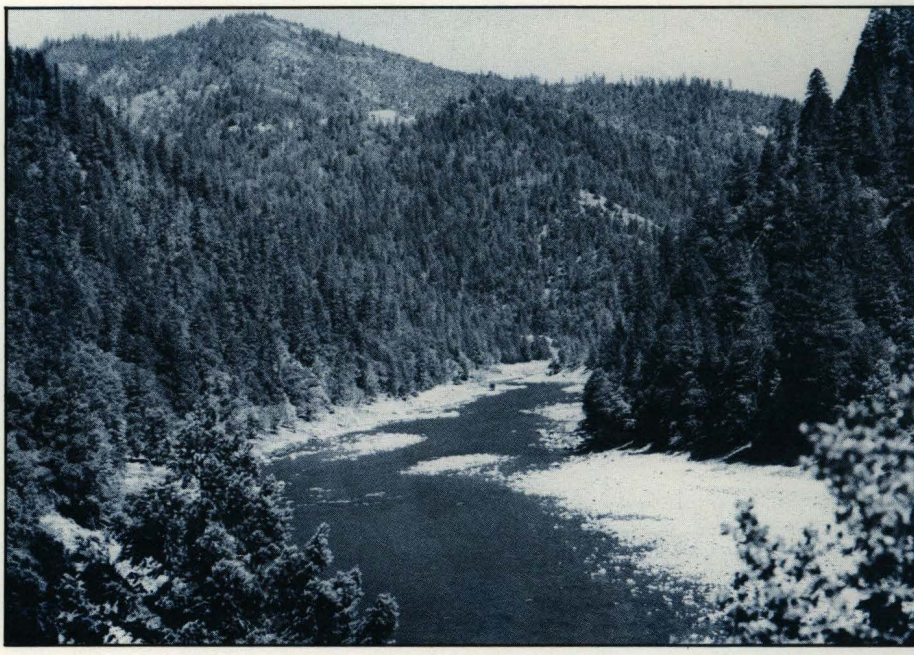
GUIDEBOOK

GUIDE TO THE GEOLOGY AND LORE OF THE WILD REACH OF THE ROGUE RIVER OREGON

by
William B. Purdom



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The *Bulletin* of the Museum of Natural History of the University of Oregon is published to increase the knowledge and understanding of the natural history of Oregon. Original articles in the fields of Archaeology, Botany, Ethnology, Geology, Paleontology, and Zoology appear irregularly in consecutively numbered issues. Contributions arise primarily from the research programs and collections of the Museum of Natural History and the Oregon State Museum of Anthropology. However, in keeping with the basic purpose of the publication, contributions are not restricted to these sources and are both technical and popular in character.

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Museum of Natural History
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For

the women in my life

LINDA, BECKY, AND SALLY.

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Guide to the Geology and Lore of the Wild Reach of the Rogue River, Oregon

by

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INTRODUCTION

PURPOSE AND SCOPE

The wild reach of the Rogue River in southwestern Oregon is one of the most remote river courses in the United States. It flows through a sparsely populated region that is inaccessible by road except at one place. Inclusion of this reach of the river in the Wild and Scenic Rivers Act of 1968 assures it will retain much of its primitive character. At the same time, however, inclusion in the act drew instant and widespread attention to this comparatively little-used area. Suddenly, several thousand people each year are storming down the Rogue River Canyon between Grave Creek and Foster Bar, essentially that segment of the river classified as wild. Most of this pressure comes during the summer months. In past years a few fishermen, often accompanied by local guides, floated down this tranquil canyon and fished in season for steelhead and salmon. Now they are outnumbered by recreational boaters, hikers, swarms of youth groups, and possibly even by their dogs. The federal and state agencies responsible for administering the region presently are struggling with the problems of regulating this onslaught.

It is the purpose of this *Bulletin* to provide a general picture of the Rogue River and a more detailed river log of the wild reach of the river. The emphasis of the log is on the geology that the river canyon exposes. The wild reach of the Rogue River is sufficiently remote to have discouraged geologic reconnaissance in past years. Indeed, the same may be said of the Klamath Mountain Province in general. Recent interest in fitting the Klamath Mountains into the new global tectonic framework has brought about fresh interest in the geologic problems in this region, yet the difficulty of working in terrain as rugged and remote as this section of the Rogue River Canyon continues to discourage detailed geologic mapping. Consequently, the user of the River Log included in this *Bulletin* often will be told what kinds of rock he is seeing at a given point along the river, but may find that the origin of the rock is obscure or its age uncertain. Much more geologic work must be done in this region before these small pieces can be fitted together.

The *Bulletin* attempts also to present the broad geographic and historical setting of the river along its course from the Cascade Mountains to the Pacific Ocean. This is done largely in preliminary sections preceding the River Log proper, though occasional biologic and historical notes punctuate the geologic observations that constitute most of the Log. It is hoped that hikers and boat travelers alike may come to understand the river better. Only in such understanding will its preservation lie.

ACKNOWLEDGEMENTS

A publication that touches on so many facets of the Rogue River Canyon as this *Bulletin* is certain to need contributions from several individuals with diverse specialties. The author was introduced to the river by river guide Irv Urie, of Medford, who accompanied him on two float trips down the wild reach of the Rogue. Mr. Urie provided many details of the geography and lore of the river. Only a river guide of long standing would know just where to locate the old arrastra at the head of Solitude Bar in that dense tangle of vegetation that lacks any path to the relic. Only an established guide with a genuine interest in the area would know that Big Windy Creek and Little Windy Creek were formerly called Big Piddle and Little Piddle, respectively. Mr. Urie reviewed sections of the manuscript for this *Bulletin*, and provided many valuable additions and corrections. Guide Larry Mullinnix also accompanied the author on one of the float trips.

Dr. Stephen Cross, biologist, identified many plants and animals while accompanying the author on a float trip, and he reviewed the appropriate sections of the log. It must be reported, however, that he was unsuccessful in accomplishing one of his ma-

jor objectives on the trip; that of collecting certain anadromous fishes. Dr. Frank Lang, botanist, also identified certain plants for the author.

Dr. Claude Curran, geographer, also accompanied the author on a trip down the river and provided much useful information on the wild reach of the river. He provided too, entertainment for our party by testing the temperature of the river water attired in the lower half of his wife's bathing suit. He insists it was an understandable mixup.

Dr. Monty Elliott, geologist, hiked the forty miles from Grave Creek to Foster Bar with the author and provided valuable assistance. He and the author shared many stimulating geologic discussions, refreshing swims, and innumerable blisters. A bibliophile of local renown, Dr. Elliott made available to the author interesting and useful references from his personal library.

Dr. Rodney Badger, organic chemist, geologic dilettante, and master chef, accompanied the author on a hike down a portion of the Rogue River trail. Aside from his companionship and culinary accomplishments, he contributed nothing whatever.

Mr. Len Ramp, of the Oregon State Department of Geology and Mineral Industries, Grants Pass office, read portions of the manuscript and provided insight into certain geologic problems in the Klamath Mountains.

Dr. Laurence R. Kittleman, Director of the Museum of Natural History at the University of Oregon, encouraged the author and edited the entire manuscript. To Dr. Kittleman and all the others mentioned above, the author is deeply grateful.

The author wishes also to acknowledge the financial assistance provided by the Research Committee of Southern Oregon State College in spite of a wary reluctance to award funds for such a suspicious venture as this. Upon receipt of this publication they will find their suspicions justified; their worst fears realized.

Physiographic Setting

The Rogue River drains a large portion of southwestern Oregon (Map 1). Its tributary streams arise on the western slopes of the Cascade Mountains, and join to form the river which flows along an irregular westerly path through the Klamath Mountains and Coast Range to the Pacific Ocean.

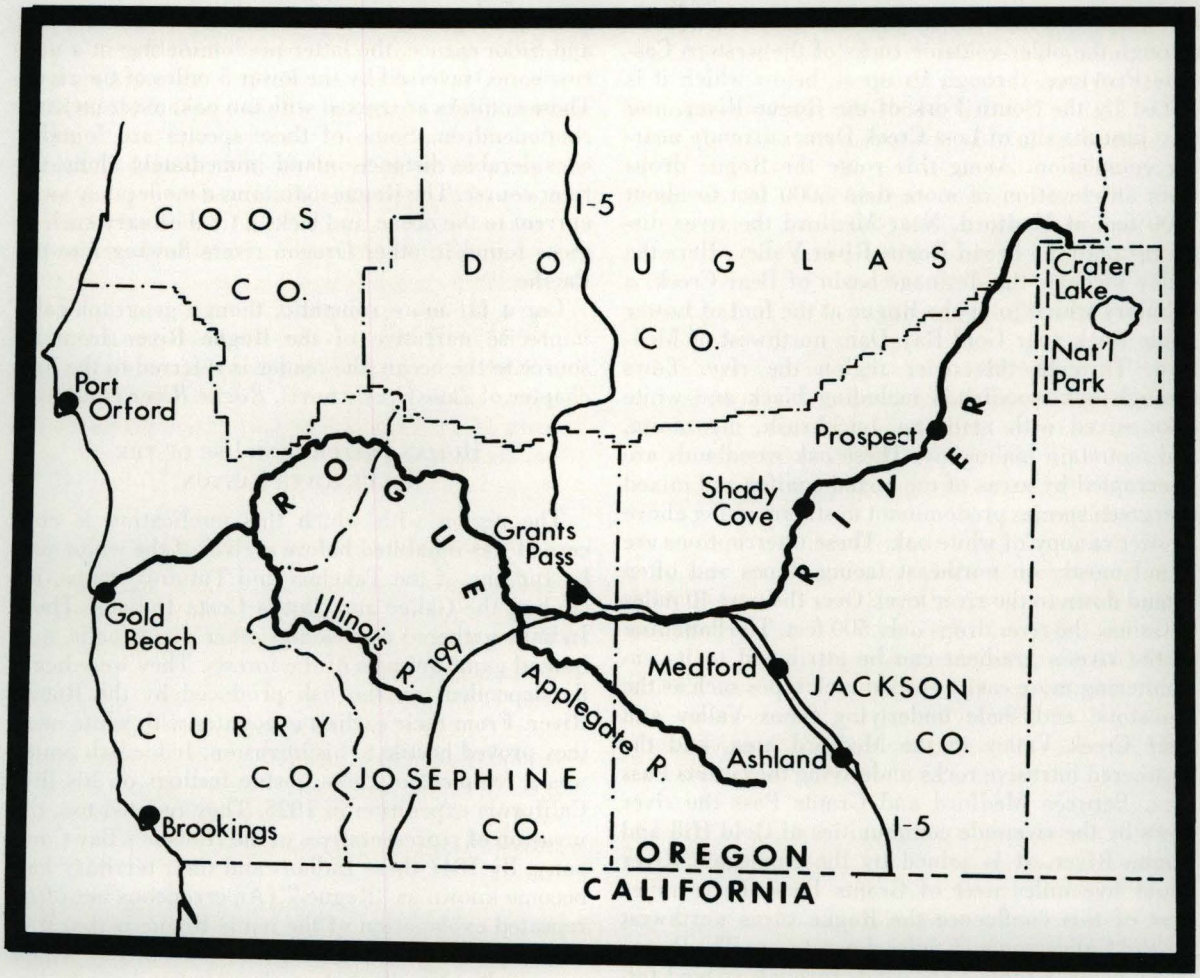
One of the earliest geologists to study the southwestern Oregon region, J. S. Diller, described the horizon of the Klamath Mountains as composed of accordant summits representing the remnants of a highly dissected peneplain. This peneplain, or nearly planar erosional surface, apparently sloped from about 4000 feet in the interior of the present Klamath Mountains to about 2000 feet near the coast. This peneplain was eroded near sea level, then in late Cenozoic time uplifted unevenly such that it sloped westward, toward the coast. From its origins on the western flanks of the Cascade Range the Rogue River had established its course across southwestern Oregon prior to the uplift of the peneplained surface. It was one of two rivers in Oregon, the Umpqua being the other, which possessed sufficient discharge and downcutting power to persist in its westerly course across the rising landscape. Smaller streams had their courses altered or reversed. The result is visible today in the deeply notched gorges of the Rogue and Umpqua River through the Klamath Mountains and Coast Ranges, and the network of dendritic tributary streams feeding them. The latter have produced the steep, rugged, and highly dissected topography with its accordant summits as described by Diller.

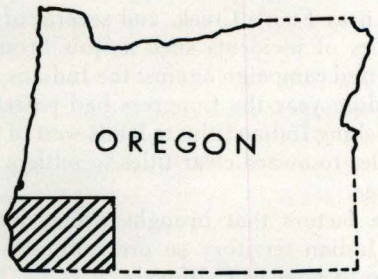
Narrative of the River's Course

The Rogue River has its origins in Boundary Springs, situated just inside the northern boundary of Crater Lake National Park, between Crater Lake and Diamond Lake. The springs lie on the west slope of the High Cascades at an elevation of approximately 5260 feet above sea level, more than one hundred airline miles northeast of the mouth of the Rogue River on the Pacific Ocean. This region is classified as a subalpine forest in which mountain hemlock, lodgepole pine, subalpine fir, and at lower elevations, Shasta red fir, predominate. Boundary Springs are typical of others in the High Cascade Mountains. They produce clear, cold water which has trickled into the porous volcanic rock as winter snows melt. This water eventually encounters an impervious layer, sometimes a glacial clay, which arrests its downward seeping and directs it toward that place where the clay layer intersects the surface.

From Boundary Springs the course of the Rogue River is generally southwesterly to Medford. As the river descends below 5000 feet in elevation, it enters a zone of mixed conifer and mixed evergreen forests. Here the predominant climax species include Douglas fir mixed with the broadleaf evergreens such as tan oak, madrone, golden chinkapin, and canyon live oak. Various pines are included, such as sugar pine and ponderosa pine. Incense cedar is present too. This vegetation zone covers a broad area and extends westward across the Klamath Mountains and the Oregon Coast Range to a point west of Agness, on the lower Rogue River. However, the drier Rogue River valley near Medford has a different flora.

Along its upper reaches the river is joined by the westerly flowing tributaries which drain the volcanic peaks of the Cascades. Some tributaries, including Red Blanket Creek and the Middle Fork of the Rogue River flow through U-shaped glaciated valleys be-





Map. 1. *The Rogue River in southwestern Oregon.*

fore emptying into the Rogue. The river then flows through the older volcanic rocks of the western Cascade Province, through Prospect, below which it is joined by the South Fork of the Rogue River, and then past the site of Lost Creek Dam, currently nearing completion. Along this route the Rogue drops from an elevation of more than 5000 feet to about 1300 feet at Medford. Near Medford the river disgorges onto the broad Rogue River Valley. Here the valley includes the drainage basin of Bear Creek, a tributary which joins the Rogue at the foot of Lower Table Rock near Gold Ray Dam northwest of Medford. Through this drier region the river flows through oak woodlands including black and white oaks mixed with madrone, buckbrush, manzanita, and mountain mahogany. These oak woodlands are interrupted by areas of the mixed conifer and mixed evergreen species predominant upstream rising above a lower canopy of white oak. These interruptions are found mostly on northeast facing slopes and often extend down to the river level. Over the next 40 miles to Galice, the river drops only 500 feet. The flattening of the river's gradient can be attributed to its encountering more easily eroded rock types such as the sandstone and shale underlying Sams Valley and Bear Creek Valley in the Medford area, and the weathered intrusive rocks underlying the Grants Pass area. Between Medford and Grants Pass the river flows by the riverside communities of Gold Hill and Rogue River. It is joined by the Applegate River about five miles west of Grants Pass. Three miles west of this confluence the Rogue turns northwest toward Galice, some 15 miles downstream. The Rogue River below Grants Pass winds through rugged terrain such as Hells Gate Canyon as it traverses metamorphosed rocks of the Klamath Mountain province. Six miles north of Galice the river is joined by Grave Creek, at which point it makes a sharp bend to the west. The elevation here is about 700 feet above sea level. The course from Grave Creek to Foster Bar, 34 miles downstream, is generally arcuate first to the northwest, then to the southwest. Here the river again flows through the mixed conifer, mixed evergreen, and oak woodland forests described above. On the banks of the river riparian vegetation predominates. The river gradient increases slightly from Galice to Agness, a few miles below Foster Bar, and decreases slightly downstream from Agness to the river's mouth at Gold Beach, 30 miles below Agness. The Illinois River adds its flow to the Rogue at Agness. Below this confluence the Rogue flows westward to the ocean through sedimentary and metamorphic rocks of the Oregon Coast Range. Between approximately 5 and 15 miles above its mouth the river flows through a vegetative zone which parallels the coastline and is dominated by western hemlock, Douglas fir, western white pine, grand fir, sugar pine, Port Orford cedar and Sitka spruce, the latter predominating in a narrow band traversed by the lower 5 miles of the river. These conifers are mixed with tan oak, madrone, and rhododendron. Some of these species are found a considerable distance inland immediately along the river course. The Rogue maintains a moderately swift current to the ocean and lacks a tidal estuary such as those found in other Oregon rivers flowing into the Pacific.

For a far more romantic, though geographically imprecise narrative of the Rogue River from its source to the ocean, the reader is referred to the first chapter of Zane Grey's novel, *Rogue River Feud.*

Human History and Use of the Rogue River Canyon

The region with which this publication is concerned was inhabited before arrival of the white man by Indians of the Takelma and Tututni groups, including the Galice and Shasta Costa Indians. These Indians gathered acorns and other plant foods, and hunted game animals of the forests. They were heavily dependent on the fish produced by the Rogue River. From their earliest encounter with white men, they proved hostile to his intrusion. Jeddediah Smith was a recipient of these hostile feelings on his first California expedition in 1825. They resisted too, the invasion of representatives of the Hudson's Bay Company. By 1841 these Indians and their territory had become known as "Rogue." (An erroneous but often repeated explanation of the name Rogue is that it is a corruption of the French term *rouge*, or red, which supposedly described the color of the river during periods of mining and heavy rainwash.) One of the earliest conflicts with the Rogue Indians occurred in 1836, when a party of trappers was attacked by Indians near Foot's Creek, and several of them killed. A series of incidents such as this brought the first organized campaign against the Indians in 1851. The preceding year the Congress had passed an act extinguishing Indian titles to lands west of the Cascades in order to award clear titles to settlers moving into the area.

The factors that brought whites into what had been Indian territory so precipitously was the discovery of gold in California in 1848. The resulting gold rush of 1849 drew many from the Willamette Valley, the only settled region in Oregon at the time. It is claimed that two-thirds to three-fourths of the population of the Willamette Valley headed south for the California gold fields, virtually paralyzing the economy of the valley. For the most part this migration rushed through southern Oregon without taking the time to discover much gold there. Not all, however, struck it rich in California, and prospectors

began to probe outward from the California gold fields, some of them toward the north and Oregon. In 1850 gold was discovered on Josephine Creek and the rush to southern Oregon was on. The discovery at Jacksonville in December of 1851 was the strike that had greatest impact. Within a few years the Rogue Valley boasted the largest population of any area in the state. In 1853 Jacksonville was made the county seat, and in 1854 was incorporated. By 1855 Jackson County was both the most populous and wealthiest county in Oregon. And on the heels of the prospectors came the settlers; the merchants and the farmers. Quarreling over water rights between farmers and miners ensued, and this entire bustle and squabble was superimposed upon the Indians indigenous to the area.

In 1851 a California Rifle Regiment attacked the Indians at Table Rock near Medford following a series of incidents between whites and Indians. This served to worsen the already hostile atmosphere, and other incidents soon followed. In 1853 the Indians were forced to sign a treaty giving up their lands and placing them on a small reservation near Table Rock. The Indians did not stay on the reservation, however, and white miners and other trouble makers were continually aggravating them. Eventually the Modoc, Klamath, Shasta, and Umpqua Indians were all involved in open conflict with the whites.

