. Tunnel out for power. Construction camps everywhere.

Over Sherman's Pass into Round Valley. Tamalpais curves. Deep ganges for both Owens and Rock Creek.

→ Supper at Bishop. Met Joe Mc Iver.

Independence at 70. A man but sleeping right.

June 22 - Bear & Bishop.

A valley in transition from foliage to desert. Farms abandoned for towns. Long descent drives to the highlands.

The Sierra is being made the recreation background of Los Angeles. Except for towns all life is being transferred above water diversions.

The towns are green and growing from the rural oldtime stage to the modern. Tourist and employe towns.

Roads broad and paved. Reach far up the side canyons.

The Los Angeles system like a panorama. The long stream, the intake, pumping wells, weather stations, maintenance headquarters.

The high Inyo becoming the towering White Mts. Canyon between them "the spot where God finished one day's work and forgot to continue the name where he resumed his task."

Up to Sabrina (North Lake) and then to South Lake to study site for a crest station. latter 9500 feet. Fairly wide the throat of the glacial

Aguaeduct showing
22700 ft. from valley.

circue. So wind direction should not be merely up & down the canyon. Horses all ready. A joint was could be hired.

Beautiful power plants. Trees, parks, lawns. Southern Sierras Power Co.

Built for Tompat days. Can scarcely compete for Imperial Valley trade against Hoover Dam power.

air 95° driving home. A volcanic landscape above granite. Craters, reefs, pumice. In the Basin mountains white with volcanic ash.

Can go thru Death Valley. Should be at Dante's View

Independence. Harsh coldness amid farms. Climate opposite that of lava bustles.

Afternoon at Agueduct Headquarters with Lewis. on methods, problems, and equipment.

→ 1. Forecasting of Underground Water Supplies.

Came same for varying depths below surface except in lower row of wells - there is a chance for research in pumping.

Why does water fail to rise higher than 15 feet below surface? Reef to raise it

but not high enough to raise it higher?
Wells below aqueduct?

→ Lewis would like to consider transfer to
Division of Irrigation.

2. Aqueduct a large, self-contained system
Problem of cooperation. Men all in binding
routine. Could not substitute gage readers
be used for house men when latter are out
on snow surveying?

3. Snowshoe improvements - holding frame,
leather shoes, tamping boards for tamping snow
from tubes, 3 ft. sections in canvas bag,
neck strap for spring balance staff, which
was felt to be too inconvenient.

→ Driving wrench and cleaning hooks as
made by Frige too heavy.

Driving wrench a necessity. Their rule:
"Take it when snow is more than 10 feet
deep" - "Tube has frozen down".

4. Their reversible snow can to catch snow



or turn upside down to cut section should
have a seal of inches on the outside.

Dinner at Lewis'.

Charming. Hated to see dinner removed,

Humming bird pictures world-wide published. Observations seen and well told in Nature Magazine - Send me a copy.

Mother bird ties little ones in to give them "ground flying" without falling out.
"They can not rise from the ground".

Nest on a swinging electric light bulb as I noticed on the entrance globe at the Sparks High School. 18 years, but a new occupant this year. Did the young remember to return?

→ Has taken more of snow surveying. He must have this in Reno,

Hunter, fisherman - both, ^{with a charming little girl,} go to Idaho for big game. Goat and bear skins on walls and floor. Large and thick. Very large goat skin (goat 200 lbs).

Has second best mountain goat picture made.

"Good Night." Will come for rescue if we fail to call up on our arrival across Death Valley. Cool tonight. Conditioned air. Conditioned water?

June 23.

up at 3 a. m. Mountains silhouetted.
Moon overhead but dim. The ~~of~~ aqueduct. Cool.

Long Pine. Quaint but modern. Break again
in the desert. My old guide up Mt Whitney
in 1906 (?), G. F. March, is in England celebrating
the King's Silver Jubilee. So I'll not call the
boys at this early hour. "He always out and never sleep."
So breakfast here.

Mount Whitney a picture three lumbardly
talls trimmed high. A new idea, Lewis is
a Teton Mountains man come south.

On Highway to Death Valley -

Is there a road thru Clancha Pass?
One cuts high across the face of the Sierra,

Owens Lake - Turn from better road and better
highway. Railway to Inyo.

The Owens is flowing 1 sec. ft. (?) Cooled
by those wells? or underground water?

Wheeler mine. Owens Lake is a
Humboldt Sink - Chemical perfumes, volcanic

The Inyo Mts a chocolate pattern, the
Sierra a flesh of red chocolate, but
canvases hued above,

Keeler - "Sierra Talk", "Sierra Snow",
"Sierra Cloud." a chemical landscape. Not
a tree.

Road paved but even rougher. Keeping, rolling at 40 mi. per hour. A vertical sided road, one car wide, as if made with a snow shovel. Turn where even a jackrabbit or a burro would have to put on brakes.

The sun! Air cool. Darning, sun hat torn.

Now the Panamints.

Down, down into Petra. Dark rocks, desert foliage, cactus,

Hard earth washed at high. Greens! rocks, lichens, plants. What a place for a cloud burst.

"Water →" sign. Did our ancestors come this way?

Far below a hazy depression - down, down. Then across and up.

Yellow barrels of water "Four radiators only". Surely need it.

Colours, but probably not as vivid as Valley of Fire.

Finally over the Panamints - up - then down into Death Valley Monument. "Don't pick foliage".

Stone Pipe Wells.

Might be Nevada. 96°F in shade. Feels cool. "Heavy mind last night, Sandstone".

"Cooler but hazy". This is Reno Hot Springs without the pool. Spanish bance type.

"Temperature will rise in shade in August to 150°F." Scotty's is 30 miles to north.

Passed one car out this morning.

"about 3 Tourist cars daily". "Still some fatalities. Even a new tire burst with heat and a half-hour work in the sun is too much".

Devil's Golf Course below us. Mountain walls all of rock. "Below sealand".

"Gusnie's Playground". Date farms by Borax Company. Mesquite green and fluffy.

Fouace Creek Dam. a cliff dwelling with sunken gardens, terraces, pool, runnels of water. Paving stone makes as at Tubal. An Italian Parents but looking over a misty valley.

In Death Valley lies Halman Hunt's Scapegoat picture. It is the Dead Sea without water.

Up thru the Federal Range.

Highway used by borax teams. Now a 50 mile high gear surfaced road. Eason now writing on it at 50 mi. Notice the evenness of this script.

Rough but easy to Dante's View, 5160 Ft. (9:40 a.m.). Directly below is lowest spot of Death Valley (-280 Ft.)

Looks like a basin of slowly drying water.

charged with chemicals, white, then brown,
then red. Far to reach the date farm.

We rest on the tip of the Funeral Range.
Over against us the Panamints, the $\frac{3}{4}$ moon
half down in the western sky. Basking
in the sun on a chair with feet on fence,
one fly our sole company. Above our peak of
hill is the sentry or outlook house. Auto road
circles around it as a Columbia River
Highway. Pleasant breeze 100°F. ? I like it.

→ What a chance today to study alluvial fans
like these in Elko valley.

I sit and sleep as on Mount Rose. Back home
again.

From South Dante Lookout. We see on the rim
as it were of a great crater which almost
undermines our outlook. Heat and the colors
of heat. Rocks baked black and brown and red.
Cactus, lizards, plants, some blossoms. 5 dead
matches.

Los Angeles can not use this as a water
source. Nature will keep her adjustment. I will
linger here.

a "Rest Room" of sheet iron down the slope.
I prefer to rest here. What a trim and crude use.
It will soon follow the way of toilet. [Later it
has. At Grand Canyon I find "Comfort Room"].

a black floor hastening below. Must be an auto
on Death Valley floor.

Charleston Peak 12,910 Ft. NW of Las Vegas appears
to southeast. Hager obacines Mt Whitney 14,496 Ft.

June 23-

Rewritten on preceding pages.

Up at 3:00 a.m.

Quit ←

Road thru Alameda Pass?

Turn from better secondary highway,
railway to Inyo -

Washed mine - Owens on Northside
Sierra. Chemical perfumes. Volcanic
Inyo chocolate petunias. Sierra a
flush of red chocolate. Canoes lined
above.

Keeler "Sierra Tale" Sierra Snow,
Sierra Cloud. Mount Haimes.
Nowhere around soda plants,
Not a tree.

Road paved but very rough
keeping rolling at 40 mi

Vertical sided road - one car
width, as if made with snow shovel.

The sun, air cool.

Barwin - Now the Panamints

Down, down into Oira,

Dark rocks, desert foliage, cactus

Tall chimneys & sec. g.
These make 2
upings in the g.

Turn when a 'sawtooth'
of mountains would be
if you were on

June 23-

Rewritten on preceding pages.

Up at 3:00 a.m.

Quit

Road then

Takes for

freeway

Washed

Sink -

Lyons

flush
above.

Keeler

Serra

Norstar

Hot a

Road

Dance the Grand Canyon

Lewis R. Freeman

Dodd, Head

\$3.00

Through the Grand Canyon
from Wyoming to Mexico

Edmund L. Kell

\$5.00

Hercules

The Colorado River

Lewis R. Freeman

Dodd, Head

\$5.00

The Scenic West

William Myall

\$3.00

Streetport

Full blooms & acc.?
Thick walls
uplym...
Turn when a few...
of...
to put on...
Keaping...
Vertical sided road - no car
side, so if made with snow shovel.
The sun, it's cool,
Now in - Now the Panaminto
Down, down into...
Dark rocks, desert foliage, cactus

Keaping...
Vertical sided road - no car
side, so if made with snow shovel.

The sun, it's cool,

Now in - Now the Panaminto

Down, down into...

Dark rocks, desert foliage, cactus

June 23-

Up at 3:00 a.m.

Re-written on preceding pages.

Good then slow

Turn for through our backroom
Southwest

Wardle #3" - Agnes C. East
McBirds

The land of Little Rain

#3" Mary Austin
Haughton, Wiffelin

The lands of the Sun

#3" Mary Austin
Haughton, Wiffelin

First through the
Grand Canyon

#2" Major J.W. Powell
Macmillan

Vertical sided road - one car
width, so if made with snow shovel.

The sun, its cool,

Parwin - Not the Panamints

Down, down into Petra,

Dark rocks, desert foliage, cactus

Quit ←

Tell them I see
those mules
working in
the canyon

Turn when a
mountain
is seen
to the
right

highway,
Horisfeldt
Liconic
was a
as head
Dunbar
to,
her

June 23 -

Up at 3:00 a.m.

Re-written on preceding pages.

Road there ... Pass?

Turn for

railway to

Marble

Sink

Traps

flush
above.

Keels

Sieve

Novels

Mat a

Box

Keaps

The Grand Canyon Highway,
and Other Passes

\$1.50 Henry Van Dyke
Scribner

The Grand Canyon
of the Colorado
\$2.50 John C. Van Dyke
Scribner

Vertical road - one car
wide. w/ made with snow shovel.

The sun, air cool.

Narrow - Not the Panamint

Down, down into Alta.

Dark rocks, desert foliage, cactus

Quit

Tell Alvares I see
these make
highway in
1902

Turn when a 'sawtooth'
or some hump would have
a flat on top.

June 23-

Up at 3:00 a.m.

Rewritten on preceding pages.

Quit

Road thru

Town of
railway

Marble

Sink -

Drops

flush

above.

Keeler

Sierra

Novato

Next a

Road

Canyon Shadows
 #2: Lane Ellsacker
 Paean.
 Times-Mirror Press
 in Angeles

Roaming the Rockies
 #3: John T. Ford
 Farrar & Rinehart

The Flaming Sink
 Songs of the Desert
 Riverside
 Ruby de Cansaw Calcan
 By another
 Sunset Canyon Country Club
 Auburn, California

Tall shadows
 there will be
 high ground in the

Tam when a secret
 of sunburn would have
 a put on trousers

keeping road at 40 mi

Vertical sided road - one car
 side. w/ made with snow shovel.

The sun, its cool,

Down in - Not the Panamints

Down, down into Ojai,

Dark rocks, desert foliage, cactus

Here much withered at her side,
Bulrushes - - so dry, lichens, plants,
what a place for a closed boat.

"Waltham" sign

Did any ancestors come this way -

Walt

Far below a hazy idyllic scene,
Down then across and up - -

Yellow barrels of water. "For radiators only"
Surely need it.

Below - but probably not so vivid as
Valley of Fire.

Over Dryan - up - then down into
North Valley Monument - "Plant pickings".

Stone Pipe Wells

Night in Nevada, 96 in shade. Falls
cool / Heavy mist last night. Sand storm.
Cooler but hazy - In Reno Hot Springs
without the pool; Special house type.

Temp. will rise in shade in Aug. to 150°F.

Scotty's 30 odd miles to Washoe.

Passed one car at this morning - "about
Stammin' cars daily".

"I'll come fatalities - Even new tires burst with
heat and a half hour over in sun is too much."
Devils golf course below us, Mountain wells

Bussard's Playground

Date Farm by Borax Co. Merquite-green
Tumasee Creek Inn - Keeper in ^{pluffy}
helmet, tan, white shorts, and
ankle socks. Ice cream.

Tumasee Creek Inn a cliff dwelling
with sunken gardens, terraces,
pool, tunnels of water - Paving stones & lava
line tables, a Saracoto but looking
over a misty valley.

In Death Valley lies Helman Herate
Cape East picture. It is the Dead Sea
with wet water.

Up thru the Funeral Range -
Highway used by Borax trains now
a 50 mi. high gear surfaced road.
Even now writing on it at 50 mi. Notice
the evenness of this script.

Rough to easy to parties view 5160 ft. (9:40 am)
Directly below is lowest spot of Death Valley (-280').
Lower line a basin of cloudy drying water,
charged with chemicals. White, then brown, then red -
far to north the Date Farm. We rest on the
tip of the Funeral Range. Area against us the
Panamints, the 3/4 moon half up in the western
sky. Basking in the sun on a chair with feet
on fence & face on peak of hill in the setting of
outlook house. Auto road circles around it as
an Columbia River highway. Pleasant breeze 100° F?
I like it.

What a chance today to study alluvial forms -
live ~~also~~ valley.

Bussard's Playground

Bussard's

I eat and sleep as on Mt. Rose. Back home again.

From South Point descent. - We are on rim as if were of great crater which almost undermines our outlook. Heat and the colors of heat. Rocks baked black and brown, and red.

Cacti, ligands, plants, some flowers. Fine weather

Los Angeles cannot see this as a water source. Nature will keep her adjustment. I will linger here.

A hot room of white iron down the slope. I prefer to rest here, what a town and scrub me. It will come follow the way of toilet.

A black flea hastening below. Must be an ant and North Valley floor.

Spring

Charleston Peak 12,910ft ^{NNW} near Las Vegas To Sinking
page elsewhere Mt. Whitney (14,496ft)

Trades easy. By Noon to Amargosa Hotel.

Along Barax Road. 60 mi. perhaps. Too fast.

"No hurry" at Great Valley junction. a great Spanish hacienda. Hat, get a good place for a siesta. One man died this morning from sunstroke.

At Nevada state line, a straight oiled road 60 mi. seemed 30.

a mountain goat! Ah. Had to step lily across the roads on his way south to the Charleston Mountains.

Indian springs the only green for fifty miles. Then a grove of yucca (C). Soon ranch central each around an artesian well. and the widespread green town of Las Vegas (The Meadows).

The town and winking Charleston Range towers

Monday, June 24 -

Los Vegas a cool town. but almost in my
absence.

Kelly! Been waiting since yesterday. "Best job
on earth" Selling Boulder Dam to the people. With the
Tourist Bureau.

Saw everything. In conducted excursion to all
outlooks. Boat ride to face of dam. Met the young,
Reclamation engineer on project. Wants the second
survey. This estimate 80% ; mine 100% - 20% for
dyeing. Peak 105 ft. Water 250 ft deep. Can see
it rising. Reached upstream 75 miles

Out on dam in the evening. Then from 6-9 pm
with Kelly in the depths of the structure bed in
the turbine houses. Vast. Then the dam illuminated.

It is grander than Death Valley. The black canyon
and green water. The tiny figures below - tourist stay
structures dwarfed. The roar of the water from the
penstocks. 180 ton 30 ft tubes hanging in air. The
tiny men riding and guiding the great pulleys.