On October 8, 1855, a group of miners and other citizens undertook to punish an Indian encampment near the mouth of Little Butte Creek for alleged cattle theft. This act initiated the Rogue River Indian War of 1855-56. The Indians retaliated with attacks near Galice and Evans Creek and retreated to the Rogue River Canyon as settlers withdrew to stockades and prepared defenses. An attack at Gold Beach in February of 1856 left 23 whites dead and forced 130 others into an unfinished fort (Miner's Fort) one and one-half miles north of the mouth of Rogue River where they huddled for about a month before troops came to their rescue. The army moved troops into both ends of the Rogue River Canyon and contained the Indians between Grave Creek and Big Bend near Illahe. Skirmishes were fought at Black Bar, Battle Bar, and Quail Creek. Forts were built near Grave Creek and Marial, and ultimately about 1000 soldiers and several hundred Indians were engaged in the struggle. The war lasted eight months, and scores of casualties were suffered on both sides. The Indians were finally defeated at the Battle of Big Bend in May of 1856, and the survivors were rounded up and transported to reservations in northwestern Oregon. It is estimated that approximately 200 Oregon whites had been killed by Indians up till this date. Southwestern Oregon was now safe for the whites, and mining and farming activities resumed.

The first gold deposits to be discovered along the wild reach of the Rogue River were placer deposits. These result from the weathering and erosion of primary gold deposits in bedrock and transportation of the weathered gold grains down tributaries and the main river itself. Native gold can be separated from the gravels by panning, or in sluice boxes (long troughs with riffles in the bottom to catch the heavier gold), or by hydraulicking (wherein large amounts of soil and gravel are washed into a sluice using a large, high-pressure water hose). These placer deposits were traced upstream to their source and several lode deposits, including those in the Mule Creek area, were discovered in that manner. Lode gold mining requires more extensive machinery for extracting the ore and processing it, and delivery of such equipment to so remote and rugged an area posed a major problem. Some machinery was hauled overland, but heavier pieces were floated and poled upstream from Gold Beach or downstream from Grants Pass on barges. Blossom Bar was the obstacle that prohibited barge traffic from Grants Pass through to the coast.

Gold mining was so important an activity on the Rogue River that the name of the river was changed to Gold River by an act of the territorial legislature on January 12, 1854. The original name was restored, however, the following year.

Chinese miners began to arrive in Oregon soon after the first gold discoveries were made. One source estimates 3000 Chinese miners were working in the Rogue River Valley by 1854, though others claim such numbers are exaggerated. Such estimates do seem high when one considers that in 1900, Curry County, which extends more than 50 miles along the Oregon Coast had a population of 1868 people, most of whom lived near the shoreline. By 1930 the county contained only 3257 people, and included no incorporated towns. At first the Chinese provided cheap labor, but quickly took over claims abandoned as too poor to work. They were willing to work for lower returns than were white miners, and in the 1860's a steady flow of Chinese from California poured into southwestern Oregon. Some became affluent enough to purchase good claims from whites, and resentment of the Chinese soon grew. In 1857 an insertion in the Oregon State Constitution stated no Chinaman, not a resident of the state at that date, could hold real estate, or mining claims, nor could he work any mining claim. In 1862 a poll tax was levied on the Chinese. Any Chinaman residing in a mining district and not obviously engaged in some legitimate business other than mining was subject to this tax of two dollars per month.

By 1885 hydraulic mining had reached a climax along the Rogue's tributaries, and Solitude Bar and

Blossom Bar were being mined during that year. As placer deposits became worked out, lode deposits assumed greater importance. The actual amount of gold extracted from southwestern Oregon is impossible to ascertain. Lode gold mining production is generally better documented than placer mining production. The ore produced by lode mining was often weighed and recorded before being broken or shipped, or at least the products of such processes were subject to careful accounting. Placer mining, however, required no such exact accounting, and it is estimated that at least three-fourths of the gold produced in southwestern Oregon was taken from placer deposits. Much gold extracted as free gold from the gravel deposits was used as monetary exchange, or hoarded, or in the case of the Chinese miners, taken out of the country. It has been estimated that the value of the gold produced in southwestern Oregon between 1850 and 1961 was approximately 70 million dollars.

Mining activity on the Rogue River and its tributaries continued at a declining rate into this century, and was essentially eliminated by the fixing of the price of gold in the 1930's. Then, during World War II, the government issued a federal order which effectively stopped gold mining and drove miners to seek employment in mining base metals in which critical shortages were feared. After the war, with the price of gold still fixed at $35 per ounce, it proved impossible to open most abandoned gold mines. Hence most of the gold mining along the Rogue River today must be described as recreation.

Commercial fishing in the Rogue River was attempted briefly in the 1920's, but did not flourish. Sport fishing for salmon and steelhead on the river has always been popular, and many natives of the area have established themselves as guides. Zane Grey visited the river many times during the late 1920's and early 1930's, and his novel, *Rogue River Feud*, is set against the commercial fishing operations on the river. In recent years the river guides have added recreational boating to their guide services. Drift boats and inflatable rafts and kayaks constitute the common mode of travel. The stretch between Grave Creek and Illahe is one of the most popular runs for fishermen and recreational boaters alike.

The Rogue River Canyon for many years provided the only link between the coastal villages of Gold Beach and Wedderburn and the interior of the state. When the railroad from Roseburg reached Ashland in 1884, the coastal settlers began to press for a mail route to the Rogue Valley in the Medford-Ashland area. At that time mail and other goods were rafted down the river to those communities. For the period from 1887 to 1915 some of the mail was packed into Marial by mule from Dothan, a Southern Pacific Railroad siding. The trail led up the west fork of Cow Creek, over the mountains to the headwaters of Mule Creek, and down Mule Creek to the Rogue River. The trail then followed the river to Illahe and on to Agness. The trail then led over the mountains to the coast. In 1898 the legendary Hathaway Jones, a raconteur of local fame became the mail carrier on the eastern end of the route from Dothan to Illahe. Jones lived with the Pettinger family at Big Bend Ranch near Illahe. Until 1963 mules and horses still were used to transport mail down the trail from Marial to Agness.

Around the turn of the century a boat line contract was established to transport the mail from Illahe to the coast. Later, boats carrying mail to the post office at Marial were powered up river from Gold Beach. The mail boat ride has become quite a tourist attraction and presently several operators daily run boats up the river, each of which is loaded with 10 to 50 passengers. They generally stop at Agness or at Paradise Bar Lodge below Blossom Bar. Some tours offer lunch at one of the lodges before the return trip. Presently only one "mail boat" operator has a contract to carry and deliver the mail.

Subdvision of the Rogue River Based on Human Usage

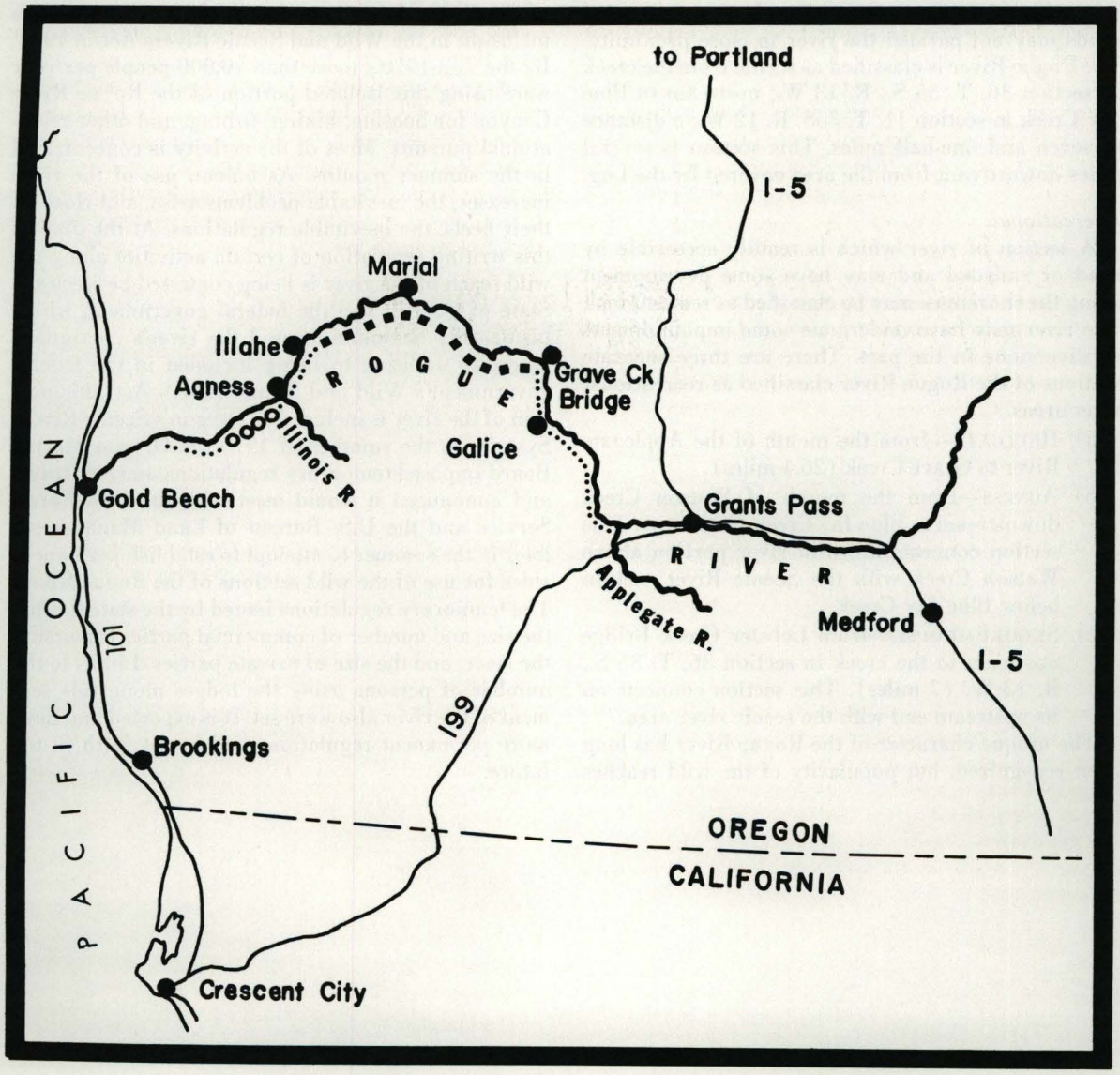
The River Log included in this *Bulletin* describes portions of the Rogue River classified Wild and Recreational by the "Wild and Scenic River Act," Public Law 90-542. This law, passed in 1968, assigns segments of the Rogue River to various categories termed wild, scenic, and recreational. Each of these categories is briefly described below, and Map 2 illustrates the classifications assigned to various sections of the Rogue River.

Wild:

Rivers classified as wild are free of impoundments and generally accessible only by trail, with shorelines essentially primitive and water unpolluted. Wild rivers may include an occasional inconspicuous road, airstrip, or habitation or other improvement already established, provided the effects are limited to the immediate vicinity. The Rogue River is classified as wild from Grave Creek to Watson Creek, a distance of about 32 miles. The roads along the Rogue River above Grave Creek leave the river at that point. Only four jeep trails and one unimproved road leading into Marial provide vehicular access to the river in the wild section. Five currently operating lodges and several seasonally occupied or abandoned dwellings exist along this section of the river.

Scenic:

A scenic river is free of impoundments, with shoreline or watershed still largely primitive and shorelines largely undeveloped but accessible in places by



Map 2. *Wild, Scenic, and Recreational segments of the Rogue River.*

roads. Long stretches of conspicuous or well traveled roads may not parallel the river in close proximity. The Rogue River is classified as scenic from the creek in section 36, T. 35 S., R. 13 W., upstream to Blue Jay Creek in section 11, T. 35S. R. 12 W., a distance of seven and one-half miles. This section is several miles downstream from the area covered by the Log.

Recreational:

A section of river which is readily accessible by road or railroad and may have some development along the shorelines may be classified as recreational. The river may have undergone some impoundments or diversions in the past. There are three separate sections of the Rogue River classified as recreational river areas.

a) HELLGATE—from the mouth of the Applegate River to Grave Creek (26.4 miles).

b) AGNESS—from the mouth of Watson Creek downstream to Blue Jay Creek (10 miles). This section connects the wild river portion above Watson Creek with the Scenic River section below Blue Jay Creek.

c) SKOOKUMHOUSE—from Lobster Creek Bridge upstream to the creek in section 36, T. 35 S., R. 13 W. (7 miles). This section connects on its upstream end with the scenic river area.

The unique character of the Rogue River has long been recognized, but popularity of the wild reaches of the Rogue River grew suddenly upon the river's inclusion in the Wild and Scenic Rivers Act in 1968. By the mid-1970's more than 10,000 people per year were using this isolated portion of the Rogue River Canyon for boating, hiking, fishing, and other recreational pursuits. Most of the activity is concentrated in the summer months. As human use of the river increases, the inevitable problems arise, and close on their heels, the inevitable regulations. At the time of this writing regulation of certain activities along the wild reach of the river is being contested between the State of Oregon and the federal government, which historically has administered the river's contiguous lands. In addition to being included in the federal government's Wild and Scenic Rivers Act, this portion of the river is included in Oregon's Scenic Rivers System. In the summer of 1976 the Oregon Marine Board imposed temporary regulations on river travel and announced it would meet with the U.S. Forest Service and the U.S. Bureau of Land Management later in the summer to attempt to establish permanent rules for use of the wild sections of the Rogue River. The temporary regulations issued by the state limited the size and number of commercial parties traversing the river, and the size of private parties. Limits to the number of persons using the lodges along this segment of the river also were set. It is expected that new, more permanent regulations will be set forth in the future.

GEOLOGIC HISTORY OF SOUTHWESTERN OREGON

Before the reader becomes immersed in the Rogue River Canyon and the geology thereof presented in the River Log, he or she may wish to become acquainted with the geologic framework within which the observations of the Log are made. For this reason, a brief introduction to the geologic history of southwestern Oregon follows.

The oldest rocks in Oregon are located in the southwestern part of the state. Outcrops of metamorphic rocks called schist are exposed over an area of several square miles on the Oregon-California border southwest of Medford. Schists are rocks which contain platy or tabular mineral grains, often micas, which are arranged in a parallel fashion termed foliation.

These rocks include two main types of schist: green schists and black schists. The schists crop out over a crudely circular area and their foliation roughly parallels their contacts with adjacent rocks which have been thrust over the schists on their eastern, northern, and western boundaries. These rocks are called the Schists of Condrey Mountain. Because of their faulted and intrusive contacts and metamorphic history, the age of these rocks has not been established. They have been tentatively correlated with various Paleozoic and Mesozoic units, including the Galice Formation, by several workers. Radiometric dating of the mica contained in the schist gives a date of 141 million years (Late Jurassic) for the age of metamorphism. These rocks are traversed by the Applegate River, a tributary of the Rogue.

The composition of the Schists of Condrey Mountain indicates dark colored sediments or volcanic rocks, carbonaceous sediments, and light-colored volcanic rocks were deposited in the region during the Paleozoic Era or early Triassic time prior to the late Jurassic metamorphic event. Elsewhere, this metamorphic event disturbed rocks resulting from outpourings of lava and volcanic cinders which alternated with accumulation of sedimentary rocks including shale, sandstone, and limestone to the north. Generally, the extent and thickness of the sedimentary layers is not great. The total thickness of the unit, named the Applegate Group, is unknown because the rocks are extensively folded and faulted. Occasional discoveries of fossils have allowed an age of early Permian to late Triassic to be assigned to the Applegate Group.

In the region west of Mt. Ashland the Applegate Group has been intruded by the igneous rocks of the Mt. Ashland Pluton and other smaller intrusions. These intrusions locally have altered the Applegate Group rocks to different metamorphic rock types including gneissic amphibolite and hornblende gneiss with occasional thin bands of quartzite, marble, or calcium-silicate rock.

Jurassic rocks in southwestern Oregon are less severely metamorphosed than those of the Triassic Applegate Group. The Jurassic rocks are exposed from the region near Riddle southwesterly to the Oregon border. The Jurassic rocks include altered sedimentary and volcanic rocks which have been divided into several formations.

The Rogue Formation is composed of tilted massive volcanic rocks which include altered, greenish lava flows, and rocks composed of lava cinders and fragments. Some associated intrusive rocks are included in this formation. Along the Rogue River below Grave Creek, rocks originally considered to belong to the Rogue Formation have been subdivided into several units, including the Briggs Creek Amphibolite, the Rum Creek Metagabbro, and the Chrome Ridge Peridotite. To the east of the Rogue Formation is the Galice Formation, which consists of dense, thin-layered, dark-colored, fine-grained metamorphosed sedimentary rocks commonly including volcanic rocks. This formation is more than 15,000 feet thick. The Colebrooke Schist probably is correlative with the Galice Formation, and is exposed along the lower Rogue River below Agness.

The Dothan Formation includes a thick (18,000 feet or more) sequence of massive sandstone layers alternating with thin layers of fine-grained sedimentary rock, and some dense and pillow lava flows. Pillow lavas are lava flows which erupted under the sea as bulbous masses of lava several inches to a few feet across piled on one another. Chert beds locally are common.

The combined thickness of the Dothan, Rogue, and Galice formations exceeds 40,000 feet. These rocks were deposited in a rapidly subsiding trough during late Jurassic time. Because the rocks have been folded, faulted, the metamorphosed, their relative ages were for a long while uncertain. The Galice Formation contains the most fossils, mostly pelecypods and ammonites, which indicate an early late Jurassic age. The Dothan Formation is essentially non-fossiliferous, so its age relative to that of the Galice Formation is not known. Earliest studies indicate the Galice is older than, and underlies the Rogue and Dothan, but later studies reversed this order. A still more recent discovery of fossils within the Dothan Formation and recognition of thrusting in the Klamath Mountains have indicated the original interpretation was the correct one. Still, some geologists consider the Rogue Formation to be part of the Galice and Dothan Formations. Yet another interpretation is that these three formations are essentially contemporaneous and represent debris of a volcanic

TABLE 1
ROCK FORMATIONS IN SOUTHWESTERN OREGON

GEOLOGIC TIME SCALE			TIME	ROCK FORMATION
ERA	PERIOD	EPOCH	Estimated ages of time-boundaries in millions of years	
Cenozoic	Quatenary	Pleistocene		gravel layers and alluvium formed during various periods of uplift and erosion
			2-3	
	Tertiary	Pliocene		pre-Mazama Basalt (caps Table Rocks near Medford)
			12	
		Miocene		Heppsie Andesite Wasson Formation } Little Butte Volcanic Series Roxy Formation }
			26	
		Oligocene		Colestin Formation Tyee Formation
			37-38	
		Eocene		Flournoy Formation Lookingglass Formation } formerly Umpqua Formation Roseburg Formation }
			53-54	
		Paleocene		
			65	
Mesozoic	Cretaceous			Beds at Cape Sebastian Hornbrook Formation Days Creek } Myrtle Group Riddle Formation } Dothan Formation — Otter Point Formation
			136	
	Jurassic			Nevadan Orogeny Intrusive Rocks Galice Formation } Colebrooke Schist relative ages of these formations uncertain Rogue Formation }
			190-195	
	Triassic			Applegate Group (age of lower part uncertain)
			225	
Paleozoic	Permian			Schists of Condrey Mountain (age uncertain)
			280	
	Pennsylvanian			
	Mississippian			
			345	

island arc, in which the shallow-marine Galice Formation accumulated to the east of the arc (represented by the Rogue Formation), while at the same time the Dothan Formation was being deposited to the west of the arc in an oceanic or slope environment. The Otter Point Formation, which includes a wide variety of rock types, possibly due to mixing by thrusting, is thought to be a contemporary of the Dothan Formation.

In Late Jurassic or Early Cretaceous time the Schists of Condrey Mountain, Applegate Group, and earlier Jurassic rocks were intruded by sheets of pyroxenite and peridotite, which are dark-colored igneous rock types.

Typical of these intrusions are those cropping out on Red Mountain and Little Red Mountain southwest of Medford. Most of these intrusives have been altered to various serpentine minerals, which in turn have been altered locally to talc and chlorite. The greater portion of these intrusives presently consists of yellow-green to dark greenish-black serpentine. The material often displays the scratches called slickensides which are typical of this rock type. Sparse concentrations of chromite occur scattered within the serpentinite. The largest occurrence of this rock type is the Josephine Peridotite, which underlies much of the Kalmiopsis Wilderness area.

Sometime after the emplacement of the peridotite and serpentinite rocks the region of southwestern Oregon was intruded by large masses of granitic rock. This intrusive episode was related to the period of large-scale intrusion that occurred during the Jurassic Period along the Pacific coast. This general period of intrusion has been dated as Jurassic to Early Cretaceous. Radiometric dates for the Ashland pluton and similar smaller bodies range generally between 145 and 155 million years before present. One of the largest intrusions in southwestern Oregon makes up Mt. Ashland, near the California border, and another surrounds Grants Pass. These intrusives are exposed over areas of 150 or 200 square miles. Several smaller intrusive bodies crop out in the region and generally range from one to 10 square miles in areal extent. Numerous related smaller bodies exist. The smaller outcrops probably are portions of the larger intrusions, with intervening areas covered by the pre-intrusive rocks. Rock types present in the intrusions vary from diorite to granite, with small dikes and patches of pegmatite.

The erosion and deformation, and in part accumulation, of the pre-upper Jurassic rocks in southwestern Oregon was associated with the Nevadan orogenic episode that affected much of the Western United States. The younger of these beds were deposited in large down-faulted basins formed during this period. These beds are overlain by the Dothan and Riddle formations, which are late Jurassic in age and post date the Nevadan deformation. The Riddle Formation consists of conglomerates composed of pebbles of rocks from the underlying formations. These grade upward into sandstone and siltstone, which in turn grade upward into rocks of similar composition which locally contain abundant lower Cretaceous pelecypods. There may be a slight angular discordance between the Riddle Formation and the Cretaceous beds, which have been named the Days Creek Formation. Perhaps the Riddle Formation too is Cretaceous in age. These two formations comprise the Myrtle Group.

Following the intrusion and uplift of the region in Jurassic or early Cretaceous time, there was another period of deformation in middle Cretaceous time, which was followed by a period of erosion, and eventually, subsidence. Lower upper Cretaceous marine sedimentary rocks were deposited over a portion of southwestern Oregon. The name Hornbrook Formation has been given these rocks. They consist largely of well-layered siltstones and sandstones, with occasional beds of conglomerate. These rocks often have a nearshore aspect, and fossils are locally abundant within them. Several marine pelecypods, gastropods, and cephalopods have been identified from the Hornbrook Formation, and in some places lenses choked with marine invertebrate fossils are present. Much of this formation has been eroded since its deposition, and only a few scattered patches persist in the Bear Creek and Rogue valleys in the Ashland-Medford area and in northwestern Jackson County on the Grave Creek drainage.

Upper Cretaceous rocks crop out at Cape Sebastian on the Oregon coast. They consist of a basal layer of massive sandstone containing some conglomerate lenses. The upper portion is composed of thin bedded, dark-grey siltstone.

Tertiary strata in southwestern Oregon are represented by the former Umpqua Formation, which recently has been divided into three formations. From oldest to youngest they are the Roseburg, the Lookingglass, and the Flournoy formations. This division is based on unconformities now recognized within the sequence. Tertiary rocks are exposed along a band from Powers to Agness, and they are bordered on the west by a fault. The middle unit consists of dark grey sandstone and siltstone, which grade upward into a conglomerate which comprises the basal portion of the upper unit. The conglomerate grades upward into coarse sandstone, which in the vicinity of the mouth of Shasta Costa Creek, is coal bearing.

In the Powers to Agness region the Roseburg, Lookingglass, and Flournoy formations are unconformably overlain by the Tyee Formation. This formation crops out as a narrow synclinal band whose

southern end is at Bald Knob above the Rogue River at Illahe. The Tyee Formation consists of massive sandstone locally containing coal seams, and at its base, conglomerate layers.

On the northeast side of the Bear Creek valley the "Umpqua Formation" was mapped overlying the Hornbrook Formation. More recently, Cretaceous fossils have been found in these rocks, so perhaps they represent the upper portion of the Hornbrook Formation. These sedimentary rocks grade upward into a thick volcanic sequence. The volcanic series overlying these sedimentary rocks in the Bear Creek Valley include fragmental volcanic rocks and thin lava flows. The volcanic rocks are interlayered with thin, discontinuous layers of waterlaid sedimentary rocks. The volcanic sequence ranges from late Eocene to Miocene in age. They comprise a section of rock some 4000-5000 feet thick which is exposed on the east side of the Bear Creek valley. This sequence has been divided into the Colestine, Roxy, and Wasson formations. The latter two formations collectively have been called the Little Butte Volcanic Series. These volcanic rocks, and the underlying sequence of sedimentary rocks mapped as Umpqua, have been completely eroded on the west side of the Bear Creek Valley. Lying atop these volcanic sequences and extending many miles to the east in a series of massive, grey, thick bedded andesite flows which are capped by Pliocene basalt flows. This unit is therefore considered to be of Miocene (?) age and is called the Heppsie Andesite.

Table Rocks, two conspicuous mesas north of Medford, are capped by a lava flow approximately 125 feet thick. The rock is a dense, dark grey basalt containing small plagioclase feldspar and pyroxene crystals. The flow is nearly horizontal, vertically jointed, and at one time certainly covered a much broader area than it presently does. Thus the Table Rocks constitute the erosional remnants of a once expansive flow whose source is unknown, but the position and attitude of the flow suggest it originated up the valley of the Rogue River as a lava flow which was contained within the canyon walls before it spread onto the broad floodplain in the Medford area. The freshness of the flow prompted its assignment to latest(?) Pliocene age.

During the Miocene and Pliocene epochs the Klamath Mountains were eroded to a flat surface near sea level as indicated by alluvial deposits strewn across the ancient erosion surface. Several terrace levels have been identified in the Klamath Mountains and these represent temporary cessation of the elevation of the mountains during the Pliocene and Pleistocene.

THE WILD REACH OF THE ROGUE RIVER

Course of the River Between Grave Creek and Foster Bar

The thirty-four-mile segment of the river described in this *Bulletin* has an average gradient of approximately fifteen feet per mile, but the gradient ranges from about thirty-five feet per mile through portions of Mule Creek Canyon to about three feet per mile below Clay Hill Rapids. The elevation of the river at Grave Creek is approximately 690 feet; at Foster Bar it is about 155 feet. The Rogue River Canyon along this stretch of the river generally is steep. The river has carved a v-shaped notch in the mountainous terrane and almost lacks a flood plain. There is a distinct change in the topography several hundred feet above the river level, giving rise to the interpretation that the river recently has cut downward to its present depth into a more moderately dissected terrane.

Just upstream from its confluence with Grave Creek the Rogue River flows almost due north. Below the confluence the river swings toward the west and continues in that direction for eight and one-half miles. Here the rugged canyon is carved through the volcanic rocks of the Rogue Formation. These rocks contain lode gold deposits, and the gravels of the Rogue and its tributaries have been mined extensively in this area, particularly up Whiskey, Howard, and Montgomery creeks. About two miles below the Grave Creek junction Rainie Falls is encountered; the one obstacle between Grave Creek and the coast that cannot be run even by experienced boatmen. Boats generally are portaged around the falls (Fig. 3). Rainie Falls occurs where the river flows over a highly resistant metamorphosed zone within the Rogue Formation. Several significant rapids are encountered between Rainie Falls and Black Bar, most notably Tyee, Wildcat, Upper Black Bar Falls, and Lower Black Bar Rapids.

At Black Bar the river again flows north for two miles to Horseshoe Bend, at the head of which is Horseshoe Rapids. Here the river flows east, then swings sharply counterclockwise around Horseshoe Bend until it reaches a northwesterly direction, in which it flows with minor deflections for ten miles to Mule Creek. Several minor rapids are encountered along this stretch, but generally the river and its canyon between Horseshoe Bend and Mule Creek are gentler and the hill slopes less rugged. The nature of the river and the terrane through which it flows is a reflection of the manner in which the underlying rocks of the Dothan Formation respond to carving by the river and its tributaries. The sedimentary rocks of the Dothan Formation include mostly sandstones, siltstones, and shales, with some conglomerate layers. These rocks have no lode gold deposits, and the only gold production along this segment of the river has come from the gravels bearing gold washed in from lode deposits upstream. Kelsey Creek adds its flow to the Rogue at mile 13.2, and the river sweeps around Battle Bar at mile 14, soon thereafter to flow by the site of Zane Grey's cabin at Winkle Bar (Fig. 17), then past the legendary fishing hole at Missouri Bar. The gentle slopes spreading upward from the river below Missouri Bar are scarred by the desolation of Quail Creek Burn (Fig. 19). Then Mule Creek flows into the Rogue River from the north and the aspect of the river changes dramatically.

Here the river is deflected toward the southwest, often along a sinuous path, for some 14 miles to Foster Bar. The deflection is in response to the river's encounter with a northeast trending band of resistant volcanic rock of the Rogue Formation. Just below Mule Creek the river swings sharply to the southwest past Marian, and rushes toward Mule Creek Canyon, also called the Narrows. In Mule Creek Canyon the river is deeply incised between steep or vertical walls (Fig. 21), and rushes over some of the most dangerous rapids on the river. The river then writhes around Inspiration Point, Pinnacle Point, and over Blossom Bar (Fig. 24), the most awesome white water negotiable by boats on this section of the river. Evidence of gold mining activity is abundant along the Rogue River and many of its tributaries such as Mule Creek and Burns Creek. Gold was mined from lode deposits in the volcanic rocks and from placer deposits contained in the gravels of the Rogue and its tributaries. Paradise Bar Lodge slips by on the north bank and the river sweeps around Brushy Bar and Solitude Bar, scenes of hectic gold mining activity early in this century. At Tate Creek (Plate III) the river abandons its contortions and enters a relatively straight, placid stretch flowing southwesterly to the Big Bend. This change in the mood of the river is caused by its encounter with more easily eroded rock formations. Here the Riddle Formation, and then just below Clay Hill Lodge, the Flournoy Forcation, are traversed by the river (Plate IV). These formations contain sedimentary rocks, including sandstones, shales, and conglomerates. They are barren of the lode gold deposits found in the Rogue Formation rocks upstream, and what little mining was done along this portion of the river was for the placer gold weathered and washed out of the gold bearing rocks upstream.

About two miles above Foster Bar the river swings northwest and describes a semi-circle around big Bend before resuming its southwesterly course. Big Bend was the site of the decisive battle of the Rogue

River Indian War of 1855-56. Foster Bar (Fig. 31), at the lower end of Big Bend, is a much used take-out point for float trips down the river, and it is here that the River-Log ends.

Flooding, Rapids, and the Ecological Balance of a Wild River

On a river as wild and unfettered by artificial restraints as the Rogue River, large seasonal fluctuations in the volume of water flowing down the river naturally will occur. The amount of water passing a point during a specified period of time is called the discharge of the river. It is usually expressed as cubic feet per second. During the past few years the discharge of the Rogue River has varied from more than 10,000 cubic feet per second in the winter and spring months to about 1,000 cubic feet per second during the late summer. Flooding, of course, occurs periodically in response to heavy rains within the Rogue's drainage basin, usually in the winter or spring. Within the present century many large floods have occurred, and within the last couple of decades several severe floods have ravaged the Rogue River Canyon. During the 1964 flood the discharge was 55,000 cubic feet per second near Prospect, and 500,000 cubic feet per second below the confluence with the Illinois River at Agness. One mile below Grave Creek the river level was fifty-five feet above normal river level during the 1964 flood. During the 1974 flood the river washed out a segment of the trail in Mule Creek Canyon more than eighty feet above normal river level. Flood levels such as these are difficult to imagine, but in December of 1964 a county bridge at Agness which was 90 feet above low-water level was destroyed by flood water, 100 feet above low-water level at that point.

The periodic phenomenon of flooding has a direct effect on every aspect of the river course. In addition to the obvious geological and biological features exposed along the river, the boat traveler will be most impressed by the rapids which occur with frequent regularity along the river course. The numerous rapids along this section of the Rogue River result from various factors. Some arise when the river flows over a contact between rock units of differing hardness. For example, Rainie Falls (mile 1.8) is formed where the river flows over the contact between greenstones of the Rogue Formation and the more highly metamorphosed amphibolite gneiss (Fig. 3).

A second source of material partially damming the river and creating rapids below is slumping of the rocks and soil along the river bank into the river. This frequently occurs where weak rock such as shale (Fig. 16) and serpentinite are exposed in the cut banks and where forest fires have denuded the slopes of their protective cover, such as the site of the Quail Creek burn (Fig. 19) (mile 18.0).

A third cause of the rapids is the emptying of debris into the main canyon by tributary streams during periods of local flooding. Examples of rapids formed in this manner are numerous, and include Blossom Bar rapids (Fig. 24) (mile 22.9). This is the most common cause of rapids in this region. In other climates, such as the arid southwestern United States, this process accounts for almost all rapids along southwestern rivers, including the Colorado River.

Heavy rains in local areas can provide enormous power to move huge quantities of rock debris down steep tributaries, where it is dumped into the main river channel. The debris forms a partial dam, slightly impounding water behind it and creating a rapid where the river flows over it. Normally, on an unmolested river, the main channel floods periodically. A flood of sufficient vigor to move the coarsest boulders in the river bed, and thus smooth out or wash away the rapids, may occur only once each 50 or 100 years. A fact often overlooked is that flooding of a river is a natural phenomena, and in a real sense is beneficial, even necessary, to maintaining the balance of natural phenomena along the river course. The periodic flooding not only moves the rock load in a river, but also cleanses the gravels which serve as spawning grounds for anadromous fishes. Flooding also periodically thins out riparian vegetation along the river course and creates new habitat where biologic succession begins anew.

The ravaging effects of flooding on the Rogue River have been well documented and publicized. In the 1964 flood more than 1000 homes were inundated by the river. Highway 99 and Interstate 5 were blocked. More than 18,000 acres of orchards and other agricultural land were flooded. The damage was 25 million dollars, and several lives were lost. But consider what may happen when the dams under construction and contemplated on the Rogue River and its tributaries are completed. The river may never flood again as it did in 1964. While this effect may be desired by persons with dwellings or farmlands on the floodplain of the river, other effects, in time, will be felt. Without periodic flooding, the rock debris flushed into the river channel by local floods will not be removed. The debris dams and rapids may well grow larger, and perhaps some will become impassable with time. A rushing river may slowly become a series of slow flowing water impoundments behind impassable rapids. The silt that may result from mining and logging operations up tributaries of the river and from forest fires within the drainage basin will not be flushed from the river. It will accumulate, slowly eradicating the gravel beds necessary for spawning of steelhead, salmon, and trout. Riparian vegetation will encroach along the river-

banks and contribute to the congestion. These processes already have been observed along other rivers which have been recently dammed. Glen Canyon Dam on the Colorado River assures that no major flooding will again occur on that river. Already the tamarisk plant has begun to take over the sand bars so valued as camping sites by river travelers. There is no flooding to control it as in the past. The dam impounding Clair Engle Lake on the Trinity River in California resulted in rapid build-up of silt from logging and mining operations on the tributaries of that river, and riparian vegetation has encroached steadily. The gravel beds necessary for spawning are rapidly being clogged by accumulating silt. If all the dams under construction and proposed for the Rogue River and its tributaries are completed, one might expect these effects soon to become obvious on that river.

Climate

The winters in the Rogue River Canyon generally are rainy and mild, and the summers are warm and dry. At Gold Beach mean monthly temperatures range from 47 degrees Fahrenheit in January to 58 degrees Fahrenheit in July, August, and September. Yet in the Rogue River Valley at Medford they range from 44 degrees Fahrenheit in December to 89.5 degrees Fahrenheit in July. Along the wild reach of the river light snow is not uncommon in winter months, and there are occasional heavy snows. Temperatures over 100 degrees Fahrenheit occur in the summer. The temperature of the water of the Rogue River itself reflects the seasonal air temperature variation. Also, there are additional factors which result in warming of the river water downstream. The turbulent flow of the water itself causes warming, and tributaries, whose temperatures are directly related to their lengths, add their warmer water as well.

The distribution of rainfall in the area is strongly controlled by the topographic configuration of the Coast Range and the Klamath Mountains and proximity of the Pacific coast. The moisture laden marine air from offshore soon encounters the rise of the mountains, and quickly begins to lose its moisture as it lifts over them. Thus rainfall diminishes markedly inland. Gold Beach on the coast at the mouth of the Rogue River receives 80 inches of rainfall per year. A similar amount is received at Illahe, 33 miles up the river. But at Grants Pass only 26 inches are received, and at Medford, only 17 inches. Precipitation again increases up the Rogue from Medford as the prevailing westerly winds rise up the higher slopes of the Cascade Mountains.

Rainfall in southwestern Oregon is seasonal, falling mostly during the winter months. Gold Beach, for example, averages 14 inches of precipitation in December, but less than one-half inch in August. Winter storms occasionally dump exceptional amounts of moisture in the area, and often floods result. The most severe flooding in recent times resulted when 9 inches or more of precipitation fell throughout the Rogue River basin from Medford to Gold Beach during the period December 19-23, 1964. Twenty-one inches of precipitation fell at Illahe during that same period, more than 8 inches coming on December 22 alone.

The December 1964-January 1965 flood exceeded in severity the December 1955-January 1956 flood and the flood of 1890. It probably did not exceed that of 1861. Of course, less severe and more local floods have occurred throughout the Rogue River basin.

Plants

Temperature, precipitation, slope direction, fire, and geology all play a role in determining the type of vegetation growing in a given region. As described earlier, the wild reach of the Rogue River flows through mixed conifer and mixed evergreen forests of Douglas fir, tan oak, madrone, golden chinkapin, and canyon live oak. Less abundant are sugar pine, ponderosa pine, and incense cedar. Often the distribution of these species is principally controlled by one or two of the influences mentioned above. Precipitation increases along this segment of the river as one travels downstream from Grave Creek to Foster Bar. The canyon itself provides access to moist, upriver winds and fogs from the coast, thus in close proximity to the river course are found species normally more abundant in the wetter terrain downstream toward the coast. These include sugar pine, Sitka spruce, and Port Orford cedar.

The direction of the slope of a hillside has a pronounced effect on the distribution of vegetation. North facing slopes provide more shade and therefore retain more moisture than the more exposed hotter, drier, south facing slopes (Plate I). Manzanita, oak, and madrone commonly are distributed on the drier south facing slopes whereas the cooler north facing slopes are mantled with stands of mixed conifers. Often this contrast in vegetative cover between north and south facing slopes on opposites sides of the river is dramatic.

Forest fires, such as the Quail Creek burn of 1970, destroy most of the vegetation allowing biological succession to begin anew. Certain plaint species including buckbrush and manzanita typically appear in an area freshly burned, and as they grow, provide shade for growth of species more typical of later stages in the succession. They are eventually overtopped by the conifers established in their shade. This botanical succession is accompanied by a faunal succession which is linked directly to the changing floral habitat.