All grand, but the grandness lies in the
dream and the machine. It is not the product
but the means that are truly great.

And the artistry of the lines. Not modernistic
but every line graceful and representative of the
dimensions of the structure. Even the kiosks and
the patios at the memorial plaque.

Tonight a Telegram from Emily. Long be called
to Salt Lake for a conference with Ware and Clyde.

Then. June 25 -
a cool sleep (air conditioned) and breakfast with
Nelly and Bob Witter. Saw Basil Kehoe (on this here and
leg).

Took leave at 7 am. Following the river
on route suggested by Reclamation Engineer Young.
Taking every cross road. First to Nelson, then down

Have found thing about Boulder Dam is the miracle, says the Census.
Each improvement felt that he has built it. The night not chosen
for especially or efficiency but for making sure, and a further
chance to be certain of making it always. Kelly part of it. I would not stop
to mention it.

150 ft diameter Turbine and entire concrete dam 150 ft diameter.

a 20 mi. array. Local, high cactus. Natural assembly ground of cactus.

At Colorado an abandoned adobe mill, a Fort Churchill?

The river like the Sacramento - $\frac{1}{3}$ to $\frac{1}{2}$ mi. wide.

The roaring water (14000 cfs?) at dawn last night now a wide yellow-green heaving stream driving up the silt from the bottom, what a fine boat ride possible.

Some sand flats with some water-loving trees - but these are relatively insignificant. Water may percolate into the sandflats but at present stage doubtful.

^{Sandstone} Adobe bluffs, volcanic mountains with a close pattern of reefs with projecting edges. An ancient Hornsandy.

Long stretches of water, some green shores, intercepting mountain ranges. Now below the canyons.

Cool in this 2-foot strip of shadow behind wall of adobe hut; no, sandstone walls smoothly plastered within, but roofless.

Over a range via Nelson into Searchlight roads. Receipt town. Water from an old mining shaft.

Searchlight at 3500 - "Cold" pop. A. T. Maricopa.

Down 15 mi. to Aerial Ferry at 4000 ft.

Air hot as oven as at Palms, and strong.

Blowing from desert. ^{Another ruin - Non scriptum} once projected on the Colorado? Lined at Colorado. More like the Humboldt but larger. Flowing between low adobe bluffs. Young willow about 8 ft. high on flood banks.

Loss should be small. Valley bed opening gradually out.

table here. We must look further
downstream also. What an opportunity
and need for a boat trip from Boulder Dam
down to Yuma. Write Mr Young.

June 26 - Leaving Needles. ^{9 am.} Our host says that
his water-fan plan reduces the temp.
of his rooms 30 degrees. Feels it. The
town cafe even with fans was stifling.

Top of end of valley and throat of
next Canyon. The tules even here. Channel
 $\frac{1}{10}$ mi. wide. Santa Fe Ry crosses here.
No permits or Kin admitted. Both states
have the sign. Retort? a good gaging
point.

Over desert to Parker Dam Site.
Dam site is in a second "black canyon".
Work stopped except an aqueduct. Again
tunnels, but water is to be pumped
a total height of 700 feet. First stage is
a lift to a 3 or 4 mile tunnel thru
of rugged range.

Dam site much like Devilight Ferry
site. A narrow sand stream with
willows. Excavation now made on

both shores. Boys swimming in one large pool excavated on shore. Clean. But river water very muddy. Bed seems to furnish silt. Very yellow.

Shacks all along road. We are having lunch under a palm-thatched dancing floor with tall mesquite trees around the table. "Tunnel Cafe" in a big wash. Hence the large scrub.

The tunnel is 5 miles back in a range of mountains where two chimneys or monuments project.

The Arizona Navy was essential because there is no road up stream on Arizona side to Pan Site. Parker at the railroad is last point of approach.

Blythe - From Parker to Blythe riverbed covered with verdure - willows, athol, occasional cottonwoods. Many sloughs. Water table high. Water dispersion apparently great but less than in Needles - Topock Valley. Parker - Blythe section miles wide in places. Stream very shallow and much braided. With river controlled.

against flooded, there should be an immense area of bottom land to clear and till. Such has already happened.

In place of millers is alfalfa and various crops, especially around Blythe. Irrigation ditches traverse the Blythe section.

Blythe toward Los Angeles represents the line of the Municipal Aqueduct - Tunnels and high line works abound.

We cut across to Mecca to look down from a winding box sandstone canyon onto Salton Sea that stretched blue beyond sight. Then date palms, grapes - trunks - wind-eroded mountains. California - large in ideas and products.

Below sea level, then 1100 ft up -

No wander tunnels and "Tunnel Cafes" everywhere along the road. Banning, Beaumont, then a Beverly Hills canyon drive down into the Southern California agricultural plain to avenues lined with palms like some Kansas river. At dusk entered into a spot a little thicker with trees and houses -

Riverside. This the home and
the journey end of Colorado and Kansas
water.

Mrs. Seafield not here - no phone to make
sure. Only two good auto camps.
Both full. So to Hotel Tetley - an
old fashioned but highly pedigreed hotel.
We have the honeymoon suite but the
ceilings were so high that despite the
art pictures Carl thought that he
was not getting his money's worth
(\$3.00 for two wide beds and a
room as large as a reception room)

June 27 - 5:15 am

Not air conditioned but cool. This
morning fog. Here they keep large window
screens to keep fog out - not glass.

To U.C. L.A. by 9:30 am. Los Angeles
not great but much repeated. Confusing.
a town that grew without being laid out.
But U.C.L.A. a wonderful expression of
romanesque with early church colors and
slender columns. Lawns, birds, flowers, rose
climbing over tiles of high roofs. Can not see

enough.

Mail from home, all well. Had not
been here. at home in Society House.

A.E.P. all fraternity houses harmonious with
kindness & joy to be here.

off at 7 - Navigating to A.

Receiving up old friends

All Chief - retired. Plainly older.

London talk. Old manuals - Conservation,
Tropical cycles. Arizona Navy.

Snuffer - May Sackerson.

The plague.

"plague two years"

arrangements. Handbills in one room, mirrors
in another. Hand on shering.

Mr. Capeland wrote the Colorado letters, and

Porter is Panter. Snow-Suey music
very much while. Dr. Krick of CIT my ideal
of the new mountain investigator. "How stretched out
his neck" given to Major Bowie. Ever seeks the
causes of things.

Precipitation and runoff papers - floods.

→ L. B. Society of Los Angeles Flood Control will send us
his papers. Valuable.

Herbert and Elizabeth spent evening with us.

a - another great finding in
before some the tunnel

enough.

Mail from home. all well. Had not
lucky beer. at home in Society House.

E. P. all fraternity houses harmonious with
university. Westwood also in keeping. joy to be here.

Meteorological meeting very helpful.

Lunchclub: Old chief present. Major Bowie devoted
friend. I was called upon to speak. Theme: The
Colorado, rivers, trade, Arizona Navy, conservation,
the river's end, happiness. Old chief aging now.
Jim quite at home. Carl seen again but
not assuming. Will be lived.

May came over. Devoted to Maryina but nice.

June 28-

The man and woman in house
arrangements. Handbooks in one room, mirrors
in another. Hand am shaving.

Mr. Capeland wrote the Colorado letters, and
Porter is Panter. Saw Susan music
very worth while. Dr. Knick of CIT my ideal
of the new weather investigator. "Has stretched out
his neck" plus to Major Bowie. Ever sees the
causes of things.

Precipitation and runoff papers - floods.

→ L. B. Lacey of Los Angeles Flood Control will send us
his paper. Valuable.

Herbert and Elizabeth spent evening with us.

a rather good study for
before down the tunnel steps

June 29 - To San Dimas -

Guided by Dr. Varney. A last visit to the campus. Met Dr. Arthur Patet McKinlay, Classics an Crepsonian - Harvard. As delicate as Hailgate and Rand. Delightful converse regarding drink among the ancients. A book on it ready if a publisher can be found. Then a run to the phone for a belated message to his wife.

A long drive to the San Gabriel watershed. To the lookout and down into the experimental areas. Must return. Ideal. Rainfall and runoff; vegetation and runoff; herb vegetation & assure most copious and timely runoff.

→ Found 2 Mt. Rose Samplers at headquarters.

Mr St. Clair in charge, Eager to meet me.

→ Suggested a comparative study of runoff from snow and rain. Will gladly undertake it.

Plans snow studies also in Sierra.

→ Wrenches and cleaning hooks of Fritz pattern too heavy.

Varney should be urged to go to Edinburgh. Likes life in Weather Bureau but prefers that broader college teaching.

Guided to Mac's by Mr. Dingenfield.

Out to the "ranch" for a 9 o'clock supper. A beautiful acre.

Mac leaving apartments and improving them.

Memo from W.W. McLaughlin to Church,
Aug. 7, 1935 to folder.

Weniger could rise to position as faculty at U.C.L.A. They want her to graduate here, but she will probably remain at Columbia. Left Sally for better opportunity at athletics.

June 30 - Sunday. To Forest Lawn and Santa Monica, L.A. a mixture of the old and the new. City center slowly moving southwest from the city hall. The new is gardens and Spanish-American architecture.

La Brea pits. So simple, yet the objects found in them.

at Forest Lawn too many ^{modern} Italian sculptures. They are unreck and exaggerated. But the chapels and the music and the wisdom in the Last Supper chapel. And the purpose and the best of the artist.

July 1 - All day at "Powers & Light."

Films can be taken to Reno, says Van Norman. Emily can come to Independence. Van could not at first understand the "roman" part, says Jimmie. How will be a joke on him.

Keep "Powers & Light" and "Water Supply" distinct. The first is interested in Colorado immediately. Hence Patterson - Painter, - Apeland. Van Norman - Phillips - James - Lewis interested now in How - Owen but in 10 years in the Colorado. Landette is construction man in power. So interested only as a pioneer.

Metropolitan Water District directed mainly by Reclamation officials. More conservative.

Think that R.S. office in Denver will make the forecasts. at least they hesitate to use bond funds for forecasts which will not be needed for 10 years. But will consider matter. Send literature to

Est. Davis Clark's NY address for May 1914.

Mr. Raymond, Chief Engineer -

Mr. Panther suggests that we visit Mr. Davis, Chief Engineer of Imperial District at Imperial and Gov. Mason at Phoenix. Emphasize fact finding feature of Cross Survey Committee. He may then refer us to Colorado River Commission or Calif. State Engineer. Also do not overemphasize large California. Make it cooperative wholly. Best idea.

Mr. Copeland lending me copies of reports etc. Topog. sheets not purchasable here.

To Jimmie Jones in the hills for coffee, Crown spirit and desolera. Name three lighted avocets.

In Yosemite. From leaves of C. H. Copeland and Jimmie Jones. Copeland part - everything he had in Yosemite for help from Emily. Topog. sheets \$5.00. Photo etc.

July 2 - "Italian Village". To eat. Unique. Expression attempt - by artist, cook, salesman.

Later: Not time for 7 course (he lunch. But stashed three. Spaghetti hanging like everglades more from servers spoon was alluring. The large reading room looked like the outside of a village with open cottage doors leading to eating booths.

Hollywood Bowl a good offset to Hollywood studios. Nat. unusual in itself but in what has been brought there. Steep slopes and windbreakers behind. Hills with Yucca, or candelas of the Lord before. 30,000 can now be seated. More shut in than Tarralpais mountain theatre. Near by the Pilgrimage Bowl, much smaller, with a heavy cross above.

Griffiths Park Planetarium - no time to ascend.

To San Marino (Ethel Clark's guidance) - The Huntington Art Gallery a perfect Roman villa

Stop signals in L.A. Certain cars in many - but the colors are even every time. "Stop" always takes you over and another choice at the intersection. In copying out on Millburn - saw the signals in time with the traffic.

in architecture, gardens, and even over wide rolling landscape. Only the stiff formality of the Roman garden yielded somewhat to the English garden type. Wonderful palms, cacti and lotus. Bamboo, waterlilies, frequent. Renaissance architecture seems fitting.

Of pictures Reynolds's Mrs Siddons, Gainsborough's Blue Boy, Raeburn's youth, and Lannuca's Peirce far the best. Pictures by Romney (many), Hogarth, Wilson, Moreland. Landscape by Gainsborough, Coome, Constable. Mostly inferior. Most of the English lacked the supreme. Chromes? Tapestries & mill designs by Baucher.

Library. Prints, Italian and Flemish primitive seemed fundamental. Goldsmiths' efforts and dreams. Statues by Houdon, Pigalle.

Wish we could obtain an illustrated catalog.

at 5 pm, the lease of Ethel and Mae. Read from my diary to Ethel. "Fartunate the person who gets it." Mae will wait another year before urging Harjorie to come home.

→ ask Ethel to come to Tahoe in August. Plan for the Emanc in July.

Could not reach Anna Elam, George Taylor, M. Raymond Harrington. Must write them, also to A. P. McKisley re back and drink.

Whittier -

Evening with Herbert and Elizabeth Evans.

Help supper looking down upon the orchards - carpeted valley toward Pomona. Cool to coast. Then thru avocado groves to Whittier.

at Whittier College a summer school of Pacific Relations. Herbert very happy here.

argued again the permanent quality of U.C.L.A. architecture.

July 3 -

Talked till 10 am. at breakfast table of the visiting and teaching professor. His ideas have been stated or anticipated. MSS lie in the desk, he could still write the philosophy. But in the long run, credit does not matter.

San Juan Capistrano - a padre's school and church for the Indians. Rubble, sandstone, brick, adobe, stucco. A cathedral also, but shrouded down by earthquake.

30' x 60' of the attending congregation finished. Only the apse remains standing. Towers and domes are gone.

To the primitive room, the buildings must have reached massive and tall. The planning done credit to the two supervising padres.

Mission of San Luis Rey overboard.

Route along the sea gone into over the Tongue of the Pacific. Beaches almost continuous.

San Diego more than dreamed. a city set on hills around a long landlocked bay. a Harland for the navy.

Old Town - a remnant - buying ground - Rancho's Marriage Place - Cardwell's Auto Court high, peeling on the slope.

To Tijuana. Walked in because of detailed

Mr. Raymond Harvington
San Fernando

Home
Pomona
Whittier

Room 4, P. O. C. Administration Bldg.
for relief map of California and home office in L.A.

and concussions were blatant everywhere, even along the eaves of the formal buildings.

Gradually we were stung out. The art gallery was almost as good as the Huntington - Newells, Velasquez, Rubens, Teniers, early Rembrandt, Watter Ufer, "The Sacred Plague(?)". Like the one in AAC in Jerusalem.

The outdoor pipe organ by Sprackles, needed a finer organist (?). The food Bowl music was more pleasing. Fountains color paintings played in harmony to the music.

The food display was intricate and educational. Two matters were copied:

1. Maximal passes from the old to the new on a human bridge formed by those who labor in the three principal arts: Agriculture, Manufacture, Transportation.
2. The industrious application of insecta genius to the natural resources of the earth is the grand wave of prosperous civilization.

The evening sky, crescent moon, and the coolness joined in unison with the palms, the rich Spanish architecture, the air-filled music and the colored fountains, and created our final impression of the Exposition. Home at 10 pm.

July 5 - To Point Loma, the old Spanish light house, and along coast to La Jolla. La Jolla town beautiful with bathing and boat basin made by semicircular seat like wall toward the sea.

Ocean laboratory $\frac{1}{2}$ mi. north. Temp. at end of wharf is beyond breakers but the ocean there seems too local and too far inside the general coast. Suggest comparative temperatures at Point Loma, La Jolla, San Pedro, or Santa Catalina, and Pacific Grove. Despite temperature seas

San Diego University of the Holy Spirit and Municipal District exhibit garden and fountain. The idea about the

La Jolla

→

anything, it should be widespread.
The view from Point Loma was geographic
next to San Francisco.

To El Centro - 120 mi.

Left S.D. after 1 p.m. Had two conferences
by 6 p.m. Then Cleveland National Forest
in El Cajon Territory. Mountains and courses.
I seemed somatose. Caught Carl's head drooping
one at 5000 on curves.

He is remarkable. Only sensitive to heat as
well as cold. I seem indifferent: "The Lord
giveth and the Lord taketh away. Blessed be
the name of the Lord." But Carl wants some
choice in the matter. It really is hot
after the hills of San Diego.

A valley almost as impressive as the
Sacramento.