The vegetative cover growing on soils derived from

serpentinite, a kind of metamorphic rock common in the Klamath Mountains and Oregon Coast Range, is unique in composition and physical character. Vegetation on these soils is invariably sparse and stunted, aparently the result of physically unfavorable, shallow soil, and the relatively high content of certain chemical elements which restrict growth in some plants and relatively low content of other chemicals necessary for most plant growth. Studies in southwestern Oregon have shown that plant distribution on serpentine soils is controlled by high levels of magnesium, nickel, and chromium, in that order of importance. The woodlands which develop on the driest serpentine soils in the Klamath Mountains include mostly Jeffrey pines scattered over open grasslands. Often this pine is the only tree found on dry serpentine soils. Even wetter forests have a sparse, dry appearance, and are dominated by several conifers including Douglas fir, incense cedar, and Jeffrey pine. Less abundant are other pines including western pine, sugar pine, and knobcone pine. Associated with these are dense layers of shrubs such as tan oak, red huckleberry, silk tassel, and myrtle.

Immediately along the river course riparian vegetation predominates, and typical of this vegetation are big leaf maple, red alder, and myrtle.

Animals

The wild reach of the Rogue River is home for a broad variety of wildlife. The Columbian black-tail deer (Fig. 30) is common throughout the area, as is the black bear. The latter frequently are seen along the river banks when the salmon are spawning. Smaller mammals are represented by a variety of squirrels, including the Beechy ground squirrel, the yellow-pine chipmunk, the pine squirrel, and the gray squirrel. Deer mice are frequently nocturnal visitors in camp, especially if food is left out. At dusk one often can see numerous bats flitting over the water in pursuit of insects. On the calmer stretches of water the effervescent river otter cruises.

Amphibians and reptiles are abundant along the river. Two common amphibians are the Pacific giant salamander, likely to be found in the waters of the Rogue's tributaries, and the rough-skinned newt. This newt is especially abundant, and is found in the slower stretches of the Rogue and its tributaries. It is readily recognized by the rough brown skin on top of its body, and deep orange undersides. Another amphibian commonly heard, but seldom seen, is the Pacific tree frog. Among the most frequently seen reptiles are the Western fence lizard and the Western aquatic garter snake. In quiet backwaters the Pacific pond turtle resides.

The Rogue River hosts a variety of fish. In addition to the well known salmon and steelhead the species include red-sided shiner, sculpin, and shad in the lower reaches of the river. In stretches of slow water or still backwater warm-water species such as large-mouth bass, catfish, crappie, blue-gill, carp, and sucker are found. The various game fish in the Rogue River provide some of the most exciting fishing in the Northwestern United States. Some authorities claim there are virtually no native trout in the lower Rogue River. However, numbers of rainbow, cut-throat, German brown, and brook trout do exist in the tributaries of the Rogue or along limited sections of the upper Rogue River. Many of these fish are stocked regularly. It is the anadromous species which have long been sought for sport and food. Foremost among these are the steelhead, sea-run rainbow trout which return to the Rogue to spawn after a year or two at sea, where they may range as far as the Aleutian Islands. The Oregon Game Commission considers any steelhead under 20 inches in length a trout, and these are subject to different regulations than those steelhead over 20 inches. There are two runs of steelhead up the Rogue River annually. The summer run consists of two more or less distinct but overlapping groups of steelhead which start up the river in May and continue slowly through October. The water level is low and the steelhead lie in deep pools for long periods. Fly fishing for these summer steelhead is prized as a fine, sporting activity. The winter run starts as the river begins to rise from seasonal rains in October and November and peaks upstream in February and early March. The steelhead, unlike the salmon, returns to the ocean after spawning.

Chinook salmon work their way up the Rogue in two runs. The spring run begins in late February and March, and culminates with the salmon spawning far upstream in late September and early October. The fall run of Chinook salmon starts upriver in August, reaches the Grants Pass area in September and October, and they spawn throughout October. The Coho, or silver, salmon enter the Rogue with the fall Chinook, but do not migrate so far upstream. They spawn in December and January, mostly in the lower 30 miles of the river.

An excellent summary of the sport fish in the Rogue River is presented in Irv Urie's Fishing Guide to the Rogue River Basin cited in the list of readings.

A rather different type of game fish is the sturgeon, which leaves the ocean and migrates upriver during very high water intervals to spawn. They tend to lie quietly in deep holes in the river bed, and have been seen as far up river as several miles from Grants Pass, though most of them are concentrated below Rainie Falls. These fish are large; often 5 feet or 6 feet or more in length.

Birds abound in the region as well. Along the trail the hiker may encounter quail or ruffed grouse (Fig.

27). Over the river an occasional osprey wheels. His nest can be seen high atop a dead snag (Fig. 18). Kingfishers sit on branches hanging over the river, and dippers (water ouzels) bob on rocks, then take off like tailless missiles. On steep and overhanging rocks above the river one finds the mud-daubed nests of cliff swallows (Fig. 10). Rounding a bend in the river you may come upon a flock of ducks, common mergansers, or a great blue heron that takes to flight with the grace (and sounds) of a pterodactyl. Occasionally, a resident gull sits on a rock midstream and warily eyes your attempts to photograph it. Other birds likely to be seen include bald eagles, woodpeckers, bandtailed pigeons, grouse, quail, and hummingbirds.

Whether hiking or boating, silence is the element which brings these often unexpected sightings, though some individual animals are less shy than others. Paddling down the river in a canoe the author spotted a river otter, and shipped his paddle to drift noiselessly toward it. It was nearly run down by one of the "mail boats" from Gold Beach, which, with a roar that reverberated through the canyon and announced its arrival several minutes before the fact, and a wake that seemed nearly to empty the river of its water, plowed directly over the spot the otter had occupied just seconds after it submerged, presumably in panic. About 30 yards upstream the roar ceased, the boat slowed, and the captain announced via loudspeaker to his audience of perhaps 30 passengers that if they would just look downstream they would likely see a river otter. Then, looking reproachfully at the author bobbing wildly in the mail boat's wake, he added, "if that guy in the canoe doesn't scare it." Until that moment, the author had not fully appreciated the importance of a silent approach to the wildlife along the Rogue River.

ROGUE RIVER LOG

Introduction

This Log describes that portion of the Rogue River between Grave Creek, approximately 15 miles northeast of Grants Pass, Oregon, and Foster Bar, about one mile above Illahe, Oregon. Illahe is situated about 6 miles north of Agness, Oregon (Fig. 2). The Log describes a variety of geological, geographical, and occasionally biological, features visible along the river and the trail. Historical notes are included also. The observations on which these descriptions are based were made during several trips down the river and trail between the summers of 1972 and 1975.

Three topographic maps are used as base maps for the River Log. All are 15-minute series U.S. Geological Survey topographic maps with a scale of 1:62,500, or about one inch to the mile. The maps, traversed from east to west by the Rogue River, are named the Galice Quadrangle, the Marial Quadrangle, and the Agness Quadrangle. Boundaries between these quadrangles are indicated on the maps.

These topographic base maps have been arranged into five maps appropriate in size to the format of this publication. (These maps, labeled Map 3 through Map 7, appear at the appropriate positions within the River Log.) Mileage figures have been added to the maps in one mile increments beginning at Grave Creek boat landing (mile 0.0) and continuing to Foster Bar (mile 33.8). Notes in the River Log locate features to the nearest one-tenth (0.1) of a mile, and the reader must interpolate between mile markers on the map. Mileages are given in the two columns at the left. The first column is accumulated mileage from the Grave Creek boat landing, and the second column is the distance from the preceding station.

Some confusion might result from trail markers in the form of metal signs which were placed along the trail to indicate miles traveled from Foster Bar toward Grave Creek. That is, they are numbered in the opposite direction from the miles indicated on the maps accompanying this Log. Only a few such signs were seen along the trail and their locations are noted in the Log.

The hiker will soon discover that the river often is out of sight, and sometimes at a considerable distance from the trail, and observations made from a boat on the river are meaningless to him. Conversely, the boat traveler will not see many of the features exposed along the trail. Still, the Log attempts to provide for both hiker and boat traveler. Observations provided in the Log were made from the river, unless specifically noted as made from the trail. The boat traveler will find the mileages indicated on the map accurate whereas the hiker will not. That is because the trail often contours back into deep ravines to avoid steep up- and down-trail stretches with the result that the trail distance between Grave Creek and Foster Bar (approximately 40 miles) is considerably farther than the river distance (approximately 34 miles). Hikers and boat travelers alike should pay continuing attention to features such as creeks and distinctive bends in the river. This should allow them to locate themselves and the features described without undue difficulty.

The traveler down the Rogue River should realize that many of the features described are ephemeral. Sand banks, rock slides, flood effects, trail conditions, location and development of campsites, bridges, old cabins, and birds' nests will change, some of them rapidly. The traveler must not expect to find such features as they were described in 1972 or 1975, but he or she may be interested in comparing the situation with that which existed at the time of publication of the Log. The author does not want to be held personally responsible if the traveler is sorely disappointed at not finding an outhouse where he stated one was located in 1975.

Important notations are printed in **Bold** type, and names of geological formations are printed in SMALL CAPITALS. Historical notes are set off from the rest of the text by a different style of type.

Technical terms are avoided, but they cannot be eliminated entirely. Many of those that must be used are explained immediately in the text, and the rest are defined in the accompanying list, Meanings of Technical Terms.

River Log

The Wild Rogue River From Grave Creek to Foster Bar

Map 3

MILEAGES

0.0 0.0 **GRAVE CREEK Boat Landing.** The boat landing is just below the point where Grave Creek enters the Rogue River (Fig. 1). The Rogue River trail begins at this point also.

GRAVE CREEK

Grave Creek is named for the grave of Martha Leland Crowley, a young pioneer girl who was buried nearby at Sunny Valley in 1846. The settlement of Leland is named for her, and an attempt to change the name of Grave Creek to Leland Creek was made in 1854.

The U.S. Bureau of Land Management and U.S. Forest Service often maintain a check station here and request hikers and boaters to register. Outhouses are available. The first mile of the trail winds along the north side of the river through a steep walled canyon. Here the river is cut into the Rogue Formation of late Jurassic age. The Rogue Formation includes mostly volcanic rocks which have been mildly metamorphosed. The various rock types included in this formation are best distinguished where weathering and erosion have accented textural differences. They include volcanic conglomerates and breccias, tuffs, pillow lavas, and locally, some gneiss and schist. The rocks dip steeply and are thoroughly fractured. The formation includes some nearly contemporaneous intrusive bodies. The rocks seen beneath the bridge at Grave Creek include tuffs and volcanic conglomerates. These beds strike northeasterly and dip southeast.

0.1 0.1 **GRAVE CREEK RAPIDS.** This is a rough stretch of water in which most of the river sweeps left around a gravel bar. The rocks along the banks are greenstone or altered lava flows.

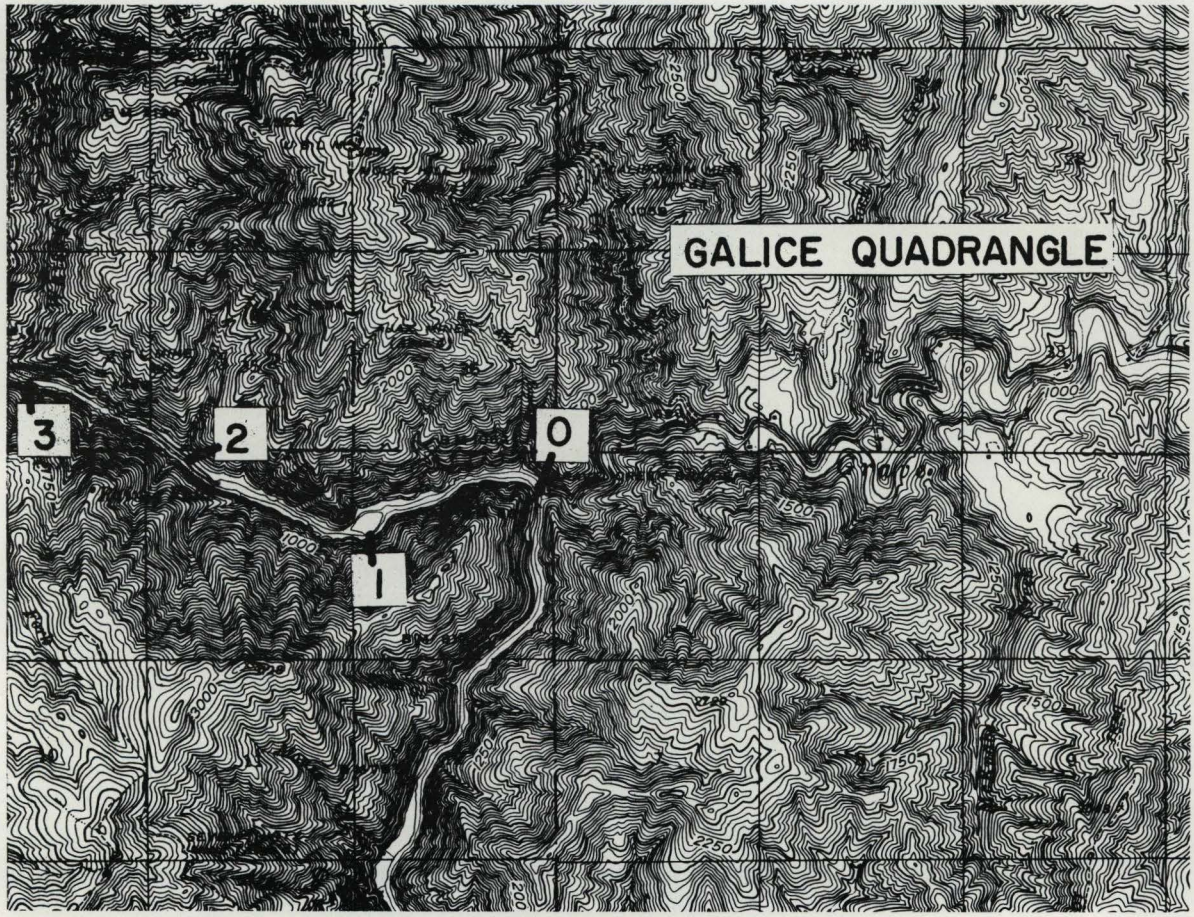
0.3 0.2 **GRAVE CREEK FALLS drops** 4 or 5 feet over Rogue Formation volcanic rocks.

0.4 0.1 **QUARTZ VEINS up to 8 inches wide** cut greenstones along the trail above the river.

0.6 0.2 **A concrete foundation of an old cabin** is situated on the north bank. Potable water is available from a small spring near the foundation. The name Sanderson and the date 1939 are scribed in the concrete. There is some evidence of an old mining operation on this site.

The first of four Sanderson brothers came to this site from Ohio in 1903. All four brothers (the older two were twins) lived on this mining claim in a cabin which was located about two hundred yards downstream from the present foundation. The foundation for the springhouse was built in 1939, and in 1940 a new cabin was built. The only access to the cabin was by river or trail, and when the last brother could no longer manage the hike in to the cabin, it was abandoned in 1971. The U.S. Bureau of Land Management then dismantled the cabin. The remaining foundation is that of the newer cabin; no evidence of the older cabin remains.

0.9 0.3 **SANDERSONS ISLAND.** Sandersons Island (Fig. 2) is a broad island composed to Quaternary alluvium. The boulders and cobbles covering this island were deposited there by the Rogue River during fairly recent



Map 3. *Topographic map of the Rogue River from Mile 0 to Mile 3.2.*

SANDERSONS ISLAND

times. At this point a fracture zone extends across the river, and the valley broadens in response. The remains of an old cabin can be seen on the south side of the river just above the ruins of a mule bridge downstream at mile 1.1.

1.0 0.1 **A wooden sign along the trail** marks the level reached by the high water of the 1964 flood, 55 feet above normal level.

1.1 0.1 **SANDERSON'S BRIDGE formerly was situated on this site.** The Rogue river trail formerly extended along the south side of the river to this point where a bridge was constructed to allow mules to cross the river to the trail on the north bank. The concrete structure visible on the south bank is a remnant of the bridge which was built in 1907 and destroyed by a flood in 1927. The Rogue Formation at this point is a highly sheared greenstone. This greenstone is exposed along the river banks to the head of Rainie Falls. The trail at this point is about 80 feet above the river level, but a spur extends down the hill to the campground above Rainie Falls. Picnic tables and outhouses are available.

1.2 0.1 **Volcanic conglomerate is exposed** along the north bank of the river and contains numerous volcanic rock fragments surrounded by green volcanic tuff. The fragments contain small patches of mineral filling

gas bubbles originally present in the lava fragments. They consist of zeolites and quartz, and rarely, calcite. Some fragments contain small crystals of plagioclase feldspar which crystallized in the lava prior to the lava's being fragmented.

1.6 0.4 **Quartz veinlets** ranging in width from a fraction of an inch to 3 inches wide shatter the rock from this point downstream to approximately mile 1.8.

1.8 0.2 **RAINIE FALLS.** (Various spellings of this name appear in the literature and on maps, including Ramey Falls, and Reamy Falls. The feature reportedly is named after a prospector who was killed nearby.)

RAINIE FALLS

Just at the head of Rainie Falls the greenstones of the ROGUE FORMATION give way abruptly to amphibole-bearing gneiss. This rock unit is called the Briggs Creek Amphibolite by some geologists. Several geologists have interpreted this contact in various ways. It has been suggested that the gneiss represents a slice of the Triassic APPLEGATE GROUP. Others describe the contact as gradational, and still others claim the contact is faulted, and represents a metamorphosed lava layer within the ROGUE FORMATION. The rock is distinctly banded in some areas, alternating between darker zones of hornblende-rich rock and lighter, more quartz-rich layers. In addition to the hornblende and plagioclase which make up the bulk of the rock, quartz, biotite, epidote, and garnet are present. The grain size of the hornblende in the darker layers is variable, with some grains being quite coarse. Considerable amounts of epidote (the lime-green coloration) are present, often coating fractures in the rock. At the immediate site of Rainie Falls the amphibole gneiss is finer grained, and contains small white veins of plagioclase feldspar cutting through the rock. The rocks at this locality strike northeasterly and dip southeast at seventy to eighty degrees, but both minor and major folds can be traced through the rock. The appearance of more resistant, perhaps more highly metamorphosed material at this locality explains the existence of Rainie Falls. The Rogue River has not been able to erode these more resistant rocks as readily as those encountered below the falls. Resistant rock layers often account for rapids or waterfalls along river courses. About 200 yards below Rainie Falls are several large boulders of light colored, wavy banded quartzite or quartz gneiss. The wearing of the river has accentuated the texture of these rocks, giving them a gnarled appearance. At this site it is difficuts to say whether these rocks are in place or have been brought to their present location by the river or by sliding or rolling downhill. Rainie Falls has a vertical drop of approximately 10 feet, and cannot be run safely by boat. Boats traveling down the river generally are lined down the fish ladder on the north side of the falls, or portaged (Fig. 3).

2.1 0.3 **CHINA GULCH.** At the first rapids below Rainie Falls on the south side of the river the wooden pole-supported metal pipe formerly carried water, but has been ravaged by flood waters. The rocks here consist of fine-grained amphibolite with some patches of coarser material. Immediately downstream from China Creek on the north bank massive outcrops of quartzite or quartz gneiss crop out. These may represent recrystallized chert beds within the Briggs Creek Amphibolite.

2.3 0.2 **A dry ditch** originates in a small dry gulley and parallels the hillside below the trail westward to the next dry gulley. This represents an attempt to divert water from one creek bed to another for mining purposes. It was probably done during the early 1900's.