Generous help. El Centro: Fortlock, McIver, Trans.
Imperial Valley Irrig. District, formerly Sec. Colorado
River Commission. (Have upon reprints). Suggested I
go down west side of Colo to Gulf to see Tullis.

Harry Madhox, Imperial, Bns. Mgr. belonged to
Recl. Service but extremely helpful. Wants me to wait
for Mr. Dowd, Chief Eng. now in L. A. see back Monday
at latest. "Should see Frank Higley, who was in
charge of River Division for years, and can tell
all about river bottom, New with U.S. at Mexicali.

We should go down the river by boat but difficult or
can take speeder down the levee for 28 mi. Mexican roads
almost abandoned and grown up.

Supper. Then 8 mi. back to see New River.

Sunset: Laman horizon, crimson clouds
become blue and gray toward South. Outlines
of encircling hills.

New River town from the valley lies a
Grand Canyon - 100000 sq ft. of rising, towering

waters. Bridges now there. a stream
below to drain silt from fields and drain
irrigated lands. So Saltwater will maintain
its present level.

Other dry channels where Her River blindly
sought its way over the sand dunes. But
these are small.

Lucy. I'm a dummy in sense of direction
and re-identification of faces. Carl is expert.
He rarely makes a mistake even at night.
I am addressing the wrong person. Is it lack
of responsibility on my part? It's getting amusing.

"But it's hot - all night." the Carl had to admit
that he slept all night without once awaking.
Could be uncomfortable anyway. It really
was 70°F. and I slept under a blanket.

July 6. [Taking part of Sunday July 7 off to write notes.
More comfortable riding than ever in the presence
of a fan. With it you need to be awfully to keep cool.
On sand it seemed under 100°F but actually 105°F
or higher. Highest in 6 years 122°F. "Plentiful irrigation
and growing trees make the temperature comfortable
this year."

Mr Maddux has mailed his position. By 8 am
had arranged a day trip down the loaves.

So to Yuma. No mail. Then to Andrade at
head of International Canal.



On way passed thru sand dunes and
driets. A plain road undermined by ceaseless

erosion. Lashed fury compressed with high ramparted surfaced road. Taming alone dunes were the arms of giant derricks industriously shoveling the all American canal. These the dunes. Here Barbara North stay ^{back}.

At Andacapa, Mr McFarland waiting. Two guests Mr Noble and Mr Horn of Reclamation Service studying silt. A canopied lorry waiting for us with a speaker to tow us.

Admitted into Mexico and out again by a customs official who unlocked a gate across the Reclamation Railroad. Mr McF. had paid the - pesos entry dues and given us lunches.

28 miles along river bottom the boxes that grew over roadbed and clogged wheels and broke dead brakes about our ears. Rock cones. No river could break them. Here went \$4000 000 profits of Imperial Valley.

Saw scene of break in 1905. The old canal had silted up . So where the canal approached  a bend of the river, a new intake was made. But it was washed out under flood and the river went the safest way down hill, that is sideways in Salton Sink (below scrubbed) instead of continuing down to the Gulf. So the continuing struggle: rising fans of the delta and rising levees. Now a rock

A long line of progress from the canal down the path from the canal.

"Ride & Blow" an 5m dips about 100 ft for some 100

improvement and two small levees with
dikes in one mark the spot.

→ Must get a map of levees and river
meanders from Mr. McFarland, Andrade.

Saw river only twice. Plans and river
do not agree. One levee was made
to cut off a fertile bend of the river
and massive siphons over the levee were
installed to suck part of the river over
into its old channel for irrigation purposes.
~~But~~ the river itself received a new-dug
channel for several miles but was then
left to finish the job. Instead it took
possession of a canal which it still uses
and has left the siphons dry. It
could be coaxed back if the Colorado River
Development Company had the heart, after
this first heavy loss.

Car finally jumped the track. A wheel
became semi-detached, I walked on
ahead to scout. A fire had burned out
some trees.

I felt young and zestful again. Back
to the primitive. The cotton landscape gone
way to river bottom with saltbush (leaves like
low tamarisk) and bamboo in tule guisa.

Homes of thatch (roof and sides). Some horses, cattle, chickens, goats. The depression could not have touched them. Only complex life is sensitive financially.

Lunch for 5. A boy was extra. Came along as helper for the trip. He skipped mine after slight coaxing. "He would ~~not~~ be hungry" but 5 eaters was depressing. I got him even to explode the sack.

→ Vegetation and Water Forces.

Mr Hoem and Mr Carliso(?) (it sounded like Ted) had boated down the Colorado from Boulder Dam (?) to Yuma to study soil and silt. Some sharp banks, flats, bars were encountered with vegetation quite like that below Yuma.

Possibly our tules are rather bamboo shoots. The same salt shrub or bush prevailed. It looks like arhal or tamarisk but is far more water-loving. Hana is

→ research problem. Compare water use by tules and by bamboo. The salt bush does not seem so wasteful of water. Leaves are smaller than those of willow - more fringe like.

also compares meas. by U.S.G.S. about 20 miles above Laguna (Lake Project) Dam at site (?) of Old American Canal Intake and at Yuma. Several hundred feet

loss thinks Mr Noble, but his measurements
are only merely. Ask Tussor office for
measurements.

1000 sqft less, said Mr Young from
Boulder Dam by Yuma. Research problem
here.

To Gulf - 80 miles by road.
and far from river. Mexican roads
often more to tatarum powder a foot
deep. "Two cars should travel together.
One way about 4 hrs".

Down streams by boat now impossible.
Even in high water, you wade sometimes
at bars. Now even a canvas boat must
be maneuvered and silt seems hip deep.

Montgomery, Electrician and guide
suggested that Major Crosby with
construction company might take us.
"What a novelty to be forced down in
Mexico". But Mr McFarland said
that Mexico was very sensitive
about flying over her territory and
permission must be sought from
Mexico City. Thus faded another dream
for Sunday.

To think that steamboats once docked at

Yuma. Changing climate. Mark Twain
steamboats. Mr. Noble says that he has seen
old pictures of it.

The Intake. The last chance down the
river. Built partly on and in sandstone
but one end rests on piles. The gate that
washed out was further down in silt and
sand.

Flash boards in small apertures raised
and lowered by cheap Mexican labor. Very
laborious. Planks weigh 70 lbs.

a track along the top to carry a dredger
to pick up floats when closing the gates.

Water opaque, yet silt samples indicate
only $\frac{1}{2}$ of 1 percent silt. Some sand trouble
due possibly to closed rivers maintained
last season. But this sand seems to
accumulate far down the ditches in
Imperial Valley.

Now comparing deeps and shallow drafts
from river and amount of silt pour each.
for use in planning all American Dam.

Two suction dredges in the river almost
as large as Mississippi River steamboats
with huge ^{discharge} pipes on flatboats leading to
outtakes high up an Arizona bank.

Cost cost \$300,000. Electric power bill
for one dredge (the larger) was \$3000 a month,
yet the cost per cu yard was only 4 cents.

Dredge itself is situated on a dredge-
filled town site.

Water sometimes colored red from the little Colorado. The water
water flows over falls of red cliffs. Minor it.

→ Mr Mc Farland was given a small set of
reprints and provided us a graph of Colorado River
flow for 1934 and 1935. A most genial host.

Exercise - felt the best and most energetic this year.
Hand seats, bumping, rocking, swaying, dodging benches,
walking is man's only defense against the kneecapping
of cushioned cars. Massaging internal, external.
Even the seats of our pants. Once were the
great granddaughters of the West.

The Two Canals: Much grief from the International
Canal. Import duty charged on train loads of
rock used to make levees. Agreed rates for
water service arbitrarily cut by Mexican Government
to one-third.

So all American canal being cut in the
rocks in order to get sufficient elevation
ward of the Border. This canal will connect
across the south side of Imperial Valley with
the present diversion or distribution systems.

On a small ridge above the present intake
a power plant will be installed to be fed
from the new and higher canal. 2500 sec. feet.
will be released. This can be returned
to the Colorado thru the present old Intake
or let go down the old canal.

If the old canal is continued, Mexico
will be forced to pay plenty for its use
in return for past grief. Mexico may attempt
to make a new intake, which will be
difficult or may use the siphons already
in place down stream. The system can not

15000 sec. feet
by Imp. Dam and Canal.

be abandoned.

The present flow in the old canal is 5400 sec. feet. So the releasing of 2500 sec. feet back to the river when the new power plant would seem to maintain Mexico's present use of the river, for it leaves practically one-half of the canal flow to Mexico.

Sands. Had we known, we could have followed the All American canal excavations from Andrade to the shoals, by a gravelled road. But an attempt was an afterthought as we drove back to El Centro. So we drove directly across the sand dunes ^{toward} the swinging arms along the road marked for employees. Fast we traversed the winding path thru the dunes until Carl became doubtful. Then we trudged our feet up a high ridge that seemed firm to look down. It sank us more than ankle deep, for it was the soft bank of the canal.

Carl came on - pennies of silt loaded with silt. His field work was just beginning. A tremendous (it seemed) stream bed lay below us with dominating dredgers

dragging huge loads by drag lines to the top. Little dredge was clearing their path. Thus the Colorado would penetrate the rim into the valley. It seemed that sand enough could never be filled such a ditch. Windbreaks, piling the banks or dredges would master the dunes.

Like Mark Twain on Vesuvius, we skated down the decline. But one car was trapped. Desert brush was useless as mats. The car was too deep for the jack. I started for the main road. Carl suggested a "cat" he had sled in the cut. The sun was low. Our mouths were getting dry. A car stranded ahead of us showed the character of the road. Then we heard the "cat" coming rolling and throwing sand. Two Valley employees came to rescue the other car. They had preempted the cat. Its operator was off duty.

We rode the rear bumper to the scene. The cars were dragged by a heavy cable

International canal will be maintained
in some form.

S.P. By transverse this section.

In fact railway from San Diego passes
thru Agua Calientes, thru thru Comitán(?)
wild canyon to El Centro. We must have
crossed it in Cleveland National Forest. Did
it tunnel beneath us?

(Border
affair) } Lost my temper. I live diffidence. On
way thru gate bisecting street of Calexico -
Mexicali to Mexico, an earnest diffident
little Mexican official glanced at our
license number and waved us ahead.
There was a notice to take fruit in under
seal for the U.S. was particular about fruit.
• Carl didn't stop and I didn't care.

On way back, we met the U.S.
officials consisting of American-Mexicans
bulky and presumptuous who confiscated
our oranges. I expostulated that they were
grown in California and had been
passed by Arizona Answer: "You are
no longer dealing with states. You're up
against the Government. Barrier against
infested Mexico."

The Mexican use of palm or other that they measure the vertical
solution of the heat problem. It keeps out the sun, it lets in
the breeze. Of course it lets in the bugs. But he would not be
pinning a mosquito without a knife.

I didn't lose inflated Americanism in a
foreign skin. So I flung a sack of banana
peels to join the oranges. Retort: "This
is not a garbage dump." Mine: "Eat
'em", meaning the oranges. But Carl
drove off while I had visions of detention,
12 miles to El Centro but it seemed only 3.
I was not asleep, only musing on those
oranges.

But we did stop to drink "all the lemonade
you can drink for 5¢" under a shelter of
palm thatch. Served by a little cheerful
American girl-mother who had a cleft palate
but a merry eye, and gave us a second
large glass. She was a good sport but
we were thirstier than the usual customer.
So another 10¢ was gladly paid.

Air-conditioning. Our restaurant has
varied only from 82° to 78°F. from day to night.
What more could one desire. The slogan
"Stop at the best. It costs no more" is not
altogether correct, for one wants to stop longer.

It does not pay to stop in rooms in
daytime. It is too hot. I just had to sweat and
sleep or sleep and sweat. They occurred at the
same time. Travel in a ventilated car seems
cooler.

July 8 - To Imperial at 8 am.

a long chat with Harry Maddux - He understand each other perfectly. "Imperial was not made, it grew. After 1898. First attempt was a land settlement plan in Sonoma. Then mutual water companies in Imperial. Finally a united plan. Struggle, idealism, grief, now slow uphill growth and contentment ahead.

The people: like Fellen, a farmer with neatly patched blue overalls. "Is this the place?" "yes, we collect here." "yes, I know you are like a graveyard. Take all you can get". And he pulled out some bills. "yes, I save a cent. I figured it a cent more". a laugh but a sad face at the struggle.

→ M.J. (Chief Engineer Imperial Irrigation District)

Mr. Dowd, a good and helpful listener.

"Have desperately needed the forecasts of stream flow in the past. Snow stakes, 3 men lost. Then they let ~~up~~ same. District has been involved in too many expenditures to favor additional expenditure now.

But of course, we must perfect methods. Summer rains also effective."

I suggested that \$20,000 annually would be a maximum amount with \$10,000

Road, Clark. I.V. Henderson managed in part by
Walter must have moved here the year of irrigation.
Water of California. Colorado
Water? Pay our own

Remembered and loved
Ries, P. L. butler -
"Superior is only a half-
million is from outside the
conurbation with 4,500."

divided 7 states and some power
and irrigation districts. But more
important, we wanted all units to
sit in on the cooperation regardless
of the financial contribution. He
heartily agreed to full consideration of
all future plans - "In 10 years we shall
need it".

Imp. Valley here
almost first right.
Have district, irrig.,
municipal water, power,
Yuma has much
from right.

→ Power men need forecasting now.
Irrigation and municipal authorities feel
lazy while the reservoir is filling. All
agree that ultimately everything possible
must be known.

→

The research problem is the relation
saving that can be made in water losses
by straightening the channel below Boulder Jam.

The reduced flow from 200,000 to 20,000
sec. feet may dry out much of the vegetation
and save water but the spreading of
20,000 sq ft over a 200,000 sq ft flood
plain will expose the water to thin
dissipation to sun and silt effects. Can
this be avoided

1. Is silt pervious or impervious? Must
say the latter is the truer? Can channel
be narrowed or will the river cut a new

channel down the old silt plain?
How much aid will the stream require?
How large will future water releases
be from Boulder Dam to avoid floods?
Can the Colorado be reduced from a
200,000 seft. flood plain ^{per annum} to one of
50,000 seft.?

Again, on the new 50,000 seft. channel
will vegetation exact the same relative
water loss as before? Is this a
question of flood plains rather than
river banks?

Main Auto Camp is a place to sleep
away your day's heat and weariness.
Almost caught cold. Needed one layer blanket.

→ Forget to stop and say "Thanks again" to
Mr. McEwen, Trans. Imper. Valley Div. District
and former Secretary, State Colorado River Commission.
Must write him.

603,840 acres.
Thames - 10 in number, almost.

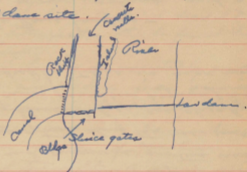
Imperial an inland empire second only
to the Columbian Basin. More improved
every time I look. Palms, date espec., cotton,
general and varied agriculture. The best
and the best. Mr. Maddux says that it is

the second largest irrigation project in the world.

Eastward Again -

To Yuma. Roads up river to Lytle reduced to one on the east and far from the river itself. So sought points along the river and either side.

Laguna Dam. a splendid adaptation to a partial dam site.



Water diverted on west side.

Imperial Dam Site:-

5 miles above Laguna Dam. 2500 feet from mountain to mountain across the shallow stream. Elevation around on rocks is 1800 ft. evidently above sea level. An immense lake will be formed almost continuous with Laguna Lake.

Drilling for foundation is just starting.

We quizzed the drilling crew regarding site and dimensions. They told us to use

→ "the brains", and a boy suggested "the headache gang". A yoke for Jeff, "our brains and brains".

Arizona is to have an intake from

→ this dam for Yuma district - and without interest. So objection has been withdrawn to the Parker dam. However, two thirds of the dam is being built by Imperial.

A site for construction camp has been burned off and engineers quarters erected in a fringe of trees along the river bank.

Two drag-shovel dredges are already digging the canal from above Laguna Dam toward Andrade. There is rock work up stream.

To Castle Dome Landing -

No need to go to Blythe. We have been there - and the road is too far from the river. So we are taking a spur from it to Castle Dome Landing higher up the stream than Imperial Dam Site.

→ Sought also to find the mouth of the Gila River. Crossed two small bridges over dry ravines in a thicket.

But I sought something more in keeping with 1000000 acre-foot max. runoff.