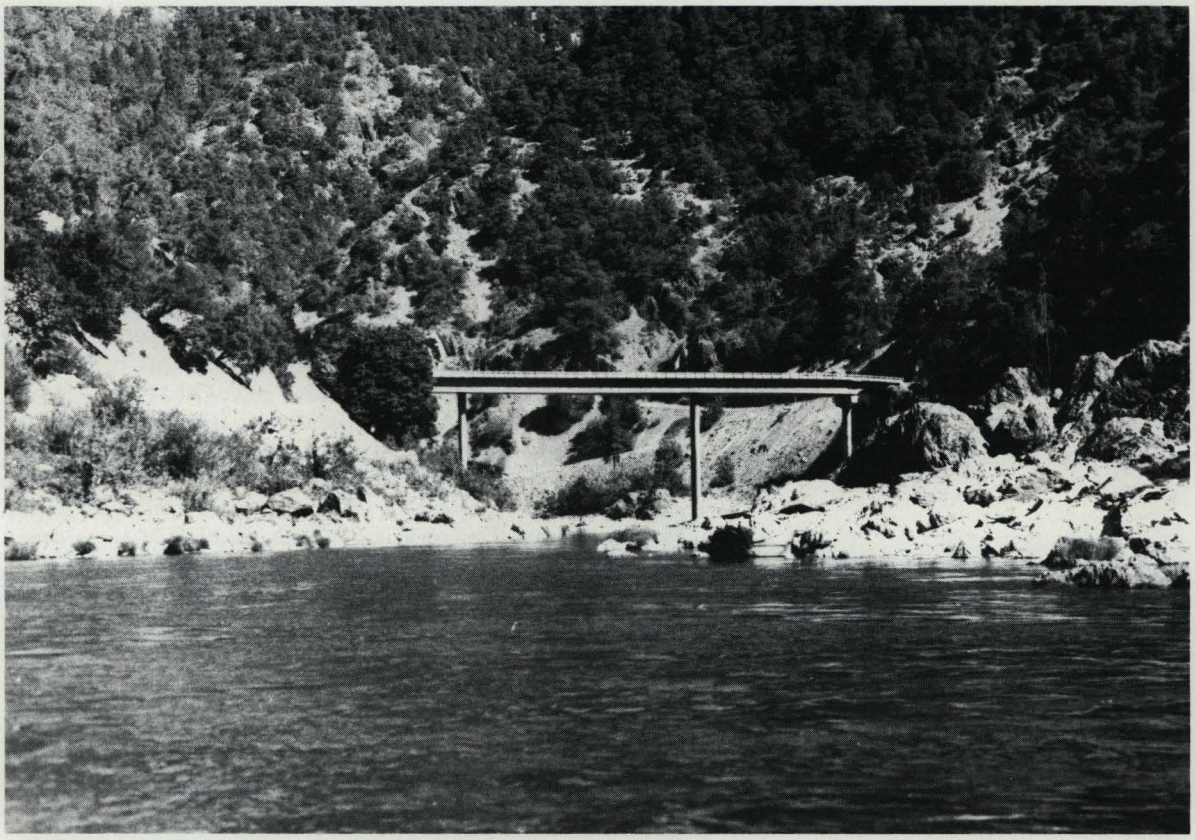


Figure 1. A view down the Rogue River toward Grave Creek Bridge. *The Grave Creek boat landing and beginning of the River Log (mile 0.0) is just below the bridge on the north (right) bank.*

2.4 0.1 **Metal mesh fencing** has been used below the trail to stabilize the amphibolite scree slope which the trail traverses here (Fig. 4).

2.5 0.1 **Greenish serpentinite** is exposed on the north side of the river. The rock is sheared, and the fractures are nearly vertical. This rock recently has been mapped to the south of the Rogue River and has been called the Chrome Ridge Peridotite. (A cabin may be seen on the south side of the river at about the point where the serpentinite is first encountered.) Intermixed with the serpentinite are greenstones, amphibolites, very coarse grained amphibolite gneiss, gabbro, and hornblendites. This rock is mapped as gabbro on one geologic map but at this locality it is very similar to the amphibolite encountered upstream at Rainie Falls, except that it does not contain the quartz and garnet here. It has recently been called the Rum Creek Metagabbro. Some geologists have aptly described the rock in this area as "mixed rocks"; an accurate description along this stretch of the river extending downstream to Whiskey Creek.

2.6 0.1 **Light colored dikes** cut through serpentinite here. Often such dikes in serpentinite are composed of rodingite.

2.7 0.1 **A large rubbly slide area** may be seen on the north side of the river where the serpentinite and "mixed rocks" have collapsed and slumped

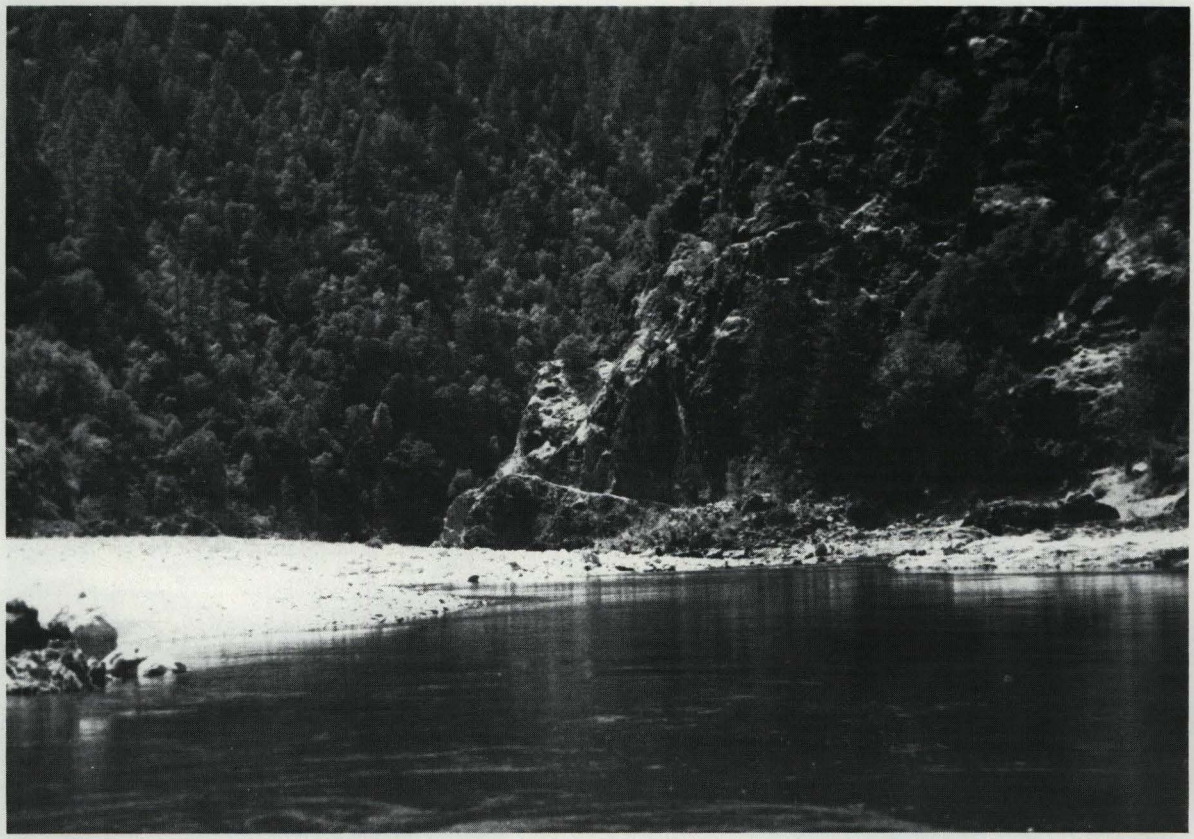


Figure 2. Sandersons Island *is formed by the broad gravel bar composed of Quarternary alluvium in the left middle distance. The Rogue River Trail may be seen carved into the rock face at the center of the photograph. Mile 1.0.*

down to the water level at this point. The trail cuts across this shiny serpentinite outcrop approximately 100 feet above the river level.

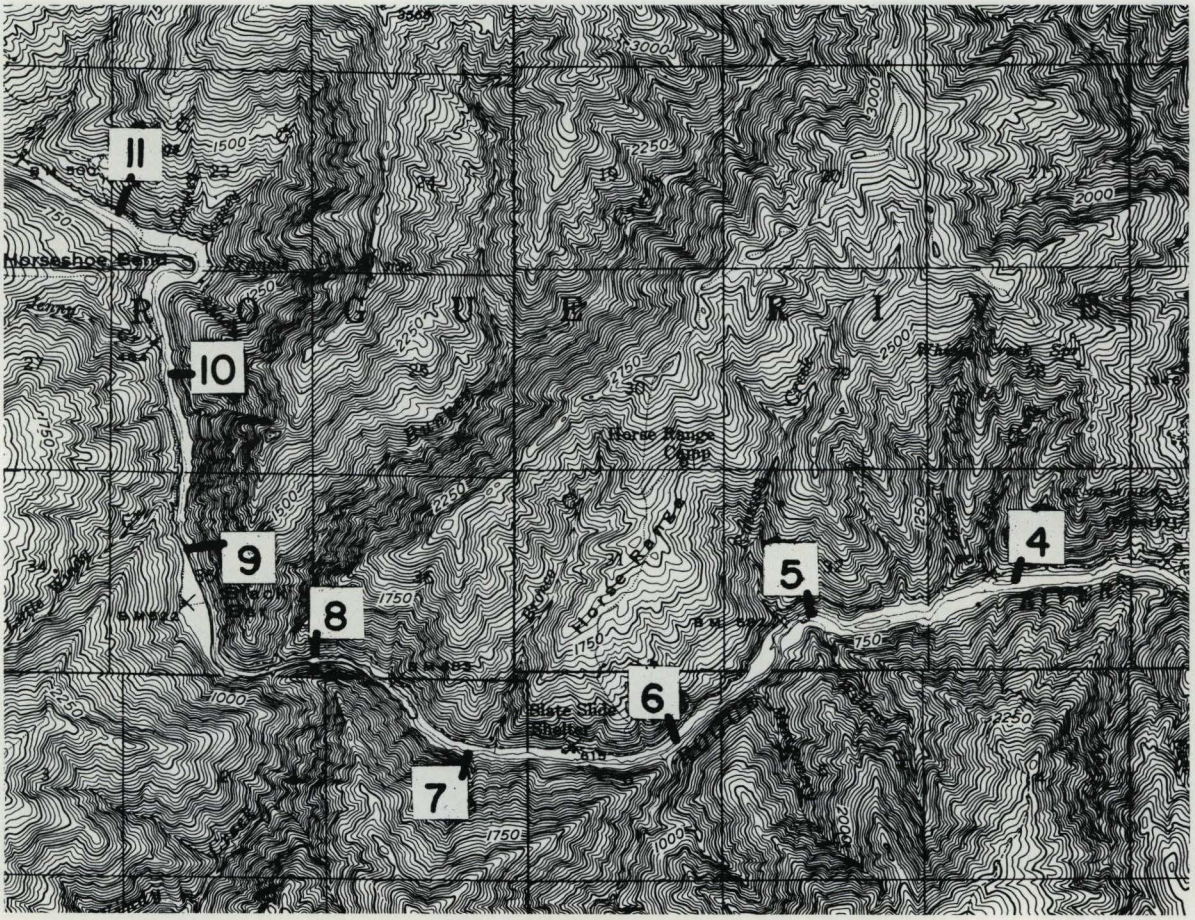
2.8 0.1 **Serpentinite underlies the barren slope** on the south side of the river.

3.2 0.4 **The River Log passes from Map 3 to Map 4.**

3.2 0.0 **WHISKY CREEK enters from the right** (north). Several placer gold deposits were located up Whisky Creek and Rum Creek, entering from the south. Creeks with names such as Whisky Creek, Rum Creek, and Booze Creek were so named by the early prospectors whose minds may have been on liquid refreshment other than creek water. The records of gold production from placer deposits along the Rogue River are sparse, and the history of mining of the placers is poorly documented. References to mining activity are often hearsay, as the author has been unable to substantiate the stories repeated about these activities. Exact dates of mining activities, quantities of gold produced, and numbers of miners involved all should be recognized as uncertain.

WHISKEY CREEK

The large rock slide at this site occurred shortly before the turn of the century and for awhile dammed the Rogue River almost to Hells Gate, some fifteen miles upstream. The water eventually washed away the debris dam. The small tributary called Whisky Creek is traversed by a large foot bridge (Fig. 5) recently constructed across the creek.



Map 4. *Topographic map of the Rogue River from Mile 3.2 to Mile 11.7.*

The remains of an earlier, smaller foot bridge may be seen along the creek about 100 feet below the new bridge. Flooding along the small tributary caused the foundation of the old bridge to be displaced and tilted. It is difficult to imagine such a powerful flow of water in such a small tributary, but frequent local floods produce effects of this type at many places along the river.

The China Gulch Trail comes into the Rogue River Trail at this point. This trail, used by early miners, descends into China Gulch and the Rogue River from Mt. Reuben, several miles to the northeast. It provided access to the Rogue River Canyon until 1963, when the present trail on the north bank of the river between Grave Creek and Whisky Creek was built. Mt. Reuben was named for Reuben Field, who fought in the Rogue River Indian War of 1855-56.

Also, there is a vehicle track from the road above down to Lou Martin's cabin just above the bridge as Whisky Creek. This road is not open to the public.

3.4 0.2 **CHROME RIDGE PERIDOTITE** is exposed on the south side of the river directly across the river from the Big Slide. Here the peridotite includes much serpentinite which is fractured and iron-stained, and large boulders of serpentinized material are exposed along both the north and south banks of the river.

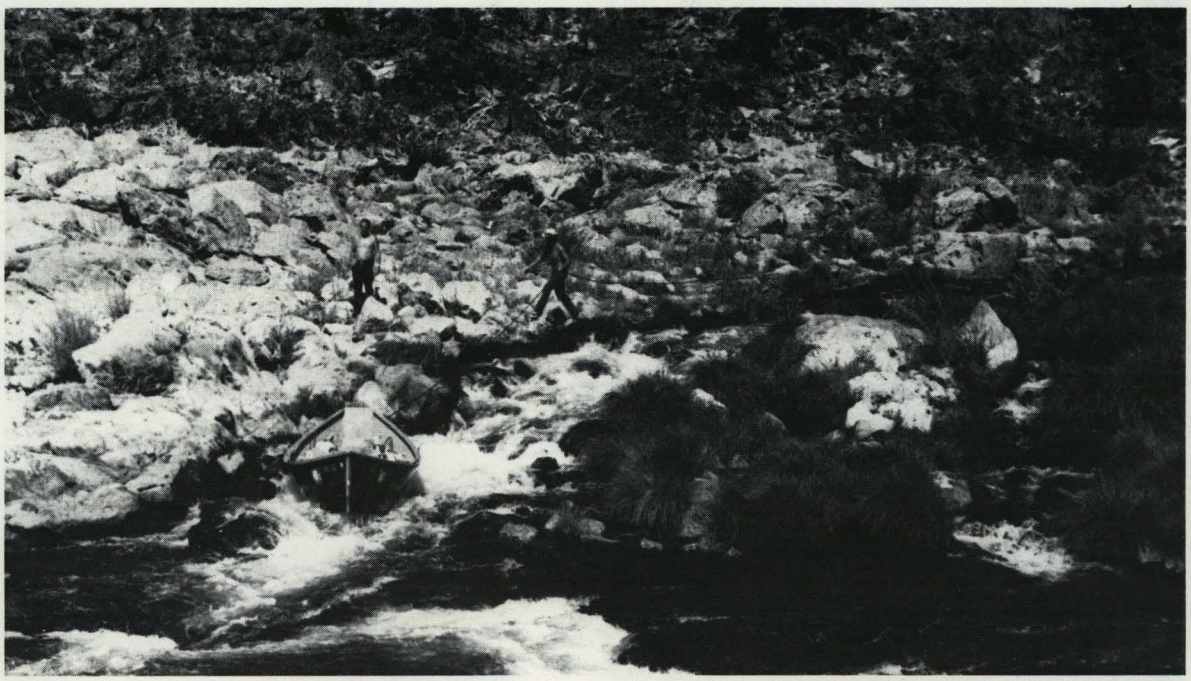


Figure 3. River guides rope a drift boat *around Rainie Falls down the fish ladder on the north side of the river. Mile 1.8.*

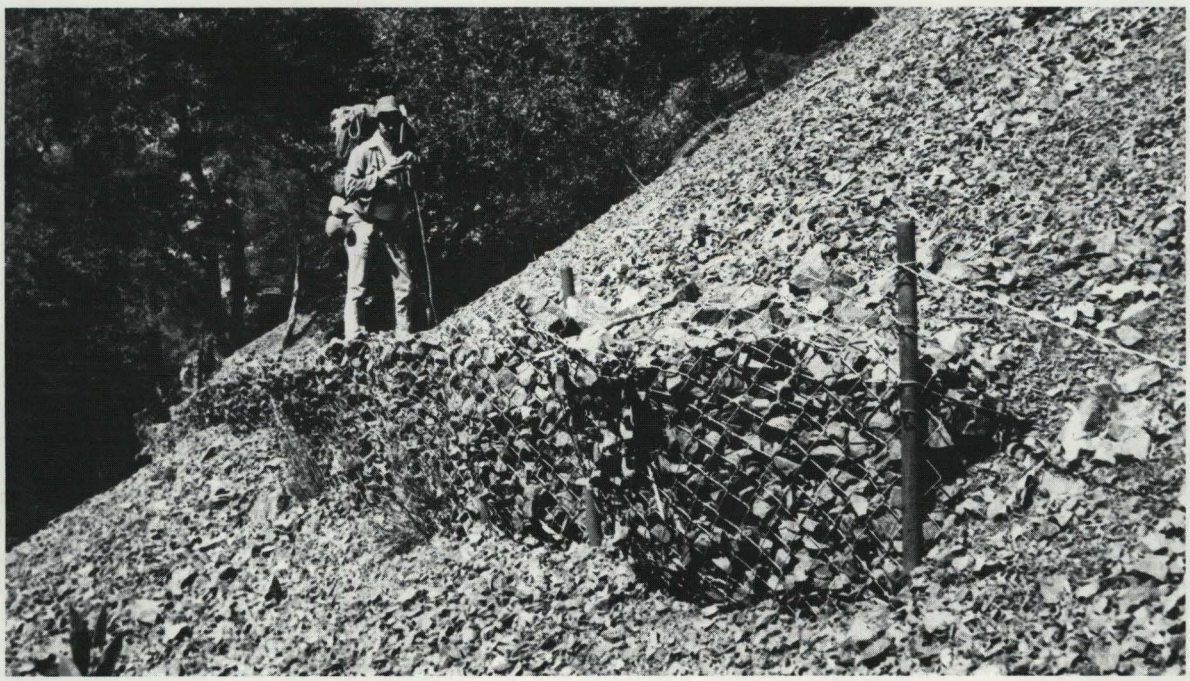


Figure 4. Chain-link fencing is used *to stabilize the trail across an amphibolite scree slope at mile 2.4.*

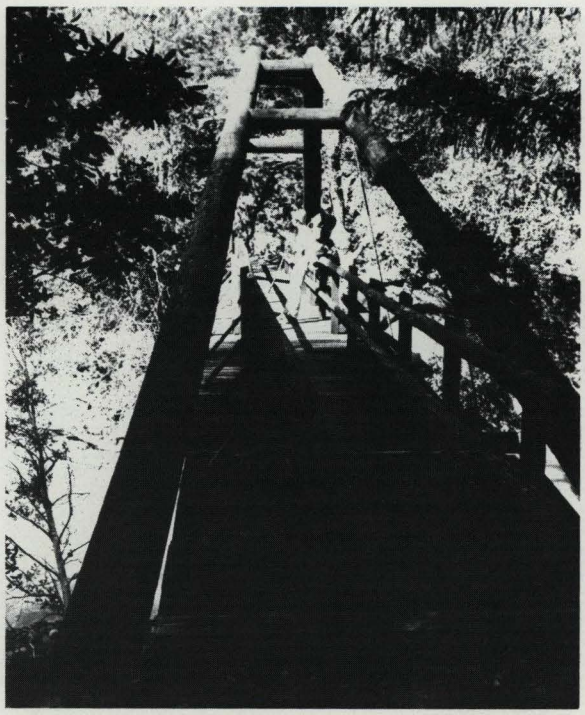


Figure 5. This bridge was built across Whiskey Creek *in 1972 after a smaller footbridge was washed off its foundation by a flood. Mile 3.2.*

3.5 0.1 **THE BIG SLIDE exposes much serpentinite** rock along the north bank. The trail cuts across the flat toe of the slide, and the Big Slide Campground is located on this same feature. Rocks of the ROGUE FORMATION have been mapped from this point down river to mile 4.4. Picnic tables and outhouses are available here. Note the vegetation, particularly the trees, which now occupy the slide area. All have grown there since the slide occurred.