But Carl again was right in accepting his map. For farther inland we found some Suspension Bridge - a wide stretch over a ravine where water must one time have choked and boiled at a canyon throat. So this was the reputation that created large bridges.

14 miles scraping high centers over a mining road. Here was mesa descent for sheep only if even for them. The Colorado still seemed beyond blue hills and I agreed to turn back. But Carl decided to ~~take~~ adventure a little farther tho he feared being caught by night.

Dreams were heading us inevitably and quickly down and verdure was growing thicker where runnels had converged. From a thicket we climbed a barren dome to gaze up a scene of grandeur, eventide and tranquility. A scene second only to our great valley and the same halcyon rode in the sky.

In a deep fringe of trees the Colorado swung round, mountain ridges - not mossy as at nasaday but a muddy silver from the evening sky. Ravines as in Grand Canyon sought its company and long tongues of green rose toward their points. One flat table rose on the river bank furnished the center of the

Later: There was another "landing" 14 miles farther around the bend, but it probably would have yielded no more. But not a large ~~to~~ side in the saddle.

* a color picture of this would be most getting.

landscape. Only an Indian encampment was lacking - such as I dreamed I saw at Needles in the 90's. But the trees are our clue and a triangulation stake showed that the surveyor had not taken the red man's land.

Vegetation - *Salicornia* - *Arthrocnemum*

Vegetation. We gathered some specimens of vegetation for comparison. As Mr Noble warned, the salt bush has a lacier foliage than the tamarisk (altho) whose leaves are pliable but pine-like. The salt bush 15 ft high, ^{at maximum}

We found both tule and bamboo sprouts, the latter almost universal. Also a tall pithy weed very thick.

Mr Maddux spoke also of a water mite (local Mex. name) with white fuzzy blossoms. Roots as large as ones met at Beptenay. One plant can spread over a half-acre. Different from a tamarisk. Has a larger leaf.

Tamarisk is a Sahara desert tree. Will endure 2 or 3 years without water. Water mite needs much. Roots may run 200 feet.

Roots of River affected. Today's scouting trip more valuable than at first thought.

→ Vegetative areas are confined mostly to

Needles - Topsoe, and Parker - Sylthe,
and Yuma - Gulf. Needles and Yuma
views are impressive as the pampas.

The Sylthe - Imperial Dam area is a
winding canyon area with fringes
rather than wide flats of vegetation.

So compute bases in this area basis.

Gaging cable is just below Yuma.

So below a wide marsh(?) pampa area.

Peach Auto Court (owned by John Peach) almost
as nice as Needles' Motor Inn Courts. Still
needed a thin blanket the sun comes up
hot. "Sun Courts, where the Winter Sun
loves to linger" suggests winter time and
our court had gas stoves.

July 9.

Up the Gila. "Adios Yuma

"Adios

Yuma

The Sunshine Capital of the World."

and we enter into the heart of Arizona that
possesses the "driest climate in the United States."

at breakfast I had taxicab Carl to the
great bridge over the Colorado to show him

last seen at same
at Yuma, and then, i.e.
is sp. 11/11/11

the green and water mouth of the Gila but again he showed me that my Gila was entering from the left or west side and would require an under or over-pass to make it. Thus now in mid-summer the Gila insisted on being and remaining dry. Even the rock or adobe horn dingson-prison on a butte looked gray and dry. Three-fourths of our journey of 199 miles to Phoenix was destined to be hot and dry.

~~Humboldt~~

The mesa above Yuma showed the large opportunity for water from the Colorado now about to be satisfied. And the cool home drive the previous evening over the scant farm lands as compared with the heated highway shows what irrigation can do for Yuma's comfort. The story of the Yuma man in Hell who sent back for his blankets will fade.

The Gila Basin proved to be another Humboldt except that the Gila flows in winter. Its water and farm lands are centered at its head.

But at Helton (named for its pumping wells?) there was a nice area ^{of green farms} in a wide valley where wells electrically pumped were spaced regularly to supply ditches.

The mountains were spaced wide

"Soft Shulkens": Mrs. romantic but unhappy.
at El Centro they added the word "Sand".

9 feet, the Gila is over
1000 feet when it is in
its main - 5000 or 12,000 feet
high - the ridge

New Beck must
have been a jogg
compared to this.

apart - lives the Humboldt at its widest,
and could carry little snow.

where the valley was widest, as at
Agua Caliente - Sentinel, a low causeway
of rocks had been laid over low ground
which marked the bed of the Gila. Here
the natives merely waited for the Gila to go
by; then tread again on dry ground.
Even so the verdure was sparse but
side washes were deep, abrupt, and
gravelly.

The cacti fooled us often, for they were
tall like telephone poles and we
thought we were seeing telephone lines.
and there was one close by that we overlooked.

Here we had our last view of "Castle Dome"
a skyline landmark dominating the Colorado
Valley like Mt. Bonanza does that of the Tiber,

at the railway station just above the Hot Springs
Agua Caliente and suggesting early Santons, Carl
sought a store - advertised scantly, found closed.
Two young high school girls and their mother
lived near in a spot relatively cool because
of cottonwood trees - rare in this region.

One gladly brought water with ice but
when glasses were ready for a second filling
she laughingly assured us that we must

take it without ice, for she had given us her last piece. "Same poor ice is made at Agua Caliente but they get theirs from Phoenix 100 miles away." The scene was typically Nevadan - live Gulchonda, but on the other side of the better date palms were growing.

The men attending a 2-year high school at Agua Caliente. They had lived here 7 years. Summers they usually spent in San Diego, but this one at home.

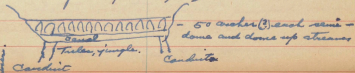
I gave them 3 oranges. They had none. We all waved adios.

Here on our treasure to Sentinel we found two tiny evidences of pools of water. At Sentinel at 4 pm. temp. was 101°F under fan in cafe. A Mexican lairna warned us that it had once been 132°F.

On road to Big Bend, the heat was possibly the most oppressive of our trip. We had it straight from the sunbaked air and it had no chance to cool when rapidly sucked thru our car.

Big Bend (of the Gila) was the beginning of verdure - some by pumping, some by streams. A dredger was riding a bank and deepening or clearing a canal.

This was fed by Gillespie Dam



They had no other clouds felt hot very all day, but only with air currents unsteady.

Below Gillespie another high bridge, 9 spans. We didn't do better on it by Los Angeles Pan.

→ But what a scene for above. The dam was full of silt and overgrown into a jungle. Only a channel between jungle and concrete face of dam carried a tiny small stream to the gates.

It looked as if the dam had been placed at the throat of the valley to force all water to the surface. Or had the Gila carried more silt than water?

Below the tiles were rocks where the water was plentiful. But silt just was the prevalent residue.

Above Big Bend. Here water and irrigation seemed continuous. To this point the Gila was an effective water carrier. Some pumping evident in places. But this was plainly the heart of Arizona - fruit, grain, cotton, corn, schools, churches, towns, smoke. A broad level valley green from river to river.

Tucson the history center (45,000⁺), but here Phoenix a modern, nicely architected city much larger than Reno.

The auto. 2 flats today. 2 cracked outer casings during trip. Only 3 cars, as I recall, have ever passed us. 60 miles is over speed. We do not want a blizzard. Carl seems to anticipate the car's weakness.

Carlisle auto camp by fence
X hills. More and things
informal, get road back home

But Carl is in weight except the settling
day on the lances. I weigh 157 lbs midair coat.
The auto is the chief sufferer. Is the pace too
fast?

July 10! Caney Auto Court. Wire seeing at Courts.

Slept under fan all night. Ventilation
slow. Sweat slightly but dried counterpane as
well as sheet over me. So not so hot.

Thin clouds today. Calls to make. 2 days' trip
along Little Colorado toward Grand Canyon.

Catching up with Mountain Time. Almost daylight
savings. Time change at Yuma. Meals most
affected. By going round world could save
three meals.

Tires - Crooked tires replaced at 1/3 price.
Larger over this time is heavier. "You are
a fast driver". Carl thinks the rocks are the
cause, the hard glass are too much. But we
must not have a blow out at our speed.
I weigh 157 lbs midair coat. Overnight.

Carl likes clean restaurants and chairs,
where will he get his field training -

We have classified the roads into
American, Californian and Mexican or Toleum.
The Toleum roads grow up the braces.

Have now come 2700 miles.

A Day of Calls -

7
The ^{Hour} Max of Weather Bureau will not

return until tomorrow - on vacation.

Richard Heine, assistant. Snowshoes on wall. Used by the Grant years ago in his snow measurements, but are a decoration now.

forecasts made by reservoir accumulation and rainfall.

Mr Heine interested in underground water ("underground lake to the north" say people) and in reservoirs fed as in New East ancient times from the moisture latent in the air. "A complete success then", "being retrieved now".

Governor Maier - Capital Building much like Nevada's but better lines. Office Annex very good - Two drums of petrified trees on column bases either side of entrance.

Everybody in shirts (white) but we put on our coats. Governor's secretary got us a few minutes appointment between Commissioners. Plainly Governor Maier was running his own car. "a courtesy call from Nevada - snow surveying on the Colorado" took instantly. with the Secretary who apologized for delay.

Full, genial welcome - quick recessary to normal profanity and views of statecraft. Sky and air common need of all. All can suffer hunger - whether Catholic or Protestant, American or Mexican. Must never

their burden lighter, alien as well as citizens must live. I ask only loyalty and work. Could end depression in Arizona if President Roosevelt would let me distribute the wages under \$70 a month and all get busy.

Untrained Federal direction he detested. "The damn little hoodwinked Tex Roosevelt sent fresh from college to show us the economics of cotton growing."

Makes \$3000 a year. Drive my own car. Pay my own expenses. Promise no offices. "If you think I will, vote for the other fellow." I am free and need not the office. I am doing my best for Arizona and have reduced the debt.

"Interested in your cooperative plan, but haven't a nickel". I assured him that we wanted his cooperation rather than his money. He sent me to his State Water Commissioner Edwin T. Stewart and highly praised his engineers advisor on the Colorado Commission, W. W. Lane.

Sent his greetings to Mally Malone but particularly to Mrs. Malone. She was the letter I heartily agreed. He took an extra minute to chat merrily with Carl while other Commissioners came in.

Mr. Stewart was a new appointee - 1935-41. Was rearranging all documents

Camp. Station # 15000
4:30 P.M. 15000
20 Times New Roman

12 years pasty to present division of
water until they can give us things
we need.

in his office to eliminate the deadwood,
very genial. Admiral H.E. Dickinson,
Dist. Engr. U.S.G.S. Water Resources at Tucson
and urged me to see him. "You both
speak the same language." Their cooperation
would be very close. He also urged a
call on Prof. A.E. Douglass to ~~sent~~ show
with tree rings. I promptly agreed. The
value was obvious.

He agreed with the Colorado Coop.
Snow Survey if it did not dislocate
present Federal agencies. esp. the U.S.G.S.
→ have him reprints.

→ He suggested that all future negotiations
be initiated with the Governor, at least
as a courtesy. Plainly Mr. Porter had been
wise.

He also believed that the Forest Service had
permitted better snow records than I thought
had out there. ^{to Forest}

U.S. Forest Service. ^{to Forest} Supervisor Kirby. See
list of officials. He had read snow stakes
in his early days. Little done now. Took
supplemental measurements to check the
stakes.

Opportunity for snow surveys in the
headwaters of the Salt and Gila and
also in San Francisco mountains above
Flagstaff. Plateau 4000 feet with higher
peaks. Snow starts to melt about
March 15.

→ Noticed that the rainfall in spring
and summer the relatively heavy deal

Clippings on Yuma project
and WPA project start to
folder

I should also meet Dr. Edelman at Gila
to study problem and the

not furnish any considerable runoff.

The snow was more effective.

Interested in snow surveying for possible use in fire watering.

→ Letter reprints and received official list.

Obtained mounted topographic map of Arizona. Auto maps as exclusive as old railroad maps. Need guides with railways, auto roads, trails, and airways included. \$3.30 but necessary.

Temp: 79°F.
A.S.M. B. inside office 119°F.
In safe next fan 119°F.

10 Tucson - 130⁺ miles but covered in 2 1/2 hrs. We visit all day and travel far at its close.

The Salt and Gila are the source of green Arizona - a Reclamation project now turned over to the project dwellers. Phoenix small in 1900. The fields now extend far up the streams. Pumps also at intervals finally the uplands and drylands.

Casa Grande - a National Monument was passed by for Pueblo Pines at Globe.

→ In newspaper learned that the Yuma Project comprises two units of 158,000 (?) and 150,000 acres, one near Yuma, the other from Wellton to Mohave, the latter where we had first severe pumping. This means green Arizona along the

Colorado and are the upper Salt-Gila.

Glad now we made that highland trip in Arizona to Castle Dome Landing -

Tucson. does not seem like a city even with its 45,000. Scattered like Los Angeles. Homes also mostly unimpressive. A thunderstorm with some wind and a few drops of rain.

Weighed today, 157 lbs without coat. Feeling better also.

Mail sent home. Seem quite out of touch. Wonder if Grand Canyon will hold our mail. Our delay is extending - but we are doing things now.

Impressed by "Dips" or says in highway for flood waters. Two universal signs: "Dip 300 Ft." and "Soft Shoulder". Other impression was a slope covered with cacti until I thought of Palo Verde, green stakes. Can these "green stakes" be the origin of the name. Water may be too expensive to go under road by conduit. One Dip goes in bed of large wash. Carl would not use a soap stone or stone soap that fitted the hand. He called for the tiny right-angled bar. Jeff Boardman will surely lose heart.

Sweating slightly under a blanket. Evening thunderstorm and few drops of rain.

July 11 - More disappointments but greater surprises.

Dr. Douglass was at Carnegie Laboratory at Stanford visiting a book. Would not return until September. Would be delighted to meet me. Mrs. Douglass would gladly have Dr. Douglass' laboratory opened for my inspection.

→ I promised to send reprints to Stanford and begin an acquaintance on trends of precipitation.

Doctor Douglass was absent on leave from the University working for the Carnegie Desert Botanical Laboratory.

"He could not teach and find time to write his book".

The phone chat with Mrs. Douglass was almost as good as a talk with her husband. She would write him all about me in her next letter in two or three days. Big men's wives match up well with their husbands.

W.E.

Mr. Dickinson also was not in Tucson. He had gone to Amer. Soc. of Civ. Engrs at L.A., had gone for a conference at Denver and would return today or tomorrow.

His assistant Mr. Gatesweather was a capable host.

7 stations now on Colorado in Utah.

200 000 acct. from low level to high level same

at the University of Arizona.

A pungent, forceful leader. Member of Lee's Committee in Amer. Geophys. Union, on Reclamation and Transpiration(?). Also on Nat. Resources Board, studying irrigated lands.

Prefers Water Resources Branch of U.S.G.S. to U.S. Weather Bureau. The latter office handles

Much history and many suggestions:

1. Knute the first water code. "Water Commission" to record water rights and opportunities second water. (Reprint). Law not followed closely. All commissioners a failure. New one advised.

2. Gillespie Dam below Phoenix to bring ground waters to surface, but silted up also. Supplies land in Big Bend.

3. Salt River orig. a ^{U.S.} Reclamation Project. Natural flow of the lands also claimed. Really a flood flow.

Pumping purely auxiliary and emergency installation due to drought, of last two years.

4. a U.S. Irrigation Engineer at Phoenix. I failed to look him up.

5. W. H. Lane a capable man, I did not know the Governor had persuaded him to accept a place on his Colo. River Commission.

6. Defended Arizona's claim to water. Sila should not have been included in the original Santa Fe Pact. Their

Pumping also necessary to prevent the rise of water table in some districts. This has stand water is required.

commissioner forced into it only after 14 days of argument.

Gila really does not belong to Colorado System - is practically a flood river in lower half. Those at Kelton and Guano dread it rather than use ^{it}. [To me also it resembles the Little Humboldt and the Reese River, which rarely reach the main stream]. [The bridges are obviously flood works - except where not attempt is made to rise above the flood. The only dam even is a 2 foot causeway of rock between Agua Caliente and Sentinel where we found 2 tiny pools or rather wet spots].