BIG SLIDE

3.6 0.1 **An unnamed creek that enters on the south side of the river** has near its mouth a nice picnic site complete with a picnic table and toilet. The creek is called Doe Creek by river guides.

3.7 0.1 **THE DOTHAN FORMATION is encountered on the trail.** At the contact the metamorphic rocks of the ROGUE FORMATION are sheared, and much quartz is present in veinlets. These rocks give way to the DOTHAN FORMATION, which consists of interbedded siltstone and sandstone layers. The DOTHAN FORMATION is not encountered along the Rogue River until mile 4.4.

4.4 0.7 **TYEE RAPIDS** is at the head of the narrow chute on the north side of the gravel bar called Tyee Bar (Plate I). These rapids are very difficult for most boat travelers to run. It should be approached with great caution. A man was drowned in a boating accident here in September of 1976.

This is the point where the DOTHAN FORMATION is found at river level. The ROGUE-DOTHAN contact is generally interpreted as a fault contact which dips steeply toward the east. In fact, this contact separates two distinct geologic provinces. Most geologists consider the ROGUE FORMATION to be a portion of the Klamath Mountain Province, whereas the DOTHAN FORMATION belongs to the Coast Range Province. Other geologists and geographers consider the Klamath Mountains Province to extend to the coast in southwestern Oregon. Considerable

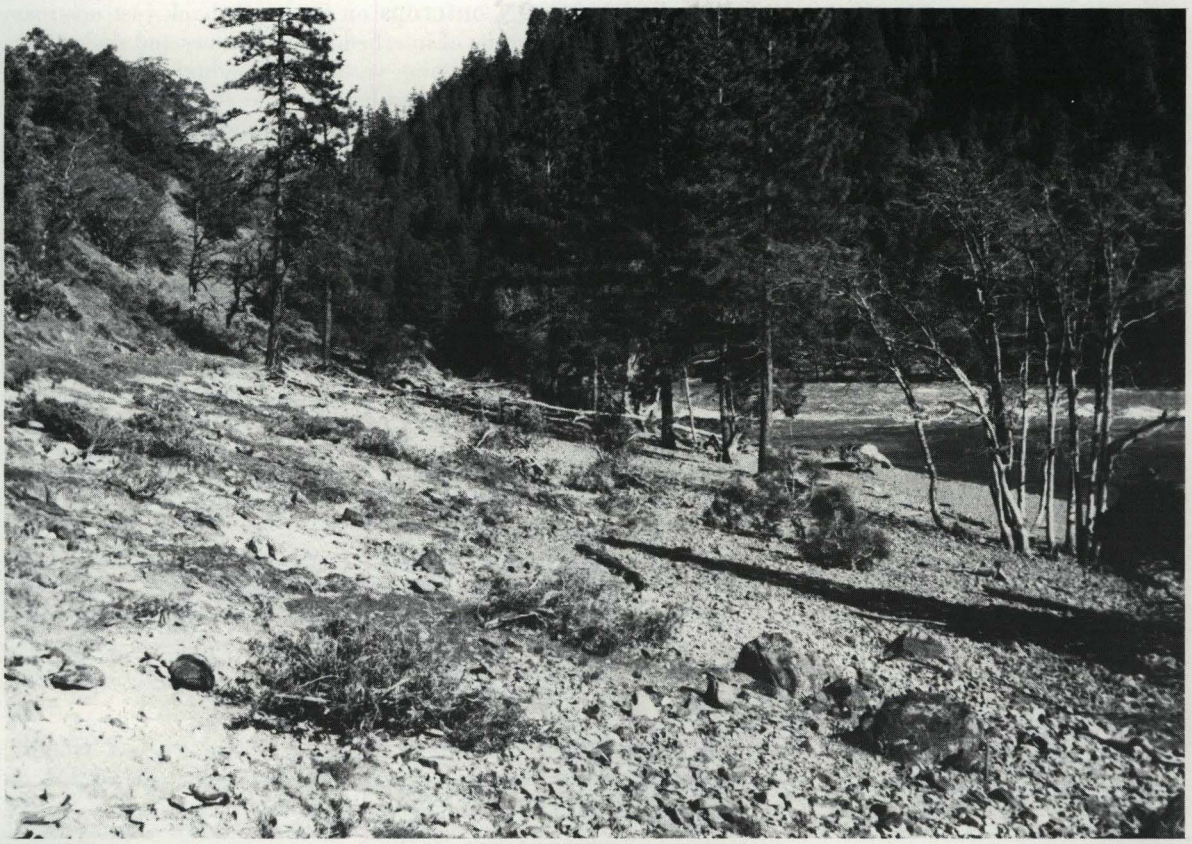


Figure 6. High waters of the 1974 flood *stripped the soil and weathered rock material from the banks here at mile 4.6. As much as two feet of such material was removed, leaving tree roots exposed, and a layer of rubble over the stream pebbles along the river's banks.*

shearing of the DOTHAN FORMATION is evident just above the river level at the contact. Several geologists have mapped thrust faults between the ROGUE and DOTHAN formations, and the discovery of fossils in the DOTHAN FORMATION in 1969 supports the conclusion that the underlying DOTHAN FORMATION is younger than the ROGUE FORMATION. The DOTHAN FORMATION is described as a massive, hard, sandstone containing numerous sand grains of broken rock material. Locally it contains layers of dark grey to black mudstone, as well as some layers of red and white chert and dense pillow lavas altered to greenstone. Conglomerate is scarce, and is composed of pebbles of greenstone and chert, and a few have quartz-rich granitic cobbles. The formation is several miles thick. The DOTHAN FORMATION has been interpreted as a large thrust sheet thrust under the ROGUE FORMATION to the east. It has also been suggested that the DOTHAN FORMATION is contemporaneous with the ROGUE FORMATION and formed on the oceanward side of a chain of volcanic islands. The DOTHAN FORMATION has been dated at latest Jurassic age by its fossils.

TYEE RAPIDS

Tyee Bar is the site of a once-famous gold mine. It is claimed that 300 Chinese workers took one million dollars in gold dust from this bar. These claims probably are extravagant. Zane Grey noted the grave site of a miner about 25 feet above the bar in 1925.

4.6 0.2 **DOTHAN FORMATION outcrops** on the north bank just upstream from Wildcat Rapids consist of interbedded sandstones and shale layers striking northeasterly and dipping vertically. The high water mark of the 1974 flood (Fig. 6) can be readily noted as the line below which soil and weathered rock material have been stripped from the banks. Commonly two or more feet of the material was removed, leaving tree roots exposed, and a layer of rubble over the stream pebbles near the water's edge.

WILDCAT RAPIDS

4.8 0.2 **WILDCAT RAPIDS are formed** where the river splits around a gravel bar and then curves sharply to the right. The river then continues through a bouldery stretch of water.

5.1 0.3 **A large alluvial fan** has been built by Wildcat Creek out into the river from the south shore. DOTHAN FORMATION sandstone strikes northeasterly and the dip is toward the southeast at about thirty-five degrees.

5.2 0.1 **RUSSIAN CREEK** flows beneath a newly constructed bridge on the trail along the north bank. A campground here has a few campsites with a picnic table and an outhouse. There is also a campsite on the opposite (south) bank of the river. Along the river the DOTHAN FORMATION consists of sandstone containing black shale seams and a black carbonaceous (?) film between sand layers. The sandstone at this point is rather massive; usually bedding is not evident, though occasionally, particularly on the north bank, it appears that the beds may be nearly vertical.

5.5 0.3 **MONTGOMERY CREEK enters the river from the left** (south). Some guides refer to the quick stretches of water here as Upper Montgomery rapids and Lower Montgomery rapids.

Between 1925 and 1930 there was an extensive gold mining operation on Montgomery Creek, and there were about 30 buildings located on the north bank at that time. These were destroyed by the 1955 flood.

6.1 0.6 **HOWARD CREEK flows into the river from the left** (south). Rapids are located just above the creek (Plate II). This also was the site of gold mining in years past. In the vicinity of Howard Creek the DOTHAN FORMATION sandstones along and just above river level display quite a few potholes. These are cylindrical holes several inches to a couple of feet in diameter which result when the swirl of the eddying river waters causes pebbles to scour the bedrock in a circular fashion. The river causes these pebbles to drill a cylindrical hole down into the bedrock. Often the pebbles may be seen at the bottom of the potholes. The presence of such structures at this locality indicates the river level is often higher than at present.

6.5 0.4 **SLATE SLIDE SHELTER is just below the trail.** This area is named for slaty shale outcrops traversed by the trail above the "shelter," which consists of a collapsed pole structure. The shale weathers to distinctive pencil-like fragments. Here may be seen more evidence of former water levels very much higher than normal river level. Prior to 1974 extensive sandbanks thirty feet or more above present river level furnished such evidence. These were mostly destroyed by flood waters in the spring of 1974. The appearance of dams on the Rogue River may alter substantially the deposition and erosion of these sand banks. After Glen Canyon Dam was built across the Colorado River the higher sandy terraces were no longer flooded, and lower bars are eroding. Dense flood plain

vegetation has begun to creep over the lower bars, whereas the higher bars (those above current high water) are suffering removal by being blown away by the wind. At this site on the Rogue River the well-bedded sandstone of the DOTHAN FORMATION strikes northeasterly and dips sixty degrees southeast. The sandstone is quite dense and mildly metamorphosed. The sandstone comprises most of the section here, and slate makes up a much smaller fraction. The slate occurs as thin, well-bedded layers one to two feet thick within the sandstone. It is medium bedded with individual layers ranging from a couple of inches to two or three feet in thickness.

6.6 0.1 **Massive sandstone layers stand steeply** inclined along the trail striking northeasterly and dipping approximate fifty-five degrees to the southeast. Note shale pebbles (Fig. 7) from a fraction of an inch to four inches across surrounded by coarse sandstone matrix. The shale pebbles have split parallel to the sandstone bedding plane. A similar outcrop is exposed at Bronco Creek on the trail just east of the creek.

6.9 0.3 **SLIM PICKENS RAPIDS is just above Bronco Creek,** which enters the river from the right (north). Note on the south side of the river at the head of Slim Pickens Rapids the large steel tank from a dredge that was washed down the river by the 1955 flood. It is said this tank was washed down river from the Alameda Mine, four miles up river from Grave Creek. It has been noted, however, that a similar tank was washed away from the mouth of Grave Creek by a flood in the 1950's. Also at this point are exposed high sand banks twenty to thirty feet above present river level. The sand is piled up there during flood seasons as river flow drops and velocity of the water decreases. Sand banks are seen on both sides of the river, and on the north bank two levels are obvious, illustrating two distinct water levels. Just downstream, trees shaped by flow of high water can be seen (Fig. 8). Potholes in the DOTHAN FORMATION also are exposed here. Along this section of the river the DOTHAN FORMATION beds strike northeasterly, and usually dip sixty or seventy degrees southeast. Occasionally the dips approach vertical, and in one or two outcrops the beds dip northwest. The well-bedded sandstones, slates, and shales of the DOTHAN FORMATION are especially well exposed on the south side of the river, and just above Bronco Creek on the north bank can be seen some dark colored, thin bedded slate, dipping southeasterly. The rapid just below Bronco Creek is called Washboard riffle or rapids, for reasons obvious to boat travelers.

SLIM PICKENS RAPIDS

7.3 0.4 **Sandstone headlands protrude** into the river with recessed shale embayments between, due to greater resistance of sandstone to erosion. This pattern extends down river for a half mile or so.

7.6 0.3 **A U.S. Geological Survey bench mark** is located along the trail. This is a circular brass plate set in a concrete footing. These are used as reference points for establishment of accurate positions and elevations on maps. An elevation of 683 feet is stamped on this bench mark.

7.7 0.1 **PLOWSHARE RAPIDS consists of a narrow chute** named for the square rock on the left side of the channel. Bedrock is DOTHAN FORMATION (Fig. 9).

PLOWSHARE RAPIDS

8.1 0.4 **BUNKER CREEK enters the river from the north** (right) bank, its debris causing a rapid in the river at this point. Just above Bunker Creek Rapids the canyon is quite narrow. Bunker Rapids is that portion of the river near the right bank; the flow of water on the left side of the river is called Big Windy Chute. The DOTHAN FORMATION sand-

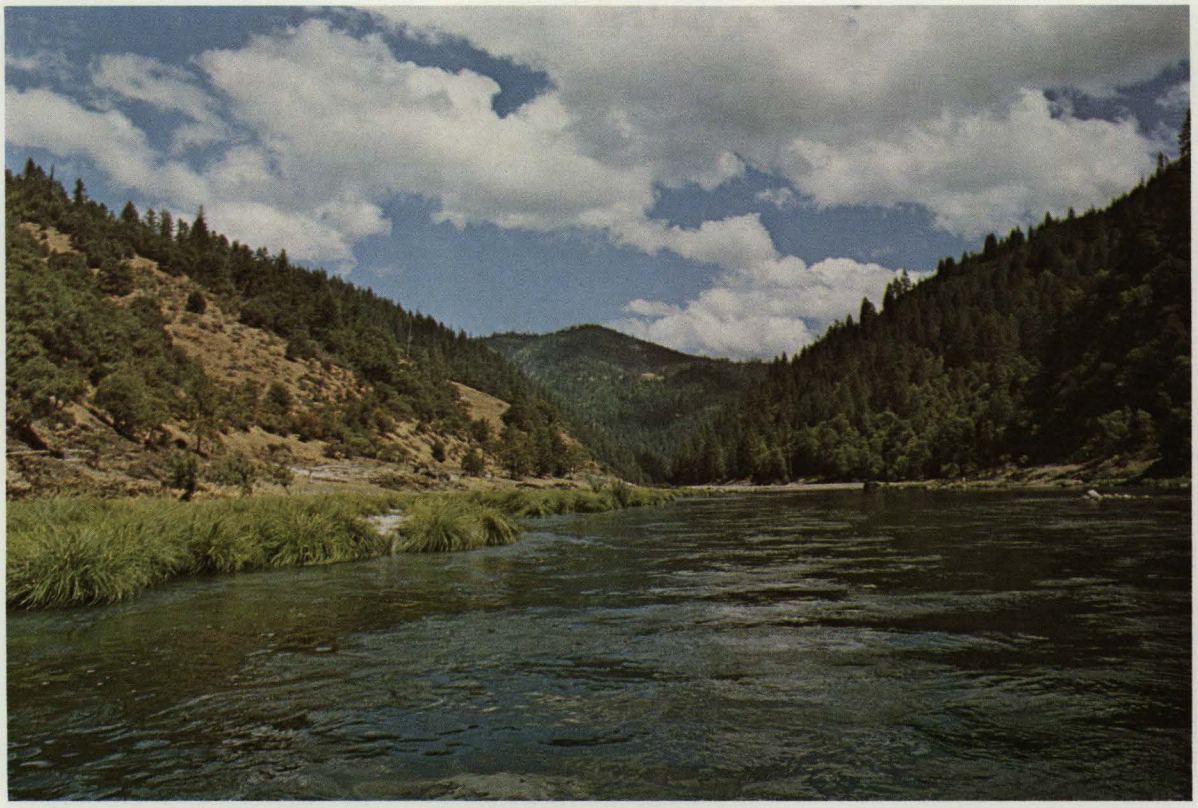


Plate I. View upriver toward Tyee Bar *at mile 4.4. Note the pronounced difference in vegetation on the south-facing slope (left) and north-facing slope (right). Note also the riparian vegetation at the water's edge.*

stones are well waterworn and full of potholes along and above present water level (Fig. 10). There are excellent exposures of sandstone along the river at this point. Both Bunker Creek and Big Windy Creek (formerly called Big Piddle) were mined for gold in the past. The prevalent method of mining utilized gold pans and sluice boxes. The trail climbs from Bunker Creek to an elevation of 250 feet to 300 feet above the river and maintains that elevation along a steep hilside to a point beyond the Horseshoe Bend some three miles down river.

8.5 0.4 **UPPER BLACK BAR FALLS.** The river slides over a step here in a confined section of the channel. Less than 0.1 mile down stream a similar drop is encountered at Lower Black Bar Falls. The drops at both falls are sharp, and should be approached with caution. DOTHAN FORMATION sedimentary rocks are flexed into anticlinal and synclinal folds (Figs. 11, 12) which are very well exposed on the steep wall of the east bank immediately below the upper falls, or rapids. Unfortunately, the trail is high above the river here, and the steepness of the canyon walls make it difficult, if not impossible, for the hiker to view these structures. Even boat travelers will find it is difficult to hold a boat in these rough water for more than a brief period.

BLACK BAR

8.7 0.2 **BLACK BAR is an alluvial gravel bar** 300-400 yards wide which extends about one-half mile along the west bank of the Rogue River. Black Bar Lodge is situated on a bank above the bar. The Lodge was built about 1934, and is currently operated by Bill and Sally Hull. A

Plate II. A rubber raft *bounces through Howard Creek Rapids, mile 6.1.*

U.S. Bureau of Land Management road into the Lodge is restricted to the Hull's use, and the Lodge is open from approximately June 1 to November 15. Prior to 1964 an airstrip was situated on the bar, but the 1964 flood covered the bar and flooded Black Bar Lodge to a depth of 2 feet, some 20 feet higher than the present water level. (Visitors will notice indications of the high water mark inside the Lodge.) The flood covered the normally sandy air strip with cobbles and boulders, mostly in the six-inch to two-foot size range. The DOTHAN FORMATION is well exposed at the boat landing at Black Bar. The well bedded sandstones strike northeasterly and dip approximately fifty degrees to the southeast.

9.3 0.6 **LITTLE WINDY CREEK** (formerly called Little Piddle) enters the river from the left (west). This is a popular camping spot for boat travelers. Water and toilet are available.