The flood of 1905 gave the Gila its reputation as a water carrier. Its early flood carried out the Imperial Head Gates below Andale and started the Colo toward Salton Sink. Then later floods in the main Colo completed the catastrophe. But Colo floods alone never bother Guano. ^{Imperial really abated floods in order to get irrigation water. fewer crops. She will not pay. as Arizona will not.}

In distribution of Colo River water 7,500,000 given to Upstream States, 1,000,000 to Nevada, 2,800,000 to Arizona but including Gila. Dickinson and Smith computed the upper Gila use at 2,700,000 acre-ft, thus leaving only 100,000 additional from the Colo.

Parker Dam decision being held as a means of bargaining. Evidently the grant

More probably to meet Mexico's 200,000 acres
[...]

of water for 308,000 acres around Yuma
is the concession man. To do so, the
upper Gila used has probably been reduced
for look-sure to 2,000,000, thus keeping
the apportionment near 2,900,000 acre-feet.

His personal solution was: Let the upper
states use all the water they physically
can - it can never be 7,500,000 acre-feet.

Then the doctrine of "consumptive use" i.e. having
complete and entire use of the water
can never cause argument or require
a water master imposed on the upper
states by the lower.

Let the lower states have all they desire.
The surplus will only run to the sea.

Internationally, offer Mexico water for
200,000 acres thru the Andrade Interoceanic
however small the flow of the Gila may
be - with the stipulation that the
United States may run its canal around
the south edge of the sand dunes
on a contour only 4 miles outside the
border. This would avoid the eternal
menace of the dunes and the heavy
work above Yuma. This trade will
be far better than cash changes
for the 2,500 cfs or 600,000 acre-feet for
4 mas. The present plan is stupid.

Imperial Valley will water by
itself if not satisfied. Almost 1/2
cent in the subsoil.

Even Dr. Chalmers says
water cost 17 Centennial Div. It can not get more than 200000
acre-feet

(See reprint).

Smith-Tyler Gray Act
don't not go for enough.

→ 7. Regarding snow surveying in Arizona, it should be feasible for the U.S.G.S. to use its 12 office men for the work.

8. Doubtful regarding present erosion control - \$100 spent on \$2 an acre land. Land barren. Even the best shoots are being pulled up by overgrazing.

→ 9. Silt problem in little Colorado and Colorado unmanageable, for silt is as fine as talcum powder and is floated away. Arizona is too dry to raise vegetation that can anchor the silt.

[Everywhere seemingly Arizona is gray from drought and alkali. Even the vegetation is gray.]

10. Once Director Votaw rose to high occasion and took him to Fallon. Rained his hair by fast driving down the Truckee Canyon and barely missed an Indian's wood wagon. Dinner by Wilson & Station men.

→ Take greetings to Votaw and Wilson.

11. Research only at first under Director Forbes in Arizona, for Arizona agriculture could not be taught until it had been discovered. However, Smith's assistants teach now.

a handover at noon and farewell.

→ Give him reports.

Mr Dickinson had not returned on the noon train, but met Mr Williams at U.S.G.S. office. Now returning from Washington D.C. and eager to meet me. Portland, an enthusiast in snow surveying. "Ryan also eager and believes the method successful." "The Washington Water Power Company, when he was in Washington felt the same."

→ "The U.S.G.S. at Portland had even started snow surveying on the upper Columbia to aid the U.S. Engineers at Bonneville Dam." Meetings sent to Ryan and thanks for his waiting to meet us.

→ He also explained the "cant" consent. The county judge and 2 elected water commissioners decide county procedure and expense in water matters. A ~~water~~ master can follow the river outside the county but his pay stops at the county line. Worse than the old county traffic officer system in California.

Carnegie Desert Botanical Laboratory.

With aid of Mr Gateweather and the U.S.G.S. secretary, we learned the way to Desert Botanical Laboratory.

I did not wish to intrude and thought at first only to skirt the grounds and see the situation. So was a barren hill in the outskirts of town

and no one was permitted to enter the grounds without permission.

I had taken evaporation measurements farthest Shreve, the Director in the early days of Mount Rose in Pres. Stebb's front door yard.

The keeper at the office at the base of the hill insisted on calling up Dr. Shreve. "I had come for a courtesy call and from Nevada". Evidently I was a coequal with scientists, for the question was raised by Dr. Shreve whether I had any campfire up the hill, and the keeper beamed her message.

A most hearty welcome. "Yes, he did remember my help and the hasty map of evaporation prepared. He also knew all about my work and eagerly accepted all of my reprints, ~~except~~ except the Geog. Rev. which he took at the laboratory.

I suggested how nearly I had passed by. He said earnestly: "I would have been quite put out if you had passed me by."

His present problem is to obtain a topographic map of desert United States. He has an excellent (pleasing) one of Mexico. Arizona Union has made an excellent sheet of Arizona with 100-meter contours.

He and Mallery are making a relief map for exhibit at Washington D.C. They are making a climate and plant survey of Mexico.

He had exploits to watch and present
one on the lance. They outsoled down
Lower California in the spring. 60 mi.
a day instead of 60 mi. an hour. Not rough
for they went so slow. Brave an axle.

Miscounted 48 hours (had the extra axle obly)
but amid beauty, flowers, and wonderful
bay view. Crossed the Gulf and returned
northward in mainland Mexico.

Speaking of 80 miles from Yuma to Gulf,
he told of one of the men (theirs?) who had
his boat burn up in the Gulf and was
forced to walk 180(?) miles along the shore
and up the Colorado to Yuma. He had an
→ mussels dug along the coast. So men
rounded timber.

Another project is the problem
whether floods or normal, routine precipitation
causes greater changes in topography.
He is using "ravines", silt layers, and
wondered if I had found debris or silt
layers in connection with snow surveying.

Sarge's classification of summer and
winter-laid snow on the Inland Ice would
have been interesting, but not pertinent, and
was forgotten.

→ He gave me a reprint of Desert & Snow.

Carnegie Institution lets them work
seven five years on problems. Only the
dead the publication of results - too expensive.

Only 3 other desert laboratories:
in Russia, Tunkestan, French Algeria (?),
and Jerusalem - The pictures he showed
me but with Persild's laboratory at
Godhavn added as it properly should be.

He loves his primitive Mexicans as
so my Eskimo. He believes that the world
over primitive people are kindly, are
observers, and philosophers, I am glad.
His bantering was: "Keep at your sweat."

We hiked together looking down
upon the wide valley filled by straggling
Tucson - impressive because of a
gathering thunderstorm rushing in the
summer rains. "Winter rains may come
from the Pacific, summer rains from the Gulf."

Tucson is on a river with a large
waterbed but with subsurface rather than
surface flow. Wells main source of city's
and district's supply.

How much Carnegie Laboratory reminded
me of Blue Hill in its plainness of buildings
but earnestness and ability of its managers.

I felt that I too had a place, and
turned back north after a mountain-top day.

Toward Roosevelt Dam -

Tucson still seemed not a city. "Good
real residents found its permanent life". The
remainder are Mexicans, transients, especially

My conviction still further deepened that
great men are made, in different things
in a William Barde in 1917 and Germany. Only
life: the great men are made.

Water Commissioner Stewart. We could not have fallen into better.

Onto the "Apache Trail" the famous from Phoenix to Roosevelt. Baby Grand Canyon Mountains. Canyon Lake with little canyon harbors and zigzagging roads cut into the rocks.

But there was no inviting resort. Summer is the off season and all resorts were primitive. At dusk Tortilla Flat (Tomball would be more common). Really an Angels Camp of 1895. But the thunder storm was overhead with lightning only and fresh air to make our Kerosene lamp flicker as I wrote. Burros with bells, a tame rabbit, "Hind rather" in prospect. a moon night.

July 12 -

(in the cool early morning)

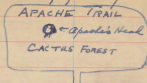
"Up and down but onward" ^{continues}
A river lake in the depths or lost behind intersecting mountains, as we climbed over shoulder after shoulder and descended into what appeared separate canyon valleys. A poneline, however, ever led the way. So sharp were some turns that the front wheels of the auto would pause to let the hind wheels make the turn.

Rugged, forbidding sandstone and spiny cactus. The Apache loved this land and seemed fitted to it.

Canyon Lake that are smaller
distances and downward while
we seem to be passing from pocket
to pocket.

why could we not have slept here on the hills under the sky?

I could not help penning the note!



→ The cacti more
about as thick as
spanish pine trees.

Even rocks have. All vegetation ancient,
but colorful. Why drive the Apache out and
then put his face on the sign? Mussolini in
Africa. The red man earned his ~~share~~
share but we hunt him out like game.

Finally Roosevelt Dam before a Pyramid base
or Lake Mead. Mountains bare of vegetation.

A cut-stone ^(sandstone?) dam - curved in - with only
a binding of cement. Before the days of
poured concrete. Then the largest in the
world. 240 ft. high. Stores 1,762,000 acre feet.
Made 1911. One quarter century old and looks
antique and weathered.

The marvel is that these ^{barren mountains} sandstones
should furnish so much water.

Breakfast at Lake - hot far above its shores -
~~at~~ in scant shade. Even the spring that
furnished some growing trees had been
piped at a cost of \$1200. Yet this was
a national forest.

To Globe - Gentler country south of Roosevelt.
In the cliffs forming the skyline are
caverns - part of cliff dwellings.
After the Arizona we met the sign

"Open Range" to guard against grazing cattle.

The desert grows on one. Arizona is truly Nature's botanical museum. "Every square mile scenic" as the slogan approximately puts it.

Over and down into ^{sycamore(?)} cottonwood country and mining at Globe. Copper mines and sludge banks. Smelter not far, but "fumes do not seem to harm the desert plants".

Here heard perpetual motion in one young fellow's chatter. He would be an ideal sales announcer.

Cleanest Rest Room. The Standard Oil Company's slogan "Clean Rest Rooms" is the best advertisement of the year. Too often rest rooms were foul with dust.

Gila Pueblo. We were looking for Doctor Gladwin and found the famous title "Gila Pueblo". Here we struck 12 in
→ our travels. Our Water Commissioner Stewart was a classicist in taste and felt that I should see it.

South of Globe as a pueblo mine had been made a pueblo museum - like the old but fresher - and cool with its adobe walls.

Closed for the summer but I told my profession and my eagerness. Take

Secretary was fine tho called from her
sister. and Doctor Harry came quickly
back from his nooning. Doctor ~~and~~ ^{me} ~~me~~ ^{me}
like the Queen of Sheba, I was overwhelmed
with the material and the research.

Loosens, arrangement of material, charts in
color that convinced. The entire Indian
civilization of the Southwest on a map.

They believed in gathering widely in order
to get environments and dig deeply.

Tree ring studies were being made. One
timber end showed the beaving by stone
instruments. Many pieces of woods dates
had been reset and made exact. A revolution
almost.

When I mentioned weather trends, Doctor Harry
said that they were studying climate too
and that one wide exodus southward
occurred in time of a definite severe
drought (in 1400, I believe but I did not write
down the dates).

This Doctor Douglass is reaping a
greater reward than he dreamed.

So many queries, problems, and obvious
trends. One slow civilization catching up
with another far more advanced but
~~not as a step~~ by assimilation, but not
at a leap as the Japanese but by slow
evolution.

The evolution of pelican design to the
use of F. The spiral. The bird, snake.

The de Tree man of L.A. was a fine
modern Indian fellow in, but American
early man can go back at least 20,000 years
(I think he said, tho he may have meant
100,000 years)

There is money from many to pottery. Clay may have been drilled on a wheel or just to make the better water tight. yet clay was made of strings of clay built up in a final and pulled another. A better method than plastic rolling.

hard toad - Tatonism or artistry? they could not yet tell.

No holes thru hammers but fine holes thru beads. Were hammer handles still made?

Copper bells or sleigh bells in shape with pebbles inside for clappers. Spherical. Too small - most of them to be hammered. Crystalline structure indicates peering and not hammering. yet copper does not usually run thin like these. However, there is a tiny spine or knob indicating the hole ^{in the middle} thru which the copper was peered.

When they shipped in as barters like jade in Europe? The impurities in the metal indicate local Arizona work. However, it is still difficult to determine origin of copper by impurity method for impurities are not uniform.

The Nevada pueblo at St Thomas is interesting as indicating the northern extension of the pueblo but is not unusual otherwise. The Mesa Verde ruins are the greatest and best.

Gila Pueblo is entirely private and research. Yet scientists from Harvard, Chicago and Carnegie are coming ^{next week} and have a ^{big name} upon you. "You are fortunate," said I. He agreed. New Mexico and Arizona were the natural centers for archaeology. "yes, this field is

so rich, that I have no desire to go to those of Europe." We passed out again into the sunlight and heat of the Arizona landscape.

To Coolidge Dam -

as it were down to Lehontan, a far reaching levee in treeless mountains as at Roosevelt.

But the dam is odd and dainty.

Multiple half domes curving upstream. Hollow behind. Light arches to the intake towers. American eagles six figures heads on the parapets.

Finished 1928 in 22 months. Dedicated by President Coolidge. Made under the direction of the Indian Reclamation Service.

Height 250 feet. Length 920 feet.

Capacity 1,200,000 acre feet.

for 50,000 acres Indian lands

and 50,000 acres private lands.

Water seems never to have been more than 20 ft higher than now. Apparently a more meager source of water than Roosevelt.

U.S.W. B. precip. and evap. station on the open hillside.

a gauge made an ideal site.

Only one criticism. The spillways

ended short of the river below and one even above the road leading down the rear of the dam to the power house under the central half dome. How could the operators enter? Is there an inside stairway? One likes to see the river bank eroded.

Up, Up, and North.

as we rose Arizona grew in individuality. Mesas, flat-topped ridges or buttes, Grand Canyon structures, far stretches, cacti, - all gray hues, and her Indian past and geologic evolution and erosion.

→ Here is Mr. Shreve's problem. The erosion of the cloud-burst Southwest and the sun-baked or even semi-arid Great Basin.

We could go two ways: up the Gila far hole east, then north; or directly north up the Salt. I wanted both, but we had to choose one.

So northward toward the source of the Little Colorado - and directly into the San Carlos Indian Reservation or White Mountains.

The mystery of the Gila Sabred.

→
Write map
now.

By a cut-off from Coolidge pass to San Carlos
not marked on the maps we rose
at 2000 ft. elev.
almost abruptly out of desert Arizona,
into the live oaks. First the San Carlos
River with cottonwoods in its river bottom.
Then at 4600 ft among the oaks, the first
running water.

Below the end far to the south low
down stretched the great yellow mesa
deeply eroded - the land of dryness and
torrential rains - where here and there a
sentinel cone.

As we climbed sharply we were among
our withered flowers *anca mora* and
ice coolness.

At 6000 pines once more and ever
running water in Black and White River
which form the Salt ("so named because of
running these salt beds").

Here we ran up and down over
uplands - the upper pine clad, the lower
oak covered.

The rain of the previous night was
centered here.

Here the rolling peaks were from 8,000
to 10,000 feet high.

Farther north at the source of White River
and Fort Apache were cedar clad
slopes and wide meadows. Grass

Cattle Brande - open range. An iron cattle guard
Two large hides spread. Evidently as the cattle could
be driven over.

Roads met with rain. Water in side of road almost luxuriant - guarded by the Indian Service. ^{Coal.} Here is red soil.

- Will it erode with its vegetal covering?
- * Come back in rain time.

at Mc Nary 7500 feet snow reaches depth of $3\frac{1}{2}$ feet and ~~not~~ starts to melt sometime in March. "It is much deeper higher up."

Toward Springfield road reaches 10000 feet. So here we have the source of the Russell water in the White Mountains culminating in Mt Baldy and Mt Ord 10800 feet.

Here at Mc Nary is the center for snow surveying. A Town permanent for past 30 years because of lumbering and the forest is wholesome and apparently unlimited because safeguarded by the Indian Service. So future permanency seems assured.

- Problem: Estimate the volume of water in the snow as compared with the storage in Russell here.

And the Gila Branch.

The elevation of the White Mountains feeds the White and Black which encircle them. Just south at about 9800 feet rises the Silver River which feeds the San Francisco which in turn feeds the Gila. Here the forests change from pine ^{at 30 mi. south} to cedar, to oak,

gradually southward and the general elevation falls to 6500 feet and even to 3000 feet in Arizona. Probably similarly in New Mexico. Thus the water surface of the Gila should be far less than for
→ the Salt, unless the area of the watershed is far greater. Compute the areas later.
* if topographic sheets are available.

Reached Mc Nary at 8 pm. Air almost cold and damp from the rain. Carl says "Great" and we both expand arms and skirts to the bracing air. "This is paradise".

Mc Nary, Ore.

George D. Clyde, Logan, Utah.

Still following the Gila. Reach Grand Canyon via Little Colorado Monday.

Church-Elges.

radially southward and the general
location falls to 6500 feet and even to
5000 feet in Arizona. Probably similarly in
New Mexico. Thus the water surface of
the Gila should be far less than for
the Salt, unless the area of the watershed
is far greater. Compute the areas later.
Topographic sheets are available.

Reached Mc-Nary at 8 pm. Air almost cold
and damp from the rain. Carl ~~has~~ says "Great
and me both expand arms and skirts to
the bracing air." "This is paradise".

July 13. Singsen here to complete notes.
Due at "Grand Canyon" July 11 at latest.
would now gladly go south to Gila and
even east to Elephant Butte Dam on
Rio Grande in western New Mexico.

Have compromised. We go south from
Springerville a half day's journey to look at
Blue River and then north to Petrified Forest
and Holbrook tonight.

For conscience' sake the following mine
has been sent to Clyde.

"Still following Gila. Grand Canyon via
Little Colorado Monday.
Chuck-Edges."

July 14 - Halbrook. With suited train bell
ringing. 6. a. m. Feel energetic today the head tired.

Headwaters of Salto River system

at N^o 1000 pines and oaks - one
as large and graceful as an elm. all
rocks larger than lower down the
watershed.

Many glades. Lumbering here but
new growth thick and luxuriant.
"Replanted," suggested Carl "did they replant
with aeroplane?" Results of careful cutting
probably. The forest looked and felt
like a park.

"Raining." Ground damp. Grass thick.
The whites gave the Apache a paradise
home here even if they took the rocks
below.

Good snow conservation when the
glades become a little higher.

What a remarkable camp ground in
summer for the people of Phoenix.
Less than 250 mi. even to Springerville.
Actually 244 on sign.

→ Study Gila Cliff esp. at mouth. and
compare with Black and White Rivers.
Early before Roosevelt game if available.

"Best of being water
in Arizona here."

at Summit.

No rocks of consequence - but
firs and aspens and hills carpeted
with meadows. Snow fences
long and ^{and} ~~and~~
where the "meadows" are large.
Evidently drifting here and snow problem.

→ Get all possible snow records from U.S. M. B.
Phoenix.

Next line bring an aneroid barometer

"Colorado Parks" here. Does the Rocky
mountain topography extend here? So
much like the Estes Parks and others
a Titan's golf course. A joy to
ride here.

→ Green grass covered hills "Speckle National
Forest". No erosion here. One distant
snow patch, then a short string of them
on sky line.

Golf courses of lush grass, dripping
with rain. I can visualize a Scotchman
in kilties here.

"Only 4 hours from Phoenix". What a boon.

Down in Little Colorado.

"Lots drier". Looks like Marin County.
almost immediately desert. Turf gray!
"Kept alive by winter rains?" and forest

by by winter and summer rains both?
on the side of mountains from Pacific?
The Blue Mountains to east also look
sparsely.

Springville: Farm lands - small units. Mostly old
houses, larger trees. Cottonwood,
sycamore, locust. Mormon settlement?
Town modern - yet on main street
stands "Madonna of the Trails" - Original
or copy? I did not stop to read. Have
the picture at university, with other
pioneer mothers,
a tiny traveling carnival in town
far ventured.

attractive advertisement: "Letterary to
Mountains, Forests, Streams". "Vacationists'
Paradise."

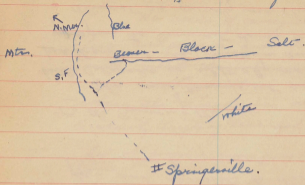
^{drainage}
Little Colorado, stretches wide and
far and smoothly to the north.
95 miles to Holbrook.

To the Source of the Gila

The mountain forest source of the
Little Colorado is relatively narrow. We
had traversed its western rim quickly
from the Summit down to Springville.

Almost as quickly we climbed south
into the drainage of the San Francisco

and Blue Rivers, tributaries of the Gila.



Tarred over all the headwater meadows of the Little Colorado. Then quickly into ferns, thick, slender aspens, as graceful as bamboo Northern mountain flowers, oaks to Beaver Creek, where we turned back. Water just flowing in creek, but vegetation delightfully green - Road met with falling rain. Penetrated ^{to upper timber} 50 miles from Springerville. Fine source for Blue River.

Then back to "alpine" and east down incipient glens but verdure almost as heavy and reaching as far east as we could see. Descended from alpine 10 miles to New Mexico border. A tiny bit of water in the San Francisco.

So the source of the Gila is broad and long. I feared that, like the Arizans, it was fed from the lee half side of White Mountains. The Blues are also broad. However, the general watershed is 500

Wild purple-flowering herb seen, but not taken due to weather.

waters" lower than the Salt's.

→ Compare areas of the two watersheds and if possible the precipitation on them

I still pinch myself. To pass from arid Coolidge to the green meadows of the Blue without transition is the great a strain on my imagination. I still want to ride up or down the Gila and prove its source by visual contact.

Three zones of Gila System:

1. Mountain forests 2. Treeless Reservoirs

3. Arid lowlands.

Could the water ever reach the sea?

Only the cloud bursts or torrential storms seem to water naturally the arid lowlands. but these destroy rather than nourish. Silt and debris rather than seduce mark their courses. How different from the Colorado.

The Little Colorado -

Supper at Springville

"We have everything you need" and we added "if we don't have it, you don't need it."

Another gage at the "Madonna of the Trails".
I now wish that I had lingered.

We drove on to Halbrook for the night
in order to advance our center of investigation.

Our side wanderings are shown by
the Sign Phoenix 244 mi. yet we have
traveled 705.

In the meadows above Springville
water was clear, but 10 miles below
the water running rapidly in an
irrigation ditch was quite hazy with silt.
Soil is red and lighter than sand.
Took a dry sample.

at St. Johns, the river was completely
dammed and practically dry. Ranches
are taking toll of all summer waters
from the highlands - and the highland
source of the Little Colorado seems small.

Sunday, July 14. Halbrook.

Railroad again and noise. Here also
comes the lumber railroad from McNamee.

Passing thru was a Nite Coach^{er} Greyhound Bus
Pullman train and Nite Coach. Neither looked
good to me. Too far removed from our
mobile auto and our old time saddle pony.

But by our hotel was a windmill with
an aeroplane propeller driving a dynamo on
the same shaft. A descending cable brought
our light. "Never out of light yet", we overheard
our landlady saying. A sign as it said:

2500 Watts Generated by the WIND.
Wind Power Light Co.

The Petrified Forest.

all things seem to have been planned
for us. So hotel provision, so much local
direction.

Backtracked to study the Little Colorado and
glance at the Petrified Forest. Both formed
a unit and solved our problem.

In the center of the Little Colorado Basin,
as it were in a gently sloping prairie,
were short sections of petrified wood
lying on the surface where the soil
or rather sand stone had been eroded
away making a bit of Bad Lands or
Grand Canyon effect, with highly colored
erosion pillars and fans - remnants
of original strata and not alluvial deposits.

Plain out-sandstone museum and
office buildings gave comfort and service

without obstruction.

Within highly polished tree trunks - in wonderful colorings - plainly from the various solutions each working long and individually. Otherwise the effect would have been a smear. The petrified wood is also harder than diamond. Hence the tree bark, knots, root base still survive in sharp detail tho' the sandstone in which the trees were first embedded has weathered out and away.

No written material but very graphic charts of hardness and coloring.

Write for
Glimpses of Our National Monuments
National Park Service,
Washington D.C.
Map of Recreational Areas of United States.
National Park Service.

→ On the wall a photo of Stephen T. Wither, First Superintendent of National Park Service on horseback on skyline.

Beneath
"There Will Never Come an End
to the Good that he has done"
Gen. Louis C. Crampton.

→ Outside a simple concrete trail leading up a tiny hill on which lies the base

When the original tree was hollow the wood was filled with crystals in which the soft wood was gradually deposited. The color in the tree trunk was found petrified in the sandstone in which the trees were embedded. Hence "petrified wood".

a spreading of the mineral substance on a petrified wood

of a fallen tree, 7 ft. at bottom, among other trees. All are in short sections because of their heavy weight or crystalline structure.

This trail is called the Stephen T. Hutton trail.

Modern and old relics also preserved.

A tiny fragment of mud showing the cast of wattle, of an ancient mud and wattle dwelling.

This may be a clue to the original pottery: i.e. mud smeared on coarse wattle baskets to make them water-tight. And on the walls, were spiral Hopi baskets



quite in the manner of the spirally formed Tila Pueblo clay & water jars. Is there here a direct connection of clay technique from basket weaving?

Three fossil centers, called forests.

In the last one called "First Forest" was

the Agate Bridge, a tree ^(6 ft diam.) 111 ft. exposed,

spanning a dry arroyo but extending further - estimated 90 feet. Some of the embedding sandstone still clings to it

and ^{cedar} trees give it background and realism as a fallen tree. Beneath it

has been built (8 yrs ago) a steel and concrete beam to keep it from falling if ever the sandstone at either end should give way.

Here and, first mud, among mile river basin at 5000 ft.

Here a "Lincoln Memorial" Rest Room,
of cut gray stone, square timbers, ^{round} projecting
ceiling timbers.



Only this sketch is
too short for the height.

Reservoirs are planned for drinking fountains
and toilets.

Immediately thought of Willis and his loose
nature and architecture. Here is a chance
for art service.

At Exit (above tunnel gallery)
a similar Rest Room except that
the pillars were lacking and
the walls were extended & designed
down into the open air.

The Silt Problem

Here on our hilltops we could see
and learn much.

Below flowed statically the Rio Puerco (the River
Hog) surfeited with yellow sand.

Around ~~us~~ us were the marks of deep
erosion where the water had gained
entrance & had created erosion areas.
This was not wind work alone but water.

at the Exit, a Park Man told us his story:
"At an elevation of 5500 feet the snow does
not stay long. But the rains are fitful and
daxhy, and run right off carrying the
surface with it."

The grass cover is thin and the

Had my not be taken from the park.
Hanging outside
I saw someone in a hat
with a stick for a cane.
One sign: "Stripped wood for sale."

Had my not be taken from the park.
Hanging outside
I saw someone in a hat
with a stick for a cane.
One sign: "Stripped wood for sale."

So stated at Rancho.
Raily soil is impregnated with water.
and heavy rain promptly washes it off and it runs

soil cover itself is only 2 feet above sandstone.
Hard for nature to keep her plant cover
heavy enough to protect the soil cover.

→ But it can be done with effort. ^{Partured down but can be thickened with care} Too
much grazing. The ^{bunchgrass} roots are ^{shallow} weak and
easily pulled up. An open spot is readily made.

Same problem in Montana where sheep
grazing takes the place of cattlegrazing here.

In the Puerco river bed, autos are quickly
caught by rain and undermined until completely
blinded and lost.

How different from the lower Gila.
There the soil is heavy i.e. gravelly. Here
the soil is light. Sand spouts can be
seen rising sometimes 3 at a time.

Furthermore, the streams are called
"Washes" instead of Rivers as in Los Angeles.

→ "Snow makes the grass, thunderstorms
make the silt." Is this not at the base of
Dr. Shreve's problem of quiet and violent action
on topography?

Rio Carrizo. Red silt. Wicker fence
to protect banks.

Halbrook to ^{Joseph City} ~~Halbrook~~

Irrigation again, from pumping?

Efficient movements. Trees also in riverbeds

Fly mode outside windshield at 60 per. a daring little cross. When some feet grew neary clinging he would make a quick jerk to adhere. His wings quivered. Our first fly-aviator. Did he fear to let go? After many miles he "bailed out" suddenly over the top. To find calmer weather after the roll and confusion was over.

Little Colorado Bed above Winslow -

480 feet wide (4 wide spans of railroad bridge) and inner bank only 3 feet high. Outer bank 6 feet. A wide flat wash. Water 6 in. deep and almost clear. However, current is very slow. The Platte River for mildness and shallowness? yet beautiful in its winding and irregularity of contour.

[Silt carrying depends upon volume and especially velocity.

as much silt now at Yuma, they think, as before Boulder Dam was built. Silt is all precipitated there but is picked up again below from deposits along the stream.]

Winslow to Leupp.

Increasing tendency toward barrenness but trees still along river beds. Found ourselves packed and returned to Winslow to take higher-land road to Leupp.

airplane became. But could easily get lost in the air. This is a genuine landscape.

at Leupp river tends to leave its definite channel. A dike has been thrown up to protect Indian Reservation lands and a trench has been dug to persuade the stream to rectify and unify its course. Here we left the river until we could later visit it at Cameron.

Roads too high in center and too misleading to follow.

Leupp to Flagstaff.

at Leupp we gradually rise from out the wide and shallow Little Colorado.

The vista down to Cameron was the Montana-Nebraska landscape seen from Springerville, only wider and deeper.

Grass lands possibly thinner but still golden. The Painted Desert, i.e. graded colored lands framed the north and east from the Petrified Forest down.

But from Leupp to the west, the soil was heavier with weathered cinders. The bunch grass was increasingly luxuriant. Both cinders and grass stopped all erosion.

Volcanic cones with smooth slopes dotted the landscape. Behind ^{the cones west} were the high clustered San Francisco Peaks - the tallest ^{plateau} pyramid.

Road was two tracks but not cut.

Higher into cedars. Then into the
Cones and Coconino National Forest.

Here are last views of the Little Colorado
Landscape.

Henceforth pines - "Turkey Refuge".
"To Black Falls". To Sunset Crater".

Soon to the paved highway in thunderstorm
and quickly at Flagstaff.

A humble town, but in forest trees.
The Lowell Observatory sits in the forest
like an immaculate reservoir tank on
its terrace peeping down at the town.

A motor inn was a delightful change
from hotel living.

→ Query: A thunder storm each day since
and from Tucson. Can we not have
one at Grand Canyon?

Monday - July 15.

The car needs inner cleaning from "silt"
which made our facetious red dust night
and the auto brakes grind.

I too need to complete these miles.

Back has been here two mornings. Was it
the rainy day in White Mountains? Must we
pay for our pleasure thus?

A rain again today. Fairly heavy. We
may have one at Grand Canyon.

Our mileage is now over 3500 and am

time 3.5 weeks. Our problems have been put behind us. We shall probably find more ahead. The avalanche problem will be one.

Later: One auto wheel would scarcely turn because of dirt. This is a light-soil land.

San Francisco Peak 12,794 ft "Highest Point in Arizona".

We did not make the ascent, tho a road led above timber line. The road had been a toll-road but had fallen into disrepair. The U.S. Forest Service is now clearing the road for fireprotection. No shelter ~~and~~ on the mountain, but view finer than from Pice's Peak ("into four states and Mexico" and ~~out~~ the rim of Grand Canyon and the basin of Little Colorado.)

San Francisco Peak is the culmination of the watershed of Havasu Creek flowing into Colorado River and Verde River flowing into the Salt. If the present attempt is permitted to store the flood waters of the Verde for a project on it, snowsurveying will be essential. The mesa at Flagstaff and Williams is timbered and lies at 7,000 ft with higher peaks.

all mountains, ^{except San Francisco} are roaded to their
summits and remind one of Vermont.

→ Color Map of Arizona.

Purchase.

The Harriet F. Cobb

Relief Map of Arizona

By Arizona Mapping Service

Phoenix, Arizona

Three colors of desert, forest, and painted desert
Must be ordered specially from Phoenix.

a Pilgrimage to Lowell Observatory.

To pay tribute to a dreamer and his
resulting vision.

Buildings next yet running down as
if the means of support or the soul
of the man had fled. Yet 8 men and
women toil here photographing the heavens
in search for planets. Plates taken are far
in advance of the toiling searcher.
Pluto's discovery was the result of devoted
following of the master's plan.

The mausoleum sits in the hillside
at the observatory door - a tiny round
Greek Temple with a blue-glass domed
roof and a marble casket beneath so
that the master can gaze from his

south into the blue sky and search its
mysteries

On the rear of the temple as you approach
appears

Percival Lowell

Founder-Director-Endeavor

Manuscript on observatory
with blue (plans) very marked
and marble carpet.