10.1 0.8 **JENNY CREEK,** another site at which the river gravels were formerly mined for gold, flows into the river from the left (west). The 1964 flood washed away much of the machinery that was situated here. Miners crossed the river from the east to west banks on a cable car, the cable for which was attached to a large fir tree on the west bank. At Jenny Creek there are some sandy beaches on the west side of the river. Two or three elevations of beach are obviously related to fluctuations in high water. Where rocky outcrops jut out into the river, sandy beaches accumulated between them. Immediately at the mouth of Jenny Creek the attitude of the rocks is somewhat variable. In places the dip

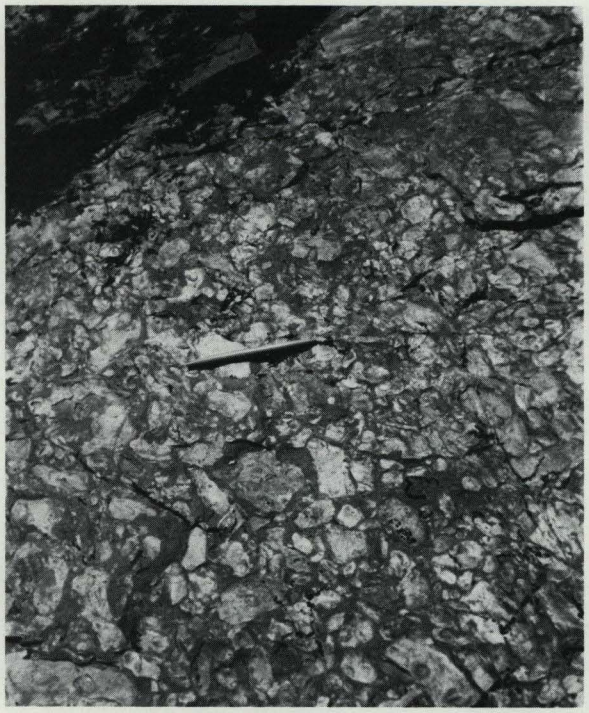


Figure 7. A conglomerate bed *within the Dothan Formation whose large pebbles consist of shale fragments. This exposure is seen along the trail at mile 6.6. The pencil gives scale.*

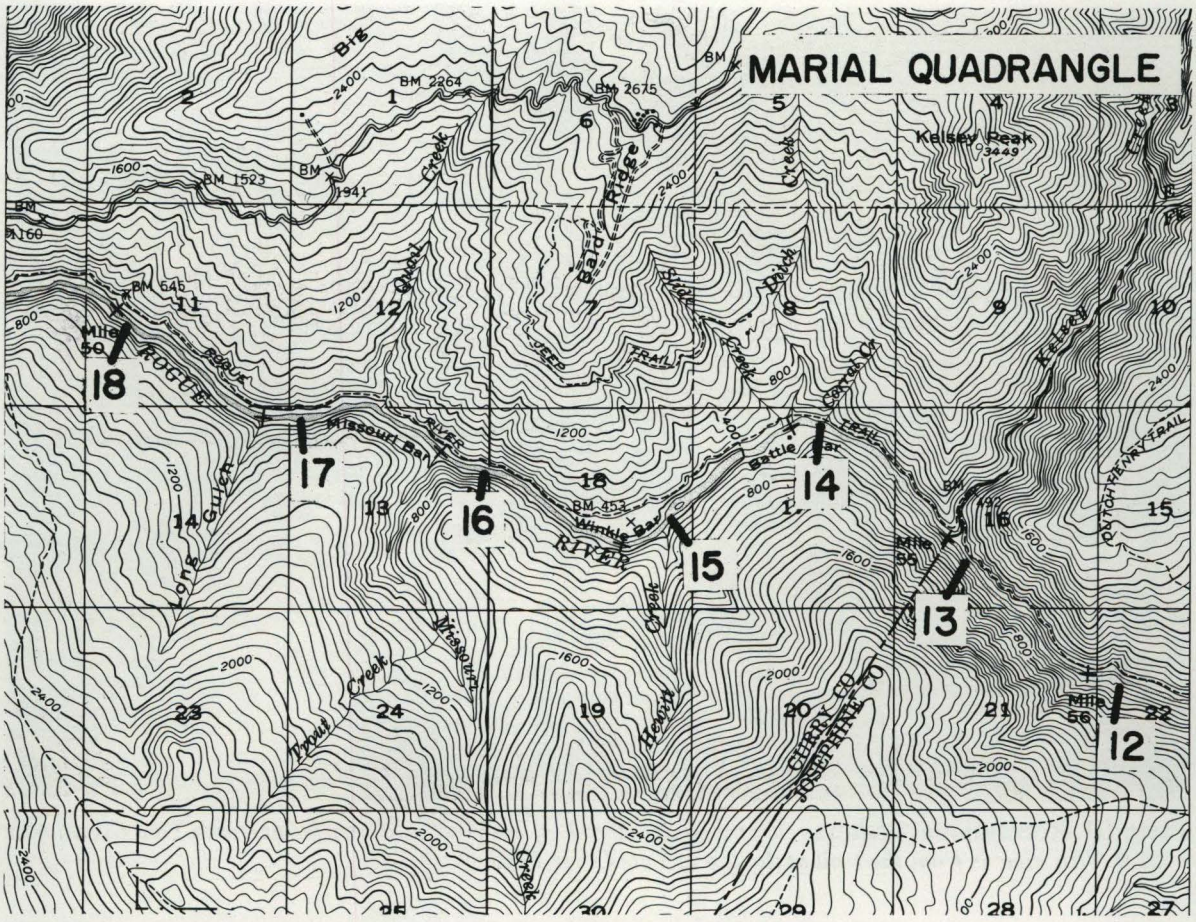
flattens to horizontal, then steepens to the usual fifty or sixty degrees toward the southeast. Numerous sugar pines are growing in the area immediately around Jenny Creek.

10.5 0.4 **Horseshoe Bend is the site of extensive chert outcrops.** The sandstones here are marbled and ribboned with chert veinlets, but the rock does not appear to have been greatly metamorphosed. A thick bed of chert is exposed about fifty yards to the south of the river. It is a massive, light greenish chert layer perhaps thirty feet thick which appears to be parallel to the underlying sandstone layers. Overlying the chert is a black shale which is interbedded with sandstones. Also exposed at this locality, on the south bank of the river, are several well developed potholes (Fig. 13) 10 or 15 feet above present water level. They are a few inches to a foot or foot-and-a-half in diameter and extend two or three feet vertically into the sandstone. They contain the well rounded drilling pebbles on their bottoms. The abundance of quartz in the rocks here at Horseshoe Bend results in harder rock which accounts for the very sharp deflection of the river at this point.

HORSESHOE BEND

11.5 1.0 **A water pipe some eighteen inches in diameter** extends across the trail to the river. This apparently is a relic of a bygone mining endeavor.

11.6 0.1 **A steep barren bank** covered with grass is located on the right (north) side of the river. A dark shale underlies a good portion of this bank, just above Meadow Creek. A new bridge is under construction at Meadow Creek. On the upstream side of the bridge is a U.S. Geological Survey bench mark indicating an elevation of 500 feet above sea level. On the gravel bar along the river just above Meadow Creek is an old winch which was used by miners to move the larger boulders on the bar. The winch was cranked by hand, and allowed the miners to mine the gold bearing sands that accumulated around the bases of the boul-



Map 5. *Topographic map of the Rogue River from Mile 11.7 to Mile 18.7.*

ders. The winch was manufactured by Mead Morrison, and bears a serial number 24337, and a model number 901. Patent dates in the years 1923, 1925, and 1926 also appear on the winch.

There is good drinking water and picnic tables at Meadow Creek, and the campsite is adequate to accommodate large parties.

11.7 0.1 **The River Log passes from Map 4 to Map 5, and from the Galice to the Marial Quadrangle.**

11.9 0.2 **Shale outcrops** of the DOTHAN FORMATION are exposed on the right (north) bend. Numerous slides develop in this soft rock and necessitate frequent relocation of the trail.

12.0 0.1 **UPPER DULOG RAPIDS, just above Dulog Creek.** Immediately upstream from Upper Dulog Rapids is a very popular camping spot for river boaters on the south side of the river.

12.1 0.1 **DULOG CREEK,** so called by locals, empties into the river from the left (south). The name China Bar incorrectly appears on some topographic maps at this point, but is correctly located at mile 19.1 on other maps. There is a gravel bar here at present water level on the southwest bank, and a sand bar 10 feet higher. Here the water is funneled through a small chute in the middle of the channel. There is a change

Plate III. Recreational boaters *relax in a quiet stretch of the river at its confluence with Tate Creek, mile 27.9. This view is from the trail at the top of Tate Creek Falls.*

in the type of rock exposed here, as sandstone layers give way to blacker shale layers below. Dulog Rapids is the first rapids below the creek of the same name, and is known also as the Door to Kelsey Canyon. Oodle Rapids, then No-Name Rapids follow in quick succession.

12.3 0.2 **Slickensides,** scratches produced on fractured surfaces in the rock as the rock fragments slide past one another, are exposed on sandstone just around the point below Dulog Creek.

12.5 0.2 **KELSEY CANYON is entered here.** The canyon walls are rather steep and rocky, and the trail climbs high on the north wall of the canyon. Kelsey Falls is located a short distance down Kelsey Canyon. It is run by boatmen on the left of the large rock in the middle of the river. This chute around the rock was opened up for boats by Glen Woolridge in the early 1960's. Prior to that time boatmen had to line their boats through the chute.

KELSEY CANYON

The DOTHAN FORMATION at this point consists of dark grey sandstones and slates, and the bedding is rather obscure. From Kelsey Canyon one can observe Bald Ridge, some three miles to the northwest. Kelsey Canyon and Kelsey Creek are named for Colonel John Kelsey, an army commander in the Rogue River Indian War of 1855-56.

13.1 0.6 **KELSEY CREEK, which is the boundary** between Josephine and Curry counties, joins the Rogue River. Kelsey Creek enters the river through a narrow crevice in the rocks on the north bank, and flows over a bouldery bed. From here one can see a cabin at midslope in the

Plate IV. Downstream from Clay Hill Creek *(mile 28.5) the trail traverses a steep slope underlain by the Flournoy Formation, which consists of massive sandstones and conglomerate layers. The beds dip downriver at this point.*

distance. A man named Badger traded this cabin for one at Horseshoe Bend. The trail crosses Kelsey Creek 200 yards up the creek from the river. There is good drinking water here, a new bridge (of the same design as that at Whisky Creek) over the creek, and picnic tables. The trail between Kelsey Creek and Winkle Bar traverses shaly rock which often washes and slumps out, and in the spring of 1975 extensive repair and relocation was accomplished on this section of the trail.

13.3 0.2 **Potholes are drilled in the rocks** in the center of the river (Fig. 14).

13.5 0.2 **STURGEON ROCK, also known as Sports Illustrated Rock,** is on the south side of the river. The name Sports Illustrated Rock was applied after the magazine of that name, which carried an article about steelhead fishing in the Rogue River in the early 1960's. There were five boats carrying a party from the magazine, and they had excellent fishing at this site. The rock is a large monolith of DOTHAN FORMATION sandstone, and perched on top, some forty-seven feet above present water level, are large logs and other debris marking high water level from a previous flood season.

13.6 0.1 **The river broadens** and becomes quite calm from this point downstream to Battle Bar. The ease with which the river broadens its valley here reflects the generally more shattered and sheared shale rocks of the DOTHAN FORMATION. From about mile 13.6 to mile 13.9 the trail traverses shaly rock and repeatedly has washed out and been rerouted.

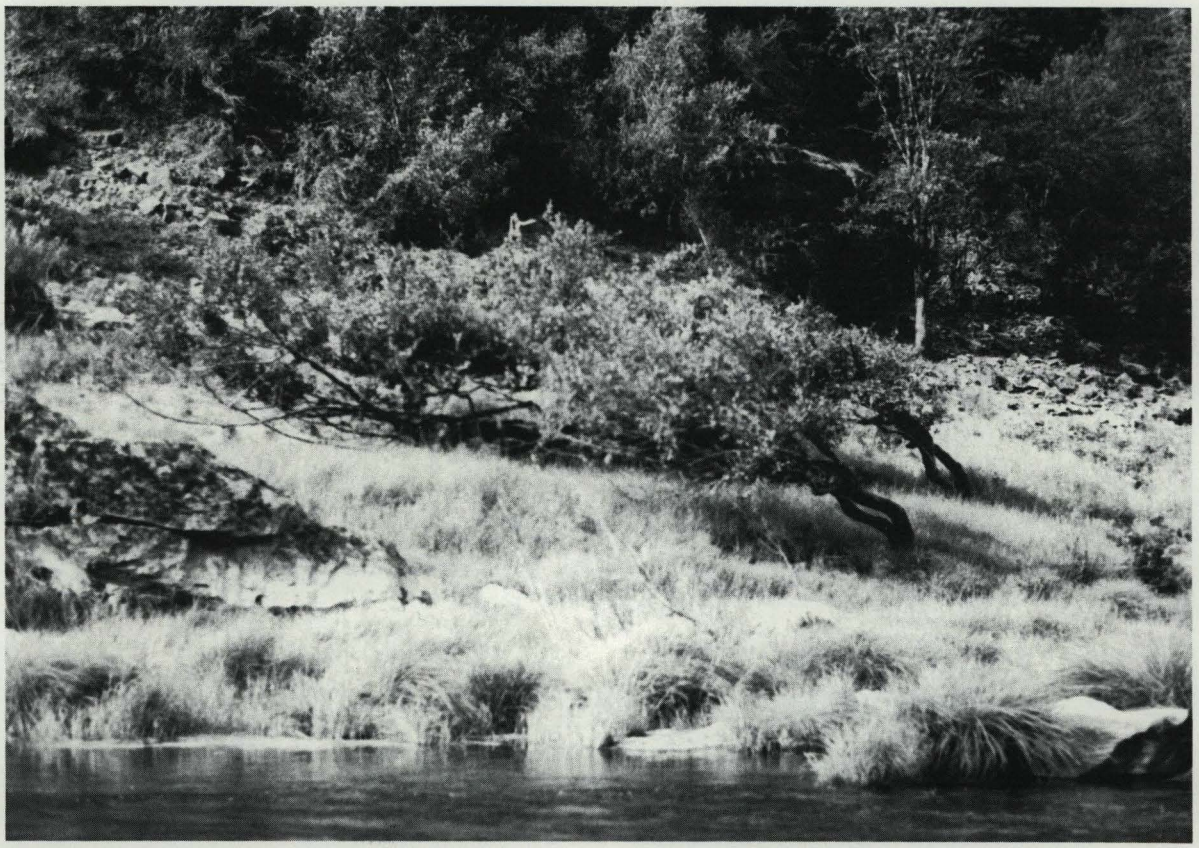


Figure 8. Water-shear effects *are displayed by these trees along the river bank at mile 7.0.*

14.0 0.4 **BATTLE BAR is on the left** (south) bank of the river.

BATTLE BAR

The name of the site is based on a fight between the U.S. Cavalry and a band of Indians in 1856. A force of 535 men under the command of Colonel Kelsey attacked an Indian encampment thought to include several hundred Indians on Battle Bar on April 27 of that year. Colonel Kelsey's strategy to sneak a part of his force across the river to intercept the flight of the Indians fell through when the soldiers, under the command of Major Bruce, refused to cross the river in collapsible canvas boats. Kelsey's force, under cover of fog, was able to approach the river without being discovered by the Indians. An indecisive battle followed, with shots being fired all day, but since the opponents were on opposite sides of the river no military conclusion was possible. Colonel Kelsey reported that 20 or 30 Indians were killed, and one soldier later died of his wounds.

Boatmen usually refer to the sloping grassy bar on the north side of the river as Battle Bar. The gravel bar itself on the south side of the river was mined for gold. In 1964 the flood waters were above this bar (Fig. 15). At the time of his 1925 trip down the Rogue River, western writer Zane Grey met an old miner who had lived in a small cabin on this site for 40 years. Grey wrote that the miner had a small garden and grew grapes and plums as well. This miner was probably Sampson Jones, father of Hathaway Jones. Hathaway Jones became widely known as a sort of folk hero and story teller during

Figure 9. Jointing in sandstone *of the Dothan Formation breaks the rock into rectangular blocks. This outcrop is exposed along the trail at mile 7.8.*

the years he carried the mail from Dothan to Agness. Sampson Jones is reported to have lived at Battle Bar from sometime in the 1890's until the 1920's.

Zane Grey, 1872-1939, was a very popular author of sporting and adventure stories. He wrote more than 60 books, including some pertaining to fishing on the Rogue River and other Oregon streams. Of his fifty-four novels, one, **Rogue River Feud,** utilizes the Rogue River Canyon as a backdrop. Grey is best known for his western adventure novels, which sold in the millions. His most popular fiction books included **The Spirit of the Border** (1905), **The Last of the Plainsmen** (1908), **Riders of the Purple Sage** (1912), and **The Lone Star Ranger** (1915). Grey was born in Zanesville, Ohio, and graduated from the University of Pennsylvania.

14.1 0.1 **DITCH CREEK flows into the river** from the right (north) bank. There is a campground, good drinking water, and a toilet at this site. A metal trail marker proclaiming "Mile 23" is situated on the tree beside the trail at the creek. Evidence of former placer mining activity is seen in piles of gravel scattered about the creek. Slumped DOTHAN FORMATION is visible on the right (north) bank (Fig. 16).

14.3 0.2 **The trail traverses a bench** well above the river. The bench is hummocky and possibly represents an old slide, though large trees are growing on it.

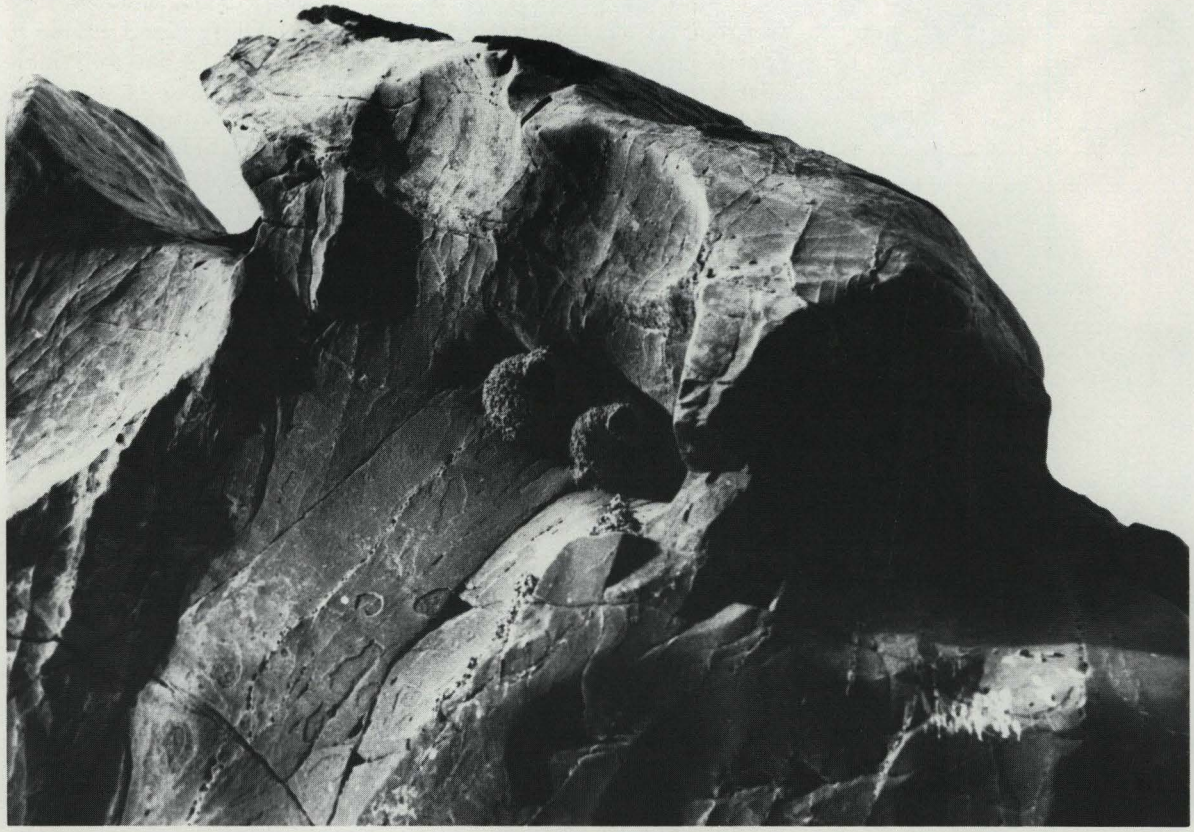


Figure 10. Cliff swallow nests *are exposed beneath ledges overhanging the river at mile 8.2. These nests are approximately six feet above the water level. Note that former higher water levels have smoothed the sandstone outcrop.*

14.5 0.2 **An unnamed creek with abundant ferns** is encountered along the trail.

15.0 0.5 **HEWITT CREEK, the sign along the trail proclaims.** (There is also a trail marker "Mile 22' beside the trail.) However, Hewitt Creek appears on the opposite (south) side of the river on the map. A small campsite and a toilet are available on the south side of the river near the mouth of the creek.