Percival Lowell
Founder-Director-Endeavor
of the Lowell Observatory
March 1894
November 1916

Call → back

Black Cat for
Popocatepetl 5 000 (?)
Pittsburgh

New Sacro on 217. P...

See - discarded indicated
Agony - see further

Silt problem - at of the
rather. Imperial Valley -

"Views from Parapet" and
guide to 2. on Part to folder 1

On
Webb
The
the

On rear
against
hill

ally
go
red

action

earth into the blue sky and search its
mysteries

As the rear of the temple as you approach
appears

Percival Lowell

Founder - Director - Endowment

of the Observatory

Astronomy now demands bodily abstraction
of its devotee... To see into the beyond
requires purity... and the securing
it makes him perform a hermit
from his kind... he must
abandon cities and forgo
plains... only in places raised
above and aloof from men can
he profitably persevere his search.

He must learn to wait upon
his opportunities and then no
less to wait for mankind's
acceptance of his results...
for in communion with most
explorers he will encounter on
his return that final penalty of
penetration the certainty
at first of being disbelieved

man and its canals

Percival Lowell

"Views from Paragonet" and
guide to Zion Part 2 to folder 1

On
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go
and

traction

earth into the blue sky and search its
mysteries

On the rear of the temple as you approach
appears

Percival Lowell

Founder - Director - Endower

of the Lowell Observatory

March thirtieth 1855

November twelfth 1916

On the front looking down upon the valley
were two excerpts from the founder's writings
These flanked the entrance and challenged
the spectator

On the left:

Astronomy now demands bodily abstraction

...

"Views from Parapet" and
guide to Zion Part to folder 1

On the night:

Everything around this earth over all --

→ Insert Meteor Crater here (see page below).

The Museum of the North.

→ We tarried until afternoon to make our courtesy call upon Dr Harold S. Cotton the director and enthusiast who was adding recent measurements to an San Francisco Peak to his study of the geology and archaeology of northern Arizona. But he had gone out for an afternoon's field trip. We signed in the guest book as "Professor of Classics" in deference to his Indian collection, but left word that his old snow survey

correspondent had called. Will he
comprehend?

Black Cat Cafe -

where did they get the idea of the
cats perched above our booths. They appear
obviously like the pictograph at U.S. Petrified
Forest.

— Lamell —

Wass:

Everything around this earth
we see is subject to an inevitable
cycle of birth growth decay -- nothing
begins but comes at last to end --
though our own lives are too brief
to even mark the slow nearing of
that eventual goal -- Today what we
already know is helping to comprehension
of another world. in a not distant future
we shall be reformed with interest
and what that other world shall have taught
us will redound to better knowledge of
ourselves and the changes which the
universe is undergoing. Walden Paradise
in my student days.

In the office, I noticed pictures of a

Le. Hair To Carl Elges from U.S. Rubber Products
To folder 1

↑
place
above.

correspondent had called. Will he
comprehend?

Black Cat Cafe -

Where did they get the idea of the
cats perched above our booths. They appear
obviously like the pictograph at the Petrified
Forest.

Another Thunder Storm.

The thunderstorm season has not
begun. and San Francisco west even
below timber line is white with wet
snow. We went forth thru the fresh
forest with this peak behind us wondering
if nature would resume the storm
for our pleasure at the Rim of Grand Canyon.

Crater Mountain.

a spot overlooked but recovered.

The mausoleum had given me the
soul of the Observatory. yet I could not
rudely depart without knocking at the
headquarters door and speaking my tribute.
Quietly but kindly we were shown the
discoveries and taken to the observatory
itself - so like the Ann Arbor observatory
in my student days.

In the office, I noticed pictures of a

meteoric pit and learned that it was the famous Arizona pit and only 45 miles behind us. In detouring to Leupp we had left it all unwittingly to one side. Except for mail at Grand Canyon we would have turned back.

→ But the airplane views were better than any view from climbing the hill. No meteoric stone in the center of the pit but a large deposit under one side. Geophysicists had detected instrumentally a concentration of meteoric deposits from the region around the pit & the pit itself.

The walls of the pit are high but might have been forced up by the plunging missile which evidently fell at an angle.

A large piece of meteorite from the pit lay on the floor below the pictures as mute evidence.

Furthermore, our guide pointed out the resemblance of the pit to craters on the moon, where some craters are evidently made by impact but some by eruption.

Desilting.

Our car had been thoroughly desalted or desilted. Could some line method

be applied to the Colorado? It reminded me of Bill Nye's solution of the Rice Problem in the South, which was to develop a rozen back hog that could outrun a darkey. At least our nearer problem was to keep silt out of our can rather than out of Imperial Valley.

First View of Colorado Basin

wide like little Colorado but forested. Cedar, and pines, the latter small. Discolored pools along the wet highway showed the latent readiness to erosion.

Fifth Car in four weeks to pass us - a Chrysler, Plymouth, Chevrolet, Ford V-8, Terraplane, the latter driven by two girls at over 60 miles per hour. Carl insists on 58 but refuses to rise often to 65. Yet leaving Washington he drove a total alone of 911 miles the first day. We are holding within 300 or less.

"Beaten by all waves of cars", said I.
"Some people in a greater hurry than I am", retorted Carl.

Mail.

Fam too little. Nothing from Clyde or Mann despite the earlier call to conference. Latest news July 5. So the following night letter was sent. Air mail too slow. Shall tarry here to complete correspondence especially Christmas answers.

Letter to S. B. Doten from Church, July 15, 1935
in folder 1

This book should also be sent back for typing so that the supporters can know our experiences and discuss future plans.

We could evidently travel for a year.

Emily's slogan of "More and more mailing addresses" should be extended to "More and more news."

The Grand Canyon -

The thunder storm was waiting. We sped to the rim and I balanced on a rock to view.

The most awe-inspiring view I had ever witnessed. Depths, widths. Earth on earth below me, ever narrower but each a mesa, with islands rising from the depth to our height. Our level juniper clad - the few sky line level and timber covered.

Bright Angel Gorge led upward from out the depths to the northern mesa. Under our feet, sheer down along the ledges led the trail to the mesas below.

The parapets were red like the Painted Desert but veiled in atmospheric blues.

The storm clouds now trailed into the northern gorges ^{which} with vapor veils slowly descended and enveloped and in time revealed the buttresses. Too hot was the canyon depth to permit the vapor to condense low down.

As the evening drew on, a more luminous lighter blue crept down the canyon and these hivers tailed slowly up trail from beneath.

When the full moon arose the colors faded but a dim sense of depth and contour remained. It was

the night of total eclipse. as the moon became a dull disk in the sky, the Canyon closed up like the ocean whose presence is felt but not seen. The stars shone overhead and on the skyline far out shone a single light like some far away beacon at sea.

July 16 -

With the morning, the Canyon slowly revived its contours and colors as the sun rose into the sky and revealed each detail. Point after point was touched with light. Light and life had returned.

Mans. Somehow man seemed not out of place. Even husbands and wives seemed noted. But behind the parapet the fussiness of commercial plants seemed offensive - the railroad yard, the power + water plant with its ~~top~~ tall smoking chimney, the water towers above the trees, the stables that smell like Tahoe.

But the rim itself seems to melt into the canyon walls. Trails, outposts, patios, gardens. The architecture also

is growing more congenial - from the cliff-dwelling and stained-wood hotels of El Toron of the 1900's to the cut-stone buildings that seem to be the upward extension of the canyon walls.

One also hums "Up where the coal begins". We are fortunate. The air and the colors stirred for us like the waters in the Hebrew pools of old.

If only we keep our digestion. Not hungry this noon. So a milk shake and a piece of watermelon. Smiled the waitress, "Some lunch you've had". We, "Yes, it does look like a child's fancy". She, "O well, maybe you've old enough to take it".

With the Canyon -

This noon the Canyon slept, but this evening it awoke. As the sun sank westward, we rode along the rim to get the changing views.

Glorious reds in the sunlight with grace notes of blue.

→ The river is turbid and turbulent. The Little Colorado did not do this. It is dry.

At Hermit's Rest the islands are
pyramids and sublime temples. The
trail in the depths. My God! How? a
descent at the rim, a tiny scratch
following contours of ledges and disappearing
behind precipices. Buildings on the mesa below!

The river roars from the depths.

The cumulous cloud on the far horizon
seems puny when lined against the buttresses.
Even the overspread clouds seem too small.

The lower inner canyon is rocky and
hard. No fans or talus.

As the sun sinks lower the Tonto Plateau
has become a greenish gray in the shadow.
The red still glows in the sun, then
fades to reddish brown, ~~and~~ ^{then} green gray
behind the bluish veil of night. The
river gorge grows dark and harsh and deep.

On a narrow outlook keeping sentry
over the canyon is an altar memorial
to John Wesley Powell who first traversed
the gorge. The work is coarse and
crude as if a part of the pioneer handicraft.
But a modern approach in carefully
edged polygonal stone gives a touch

of architectural beauty to the spot and binds it into the many landscapes - architectural outlooks along the river.

The Canyon in Moonlight.

The canyon in full but dimming moonlight stood forth dimly in its masses as if waiting for fuller revelation ^{when} the moon rode overhead. Two dim points

of architectural beauty to the spot and binds it into the many landscapes - architectural outlooks along the river.

The Canyon in Moonlight.

The Canyon in full but dimming moonlight stood forth dimly in its masses as if waiting for fuller revelation ^{when} the moon rode overhead. Two dim points of fire flickered in the depths along the trail.

Telegrams -

Connection established once more by the following messages. We shall now complete accumulated correspondence and push on into the upper Colorado.

Grand Canyon, July 17, 1935.

Prof. George D. Clyde,

Care State Engineer, Cheyenne, Wyoming.

Reach Ephraim Monday evening July 22

Route from there should be ~~Green River, Moab,~~
~~Hartsville, Durango,~~

cross Green River and ascend San Juan River to Rio Grande Basin thence via Pueblo to Denver, Fort Collins and down Grand River to Uintah Mountains thence up Green to Snake and Missouri. Mail points Green

Durango, Denver.

~~Route to Durango.~~ Should we see New Mexico State Engineer.

Should we go to Cheyenne. Can't you join us at Ephraim. Please wire Ephraim.

J. E. Church.

Wednesday July 17.

Changing Times and Places.

This morning under an open cloudless sky, the Canyon was pastel. Tonight under overcast clouds, the Canyon was soft as satin especially the mesas.

Storm veils are up canyon, down canyon, and in Bright Angel Canyon. Before us the canyon is clear.

The unscrubbed unit before us is more easily comprehensible than when the units combined.

In the evening the storm had shut out the farther canyon wall. ~~Finally the rain~~ The night settled into rain. Over the void was a luminous line where rim and sky met with a dot of light on the rim and a single light in the depths.

The rainy season had returned. The wind blew fresh and free as from the sea.

→ Problems: Study the climate of the Grand Canyon.

1. The snow rarely occurs below 2,500 ft. Is precipitation lighter or heavier at the bottom than on the rim?

2. What is the cause of the Rainy Season?

It seems also to occur on the Continental Divide.

Lecture by Kalb on the Colorado River from Wyoming to the Gulf. 101 days.

Silt heavy. Cannot see $\frac{3}{4}$ in. below surface.
Ceaselessly grinding the rocks. No sandstone
on shores. Same in side canyons.
 $1\frac{1}{2}$ million tons of silt each 24 hours.
Entire down stream is silt deposits.

My ~~acres~~ were jaded. Kolb is a
tiny man. Predates the hotels by 17 years.
The mill to do, not brass, marks
the herd. An artist also. 600 miles overland
to see the Rainbow Bridge which they had
missed by 6 miles by fording the side canyon
too quickly. The bridge is higher than
the Capital at Washington.

→ Purchase

Through the Grand Canyon from Wyoming
& Mexico by Ellsworth L. Kolb. Macmillan.

Mail. Tarrying two days extra at Canyon
North and South Rims to answer Christmas
mail of 1934. We must leave here free
from unfinished work.

Thursday July 18-

"Senior View" day taking leave of the South Rim.
As on Mount Rose the first 50 visits present
different views.

Down Bright Angel trail a bit to get the

"feet" of walls above as well as below.

Trail broad and gentle, I marvel that someone has not attempted to ride it in an Austin rather than on a mule. A very little width additional would make this possible. Will the public finally force an auto road across. Such is some types of progress.

The Recent Drive toward the Little Colorado brings new visions of the Canyon. From Point LIBAN 2 reds, maroon and strawberry. Templated structures - square, terraced - in architectural naturalness.

Little Colorado

The Indian Watch Tower - Indian, modern - ends the drive. Thence on winding roads along the Tonto Mesa we almost unceasingly descended to the lower canyon of the Colorado - and crossed the mouth of the Little Colorado where it cut rapidly thru its own narrow gorge to the main stream. Its bed was moist - but its contents were silt and sand. Its course meanders even in the rock.

The red cliffs upon which we stood at South Rim had now retreated and left a normal valley along which we drove.

At Cameron, we crossed on a suspension bridge supported by 7 cables (2 in? diam) on either side. We are still in gorge formation but a gorge wider and shallower than below.

The Colorado drains $\frac{1}{15}$ of the U.S.
However, out $\frac{1}{15}$ of U.S. furnishes the silt.

The bed is sand. The valley is almost bare sand.

Silt again. It is in the air, fine but palpable. The bald head quickly reveals its presence to the touch.

→ But the erosion cuts were not among the plants sparse as they were. If the light soil was being removed, it was removed evenly as by the wind, and then only slightly for the roots were still covered tho' gently rounded.

However, among the rolling knolls, and the buttes of the Painted Desert, the erosion marks were plain. Here where the formation seemed more rocklike, the ravines and gullies were pronounced. It had been raining and the creek bed was red with floating silt. Water $\frac{1}{16}$ in. deep in the palm gully band was opaque. A tiny sample of the wet silt was gathered from a rock.

This silt seemed to be the product of the erosion of the buttes (the erosion that made the Grand Canyon) rather than the carrying down of silt from the gentler vegetative slopes.

The movement was incipient in the gentle shower prevailing. The heavy movement must come in the heavier or longer continued storms especially of the wetter

Colony from 900 ft. to 1000 ft.
to ground or in a middle area.

→ seasons. Have observations been made?

However, the vegetative covering is very precarious. Except in the case of the barren cliffs and knolls, an increase in rain or possibly a decrease in grazing may make an anchoring covering. Is the Colorado erosion the result of desert climate?

Its soils seem to be as heavy as the Palouse soils of Washington but owing to somewhat heavier precipitation, the Columbia runs relatively clear.

Is there any solution for the present silting of the Colorado except changing the climate?

Navajo Bridge.

The old pioneers were pathfinders. A natural wide approach down the Little Colorado mesa to a point on the Big Colorado where even its first gorge falls away to the level of the water. This spot was known as Lee's Ferry. Only slight cutting on the south bank was necessary to approach the water - a cable was all that was necessary to force the river to drive the flatboat. Then ^{finally} the loss of the boat with these lives, caused the construction of a broad, steel-arch bridge directly across the gorge 5 miles downstream. Tho the bridge is 467 feet above the river and 833 feet long, it seems commonplace

Have some stone clogs had been actually undermined and were sliding in places down the erosion slopes.

as deer Marble Canyon which it spans
after the chasm we had experienced.
That was 143 miles away - our starting
point - but we had come so rapidly
that the transition seemed almost
instantaneous.

The Kaibab Plateau -

The ascent to Kaibab Plateau brought
dense forest similar to the Sierra Nevada
with dampness and rain.

July 19. Jacob's Luce however was merely
"a mud hole". Water for the inn had
to be brought from Kaibab, a distance
of 38 miles, yet the forest was rank,
and aspens abundant.

Nature's Balance.

In a forest of three-quarters million
acres there was not a running stream.
Only meadows and occasional water
holes. No erosion whatever. Does the
forest use all surplus water in its
own maintenance? The summer rains

→ are frequent. What of the winter precipitation?
" there is a weather station here. Get
the data.

But the Bright Angel Canyon runs water,
and there are "Roaring Springs" in its
walls from which the lodge pumps

Use water power here
for light came from water
but at South Rim from steam
with its chimney smoke stack.

ample water for lawns, fire protection,
and domestic use for three score
cottages. The Lodge burned in 1932 but its
stone ruins blend with the Rim. It may be rebuilt this autumn.

But at South Rim all water is hauled
in tank cars and carefully distinguished
in use. At least there are no water-
bearing gravels.

North Rim.

Pine trees, lawns, verdure covering
all available soil. - Flowers. - Yuccas.

The walls descend more gradually.
Canyons numerous. Canyon walls more
brilliant in color and capped or veiled
by breaking clouds.

South Rim seems far away like some
abrupt mesa that melts into the horizon.
On its edge, a plume of smoke, and
tanks rising above the trees.

There is no river and no chasm -
Merely Canyon depths and pinnacles, and
verdure to rest in as you gaze.

No commercialism and bustle as at
South Rim. Songs as the stages leave
as at Hawaii. A marmoset touch?

Far from Tia Juana.

Evening - As sits and ponders.

The view is over a verdured mesa
as wide as the Western prairie

and more smooth - and lifted so smoothly that it seems never to have been lifted at all - and gently opened to reveal some gigantic Babylon with colored battlements and terraced temples at our feet.

On the mesa far beyond the canyon a trail of smoke recedes as a train makes its way from sight while at our backs a stage must travel two days to reach the paths of men.

Yet the view from the south overwhelms. Here from the north the view is grand but blends with the fabric of man. Here a chasm no longer but a gallery view upon some immense city.

July 20-

a heavy downpour last night with pools of water. ^[0.81 in measured by Park Service] But the sun has returned.

- Our 8000 ft. elevation gives us an advantage over the south rim. as shown by centering of daily showers and the the prevailing arid juniper there.
- Compare actual rainfall records if the rains are not too spotted.
- The snow here is also said to be deep. Any records?

The place fascinates. I would go down into Bright Angel Canyon, and listen to the nature talks.

We shall visit the Point of Vision. But my extra day here must be spent in answering last Christmas' mail and other correspondence.

It is delightfully cool. The morning's query at the deer was "Did you use your fire last night?" for the bay was replenishing wood boxes.

a Hawaiian Custom

When the stage leaves (it left this morning at 8) the "help" gathers and sings party songs. So made my morning musical. One song: "Why Grand Canyon?" "A place to throw your bones." The marraons use music as a social bond.


Tonight at entertainment a girl sang the most pleasing bird song I have ever heard - not a few cadences but an entire aria. Then gave imitation of many birds.

Nature Talks.

"Why the long canyons on the north side?"

The original mesa sloped down E, S, and W from the point now occupied by the "Checking Station 7,000 ft. to the north

side slopes toward the Grand Canyon
and the south side slopes away. However,
some canyons at west end seem to reach
out from the south. The canyons on the
north side reach $\frac{2}{3}$ of the way to the
south rim. Hence the Colorado is against
the south wall and can only occasionally
be seen from the north.



Bright Angel Canyon a fault line.

"Size?"

porosites below tops of "temples" and only
part of Bright Angel Canyon in area.

Yellowstone even smaller than Grand Canyon.
But did he mean Yellowstone Lake or Yellowstone
National Park?

"Waisture?"

Snow plow here 5 feet high - for
emergency use in getting out in the fall.
Snow comes in October 15 to December.
Is 5 to 6 ft deep.

In summer, "The Park Service has
the Weather Bureau sprinkle these
roads each day. Only they get too much
in spots."

Balance of Nature

Five hundred Kaibab forests. Then came whole hillsides of luxuriant aspen like bamboo. Then the conifers began to return in the shade of the aspens and drive them out.

Mountain lions preyed on deer that fed on aspen browse, but ate the cattle also. Then the Government killed the mountain lions. Consequently the deer increased to 30,000 and ate up all the baby aspens and were forced to eat the meadows also. Then attempts to ship the deer and final Open Seasons for Hunters. The deer are now reduced to 16,000 and are thin. We saw a mother and fawn - both so tiny. Then in losing 8 in a meadow. Then at night one on our lawn.

One woman saw 36.

Same day ~~definitely~~ ~~the~~ Kaibab forest will lose its delicate aspen forest and become coniferous again.
Last Views.

Cape Imperial 8801 FT. Really East Rim.

Here the topography of Grand Canyon lay like a map before us. From the north the entire mesa fell away to west, to south, and to east. To east it sank so low that canyon cutting had ceased and a broad path from north to south furnished a natural route from Utah to Arizona southlands. In this broad path was the little Colorado that descended from its mesa through the limestone into the Colorado Canyon.

The winding of its gorge was as tortuous as if in silt. The naturalist said that the winding started when the stream was on

the surface and continued to wind as the
meas rose. But the river seems to cut a
winding channel even in rock. I have
seen water ~~to the~~ ^{meander} in ice. It is quite normal
on the surface of the Greenland Inland Ice.

Paint Royal 7876 Ft. protrudes miles
out into the Canyon. Nazy toward the sun,
but view east was clear.

→ The view straight down was so deep that
the depth has a bluish tinge.

The side canyons are all dry. But the
Colorado winds against the distant wall
almost in a loop "because it wound when
earth was low and continued winding because
earth rose gradually."

There a square window looked in the
Paint Royal could be caught a glimpse of
the river. Some day erosion will break
this window upward until our path
will be undermined.

The descending skyline from South Rim
toward the east showed how very had been
our descent to the little Colorado and
reascend to the North Rim. It is only 20 miles
across, but 200 miles around.

Cloud shadows played over the landscape
as the do below from Mount Rose. Yet here
around us is sagebrush and its fragrance.

Two beyond South Rim rises the
San Francisco Peaks named by the monks
before the city of San Francisco learned its name.

Point Supreme - 7464 FT.

Far down at the opposite end of the Canyon. A trail to it has become a narrow road thru dense forest and ~~meadows~~ ^{winding} meadows. Clever driving will prevent the leisure window from striking the trees. 16 miles each way. A loop that crosses at level sometimes turns the surveyor home without seeing the Point. The Park Guide calls this the engineering achievement of road building.



This point is more like South Rim in its view, but canyon fins underneath. Here erosion, in the ^{sandstone} limestone structure is occurring ~~at hand~~ ^{before our eyes}. The gray sandstone is fissured into chusses. Great holes in ledge. Immense fans or talus upon flanks of red stratum below.

To south one long fantastic oriental temple redstone temple, as in Tava, with intricately sculptured terraces or horizontal facades.



and the highest large area in Arizona contains no running streams.

So on our way out we visited with Warren F. Hamilton, resident park officer and weather observer for two winters and N.H. Dodge, who may remain in this winter.

The snow cover this past winter was Max. depth $5\frac{1}{2}$ ft.; accumulated depth 14 ft. Water content 23 in. The total for the year may approximate 40 in. Snow runoff occurs about April 15.

There is little surface runoff. a few shallow pools where deer drink. a few springs.* The three drainage channels are 1. Bright Angel Canyon, where at total of 125 000 ac. ft. (250 000 acre ft) in one spring month has been measured

2. Drainage ^{east} into Stone House Valley where the water is dissipated.

3. Drainage northward in the ^{Kanab Creek} ~~region~~ which ~~drains into the Colorado in Nevada.~~ ~~flows into the Colorado in Nevada.~~

No "wash" appears in any of these drainages except in Bright Angel Canyon below the Rim.

Nine "Roaring Springs" emerge from a limestone tunnel traced 1 mile northward from its mouth. These springs furnish water for the "hodge".

* Yet in a similar mesa of western Colorado there are many loaves, says Dodge. Inquire further

Max. precip. in Arizona measured here. But possibly runs on Francisco River.

flows finally into the Colorado.

The entire landscape is satine.

The sun behind clouds sends light shafts into the depths. Haze fills the west, and the canyon becomes a succession of fingers protruding beyond each other both from the north and the south.

The light steals away from point after point. The air sounds dimly in the distant trees. 16 miles to the main road. It's time to go.

Erosion Potential -

It had poured the night of arrival at North Rim some 0.8 in. in 1 1/2 hrs. yet the only marks of erosion were on the hard road with slight traces on sloping banks.

Evidently the same quantity of water, if small, should erode hard surfaces more quickly than soft, for the soft surface will absorb it while the hard surface will allow it to flow.

This seems to be basic for the Little Colorado and the Canyon. The milder slopes with softer soils seem to suffer little - at least the bare harder soils are the focal points of break down.

Sunday, July 21 -

→ The great Kaibah Forest Plateau seems to contain a problem and an opportunity for studying stream flow. This area of over 1,000 sq. miles (750,000 acres)

Some water in melting times spills over the Rim, but all erosion ^{above the rim} appears to be incipient.

Old timers think that there are a "million" seep holes in the limestone and that the water enters the Colorado thru the Canyon walls. The known springs seem three formations down.

Limestone outcrops. So the soil is shallow, yet the forest growth is luxuriant. Is this luxuriance maintained by the heavy summer rains?

→ Problem: Compute the moisture of this area and compare with known transpiration losses.

Determine if possible the runoff. Station already maintained on Bright Angel by Howard Leach.

No stations on this arm of Virgin River.

Plan for Precipitation Stations

→ Site for Snow Survey and Precipitation and runoff measurements.

The hills Colorado, Bright Angel, and Virgin are likely headwaters of the Colorado, and are on the lower stream.

Suggest snow survey for White Mountains, Kaibab Plateau and possibly above Zion Park. Especially precipitation stations in these areas.

Are already at North Rim (Kaibab Postoffice), another just established in Bright Angel Canyon (by Howard Leach), another is at South Rim.

However, doubtful whether there is a station on Tonto Platform midway down for experimental purposes.

Left separate with Hamilton

Bill Hamilton and Dodge will make snow surveys if equipment can be furnished. Hamilton has had experience in Sequoia National Forest, California and Dodge has measured glacier recession on Mt. Rainier, where glacier-fed streams are used for power and hence may become precarious. It raises the point of forecasting the flow of glacier streams - fed by snow supplemented and worn down excessively by heat.

If Bright Angel flows so heavily, the snow survey can well become ^{at least} a minor factor in the Colorado forecast.

Bob Williamson, Ranger at South Rim is an enthusiast in weather.

N.R. Tillotson is in charge of Grand Canyon Park.

Zion National Park -

If Zion Canyon could be entered only from the east, it would be an immense Petra. The gorge is almost as narrow as the Petra gorge, the rocks are as red. The walls are possibly sheerer. In place of rock havens, temples and amphitheatres, there are similar forms in titanic size.

The mile-long tunnel with several windows gives one the feeling of actually entering by the gorge. A winding road however

47
road delivers one finally on the canyon floor along which flows the Virgin River muddily out the Canyon to the south.

Ascending the canyon, one passes quickly from the desert heat and bareness ^{into} coolness and luxuriant foliage ^{of cottonwood, boxelder, vines.} Part of this is due to shade and part to water which seeps thru the canyon walls and affords sustenance to "hanging gardens" of vines, ferns, and flowers. Pines cling in every crevice to the crowns of the crags. Vines make umbrellas and arbors of the trees.

High overhead, 2500 feet and more, tower architectural forms as if around some city square. Hardly puny, the Hollywood Bowl in comparison. "The Great White Throne", "The Angel's Landing Place", "The Temple of Sivamona," which is in reality to me a great but ragged cathedral from whose tower the bells are about to peel forth.

Further in the depths of the canyon where spring waters well forth from the sand is a tiny amphitheater where one can sit in cozy balance.

One turns back reluctantly where the path descends to the water's edge unable farther to ascend the gorge.

The reds are brilliant where freshly exposed, but duller and maroon-like where weathered.

Zion is a Yosemite in spirit but without its individual grandeur of waterfalls, El Capitan, Half Dome, Glacier Point. However, Yosemite is soiled canvas in color while Zion is warm and pleasing.

→ But the Virgin River is muddy. It discharges 3000,000 tons silt annually into the Colorado. "Sometimes it is gray, sometimes red, and sometimes black", depending upon the location of the storm in the watershed of 500 sq. miles above the Park. Today it flows gray.

Sergeant Willard Dangles who worked there on erosion control says that the silt comes mainly from the erosion of the river channel and that walls were constructed to straighten the river and to impound silt. He adds that the farms are washing away too rapidly.

The use of a gaging station to measure floods on the Virgin is problematical, for it flows far thru the desert before

→ reaching the Colorado. However, a snow survey system may be quite feasible in the Dixie National Forest for the use of irrigation at St. George and further downstream.

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Bryce Canyon Park

To a Sierra Nevada Bryce Canyon would suggest Dutch flat washed out in red soil by hydraulic mining. Only here Nature has been gentle and allowed the remnants to crumble slowly.

Luliva Lian, the strata here are softer and almost crumbly. But the colors are brilliant varying from lemon yellow to vermilion, almost like the layers of a canyon. The park is a vast amphitheatre on the upper rim of which ^{on the upper rim of which} ~~engages~~ ^{engages} ~~down~~ ^{down} toward the canyon throat.

At sunset from Sunset Point, there was soft-toned fantasy. India's spire-dances clustered so thickly that one could scarcely escape from the maze if dropped into it from above.

From Inspiration Point, the spires radiated like the spokes of a wheel, converging below where forests clad the floor. But on the southern edge near by appeared as vivid as the buttresses and spires of the Cathedral at Milan, a cathedral of delicate design. Near by ~~was~~ was a medieval, feudal hill with square castle surmounted by another.

A tiny chipmunk ran over the crumbling cliff at our feet and paused to nip its tail.

At Sunrise from Sunrise Point, shadows appeared behind the pinnacles. The jumbles seemed to ~~disappear~~, and give way to radiating lines conforming to the contour of the amphitheatre. ~~if we turned~~

The floor of the amphitheatre gradually became a forested throat beyond which lay a peaceful farming valley below.

At Bryce Point, ^{on the Rim Drive} all canyons blend, a valley town. Pinnacles numerous again. Winding trails

From Rainbow Point 9105 Ft Bryce Park becomes a Grand Canyon but not as deep. A mesa many miles to east displays the same colors and erosion. Between are low rounded ridges with upland valleys.

The charm of exquisite coloring and carving lies, however, in Bryce Canyon, one of the many lobes along the western side. The other lobes are still raw but may weather in the fullness of time to greater delicacy.

Savies Basin.

On either side of Bryce Park

country rise the power of Sevier River.
Is this a good snow country? Even in
late July of a subnormal year the Sevier
is flowing where many streams elsewhere
are washes. It seems at least a quick
start from the crest of its watershed
at Cedarville.

Mountains on either side of the main
stream. Plateaus 8,000, peaks up to 12,000 ft.
But not many side streams enter
the some ranches are watered from
the side canyons.

→ a gage below Panguitch with
Pinto Reservoir near Junction.

What is the normal flow of the stream?
A succession of ranches appears along
the entire length of the stream with
wide valleys at intervals. Has Utah
made better application of water than others?
The marvel is that there is water enough.
However, below Gunnison the stream
seems to have spent its force, for the
large Sevier Bridge Reservoir seems
practically dry. Settlements shown on the
map below this reservoir indicate some
further water supply.

Only medium dissection
in water the soil in
dry stream. Compare with
Abajo irrigation water seen
near Hunt's stream.

July 23 - Ephraim, Wash.

Mr. Humphrey, Supervisor of the Manti Forest, at Ephraim tells me that the Sevier River flows small but long and does more an even wider area above Sevier Sink than in Sevier Valley itself. Furthermore, that Sevier Bridge Reservoir is normally filled. Low dams and return flow aid the water supply much.

also that 2 second feet is the usual allowance to the land.

The mountains are high on either side of both forks and the runoff from side canyons is strong tho the creases are short. The Sevier valley extends 30 miles north of Ephraim and this north fork joins the main stream where the latter turns west. But most of this part is used in its own valley.

The individuality of the Sevier is that it starts flowing late and runs late. This is due to the fact that the snow on the valley floor and up to 7,500 feet is insufficient to create runoff. Hence the water runs down and back essential early runoff.

at Manti the people jealously guard the range against any over grazing. At Ephraim they are arguing that all vegetation be removed to increase stream flow. They do not fear floods, not having had one since 1909.

An experiment is being conducted at the experiment station here on the effect of denudation on runoff, silt formation, and erosion.

However, the hay and grain crops are first mowing together. The elevation is 5,000 - 6,000 ft. The snow is about like an at-hamilla. Run are being caused at country. Small crops, like pine, are the widest kind of any water.

Time in Sun
1932