15.2 0.2 **WINKLE BAR, like Battle Bar upstream** and many other gravel bars along the Rogue River is situated on the inside of a meander, or bend, in the river course. This is predictable because deposition generally occurs on the inside of such meanders, whereas erosion is occurring simultaneously on the outside of the meander. These "Bars," (Black Bar, Battle Bar, and Winkle Bar) are actually terraced point bars which are mantled by sand and/or gravel deposited there during periods of flooding. Beneath the veneer of gravel on Winkle Bar the bedrock is composed of dark grey, thin-bedded slate and shale with some lenses of sandy material. The rock is somewhat fractured and some small quartz veinlets are scattered through it. The strike of the beds is northeasterly, and the dip is forty-five degrees to the southeast.

WINKLE BAR

On his 1925 trip down the Rogue River, Zane Grey became enamoured with the tranquil setting of Winkle Bar, and vowed to possess it if it were possible. The following year he bought Winkle Bar from a prospector who held it on a mining claim. He used this site as a fishing camp (Fig. 17) for himself and friends and family on various occasions. The old cabin at that site has been preserved. He later wrote in 1935 that he had virtually abandoned the Rogue River and Winkle Bar for fishing adventures on the North Umpqua River. Winkle Bar and the buildings thereon are now private property purchased from Grey's heirs.

16.0 0.8 **Sandy beaches on the north side** of the river attest to higher water levels in the past. The bedrocks exposed in this region are massive sandstones of DOTHAN FORMATION whose attitude is unchanged from that at Winkle Bar.

16.3 0.3 **MISSOURI CREEK enters the Rogue River** from the south. Situated at the base of Missouri Creek is the cabin of Gerald Fry, an Indian who cares for the old Zane Grey cabin. Just at this confluence on the north bank of the Rogue River are exposed massive sandstone layers above a thin-bedded shale. From the river the beds appeared to be horizontal or nearly so. A good bit of gold mining has been carried on up Missouri Creek.

16.6 0.3 **QUAIL CREEK flows into the river** from the right (north). There is a small campsite above the trail. To the west on the north bank one can see evidence of the extensive Quail Creek fire of 1970. The fire burned some 2800 acres on both sides of the river. It was man-caused.

16.7 0.1 **A road down Quail Creek** was reconstructed to aid the fire fighting activities in 1970. Travel on this road, however, is restricted.

16.8 0.1 **Sandstones of the Dothan Formation** are well exposed on the south bank. These sandstones are well bedded, with individual beds from a few inches to two feet in thickness, and include some interbedded shale. The strike is northeasterly, the dip about thirty-five degrees southeast.

17.0 0.2 **A rock slide is evident** here on the south side of the river. The slide reportedly has been here for a number of years, and most recently displayed gross movement in 1968. Apparently a little movement occurs annually in the shaly bedrock. Several trees are strewn over the surface of the slide at various angles, indicative of recent movement of slide.

LONG GULCH CREEK

17.2 0.2 **LONG GULCH CREEK enters from the south.** Long Gulch Creek Rapids is situated just downstream. An osprey nest (Fig. 18) can be seen atop a high snag close to the river's edge.

18.0 0.8 **A rock slide on the north side** of the river may be seen here. This slide is most likely the direct result of the Quail Creek fire in 1970 (Fig. 19). Removal of the vegetative cover allows precipitation to saturate the denuded soil and weathered rock material, promoting slumps and slides of this type. Additional slumps of this nature may be seen just downstream on the north bank. In some instances numerous large trees have ridden the slide and been tipped to various attitudes. The slides also have moved rather large boulders downhill.

18.5 0.5 **JOHNS RAPID is a very quick stretch** of water; steep, but smooth.

18.7 0.2 **The River Log passes from Map 5 to Map 6.**

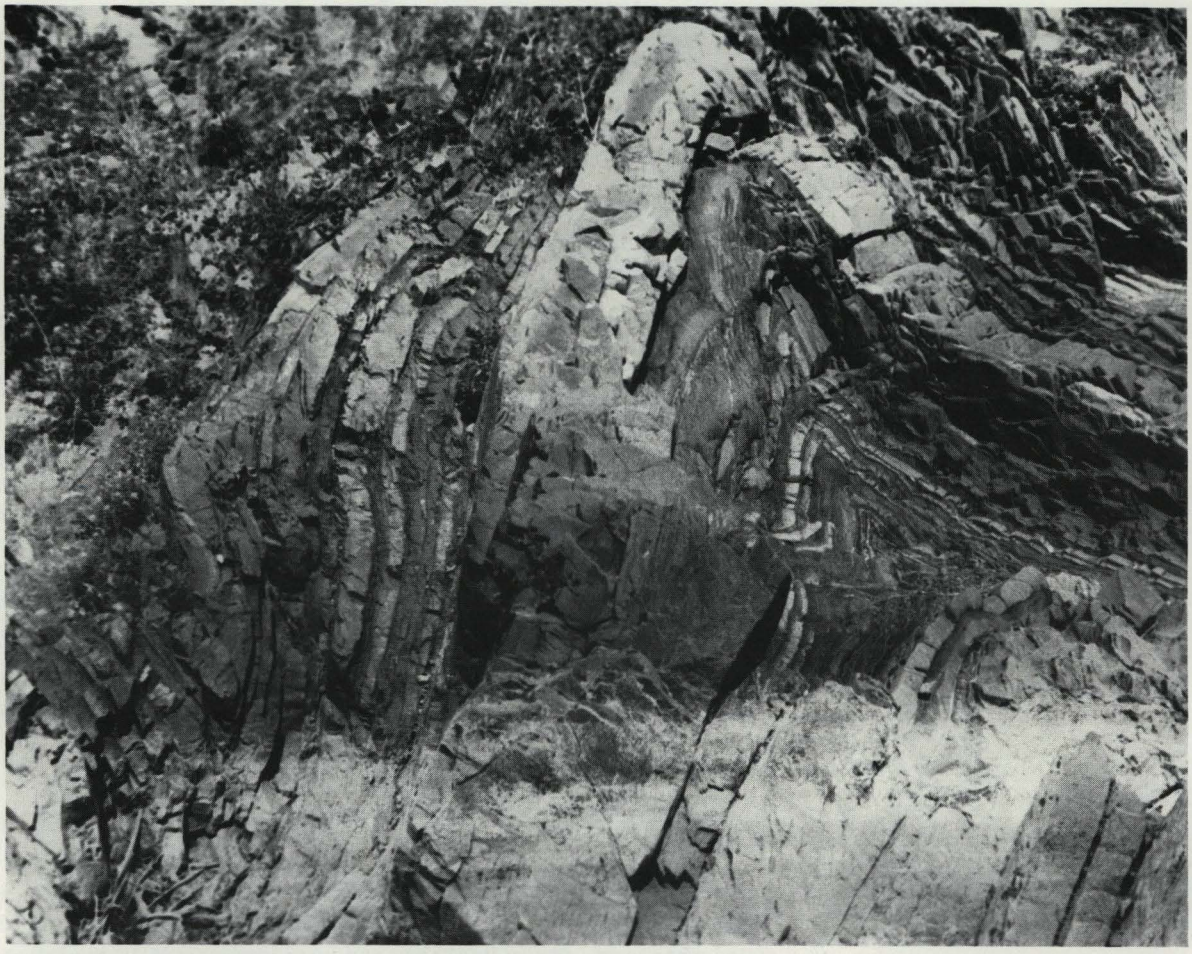


Figure 11. Interbedded sandstone and shale layers *of the Dothan Formation are contorted into anticlines and synclines at the base of Black Bar Falls, mile 8.6.*

19.0 0.3 **A large rubbly slide** is encountered on the north bank. Shaly rock is exposed cropping out in the bank itself, but this slide is apparently an older one than those initiated by the Quail Creek fire, as it is overgrown by shrubs and young trees.

19.0 0.0 **The Luis F. Rodriguez Memorial** is located alongside the trail. Mr. Rodriguez was killed by a falling tree while fighting the Quail Creek fire in 1970 (Fig. 20).

19.1 0.1 **CHINA BAR,** which is mislocated at mile 12.2 on some topographic maps, is encountered at this point.

19.2 0.1 **Massive sandstones interbedded with occasional shaly layers** crop out along this section of the river. The strike is northeasterly and the dip toward the southeast. In some places the sandstones are ribboned with quartz veinlets.

19.4 0.2 **A footbridge formerly stretched across the Rogue River** at this point. Massive sandstones dip forty degrees southeasterly at the site of the footbridge.

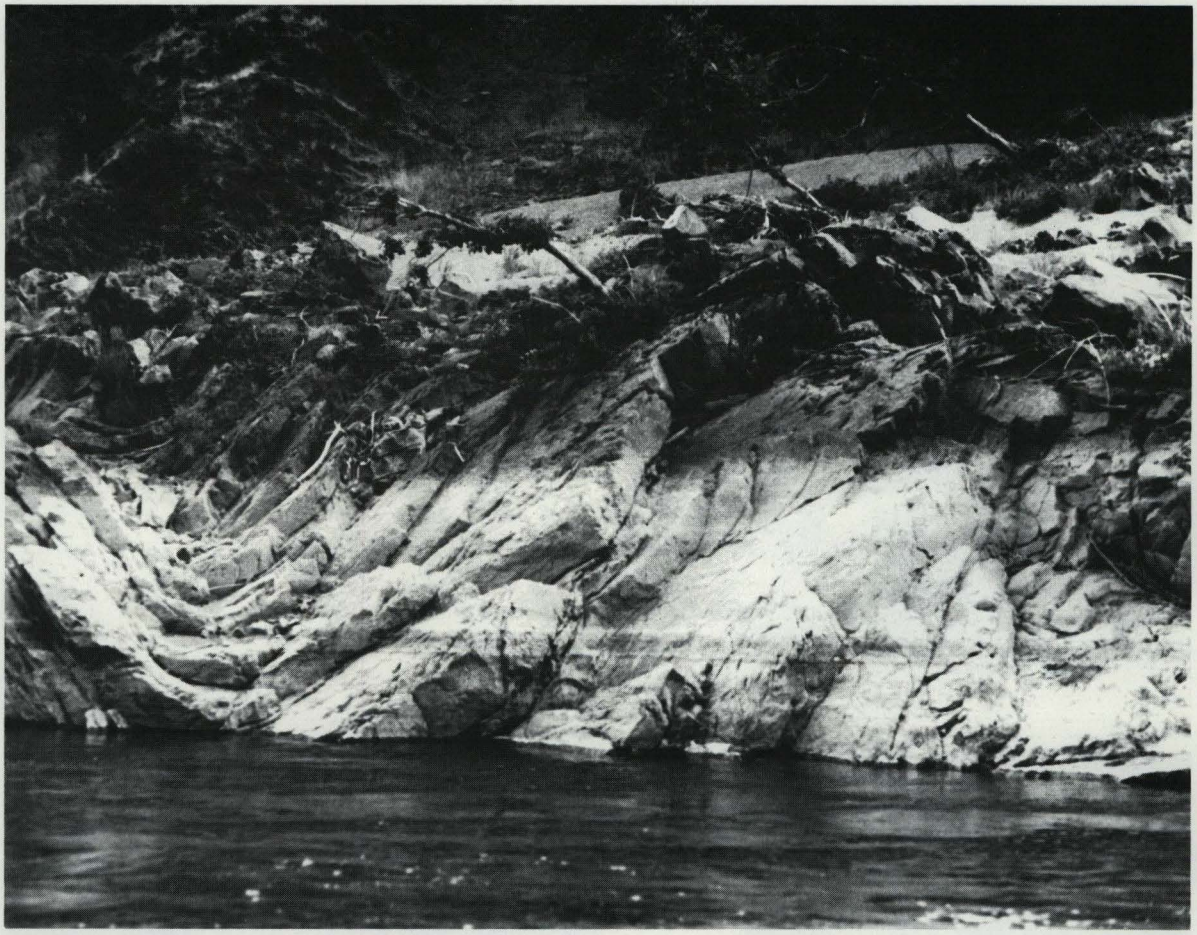


Figure 12. Sandstone beds *of the Dothan Formation are warped into a syncline at the base of Black Bar Falls, mile 8.6. The light color of the rocks a few feet above the river level is due to the growth of algae on the rocks when water level was higher.*

19.6 0.2 **TUCKER FLAT CAMP is a short distance up Mule Creek** from Anderson Ranch, also known as Rogue River Ranch. The ranch extends along the north bank of the river. On the north bank of the Rogue River the contact between the sandstones of the DOTHAN FORMATION and the ROGUE FORMATION volcanic rocks is pronounced above Tucker Flat. The bare, craggy rock forming the ridge in the background is composed of volcanic rock, and the heavily vegetated ridge in the foreground is composed of sedimentary rock.

TUCKER FLAT CAMP

The area was settled by Thomas W. Billings, who homesteaded 70 acres in 1887 and later operated a mercantile business out of the old two story building which he built there in 1903. His business served the miners and settlers in the area. Billings later sold his property to a wealthy Californian, Mr. Jack Anderson. The Bureau of Lane Management acquired the property in 1970 under the National Wild and Scenic Rivers Program. The building across the river (on the south bank) was a part of the Anderson Ranch, and was constructed with wooden pegs instead of nails. The property has been

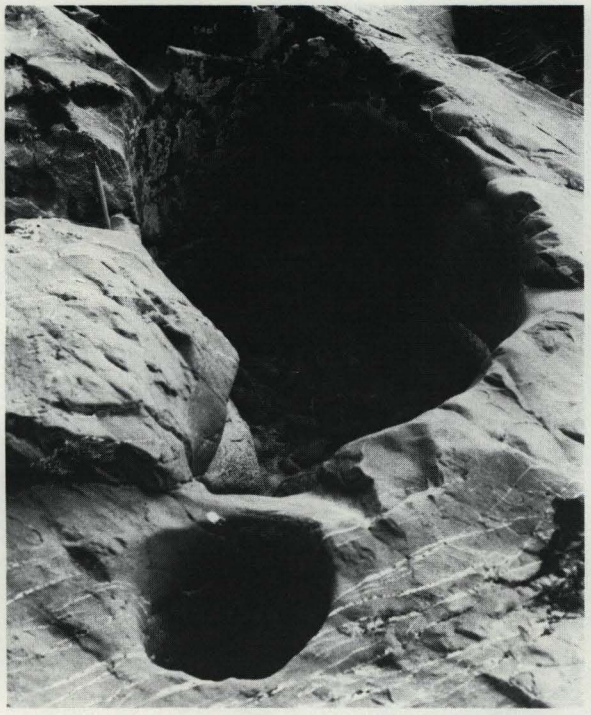


Figure 13. Potholes drilled in Dothan sandstone *a few feet above river level at mile 10.5. Swirling eddies stir the pebbles in a circular fashion, wearing a vertical hole a few feet deep into the rock.*

Figure 14. A block of massive Dothan sandstone *in mid-river has many potholes. Mile 13.3.*

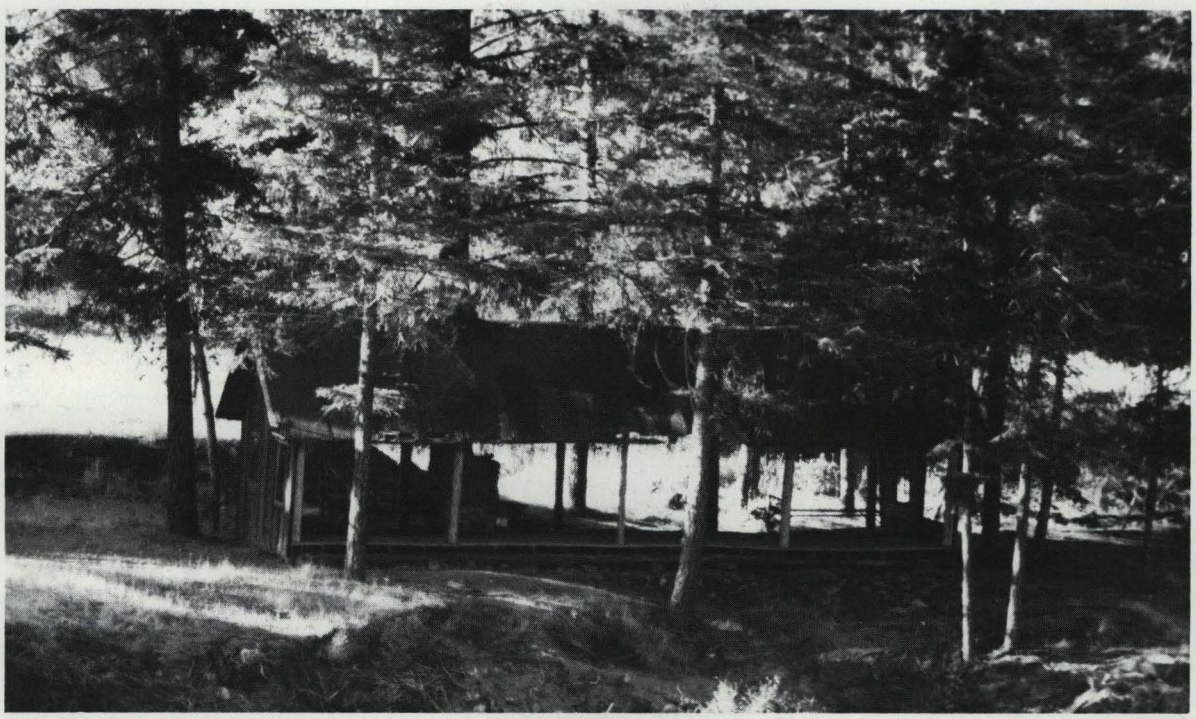


Figure 15. The Bob Fox cabin, *built in the 1920's, at Battle Bar, mile 14.1. The cabin was partially destroyed by the 1964 flood which covered Battle Bar.*

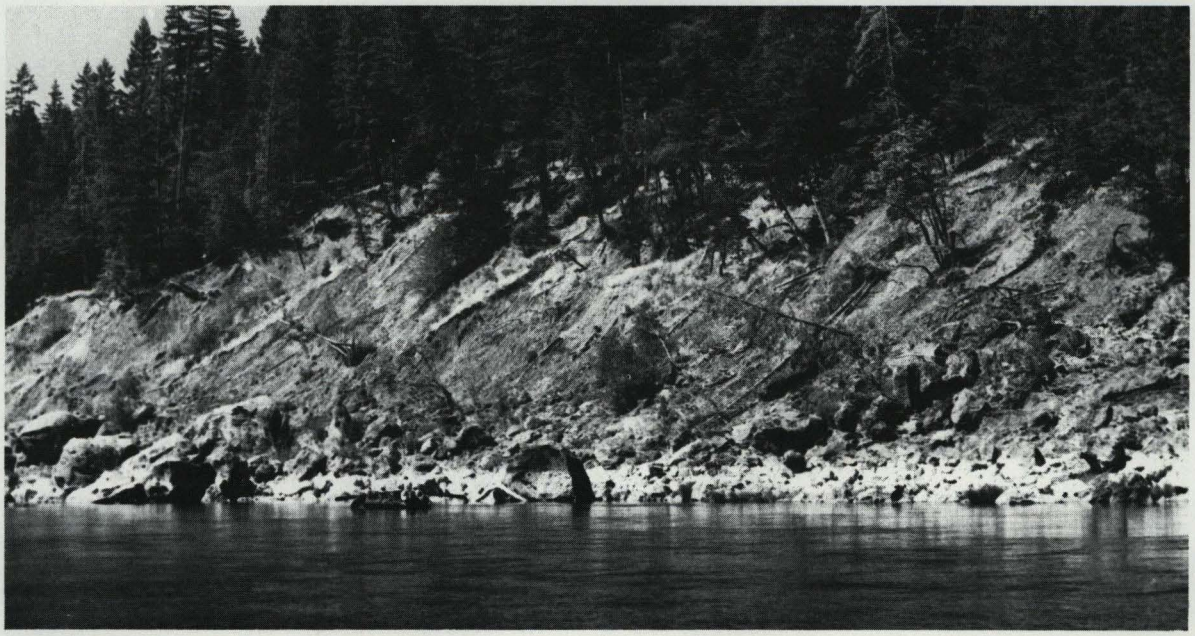
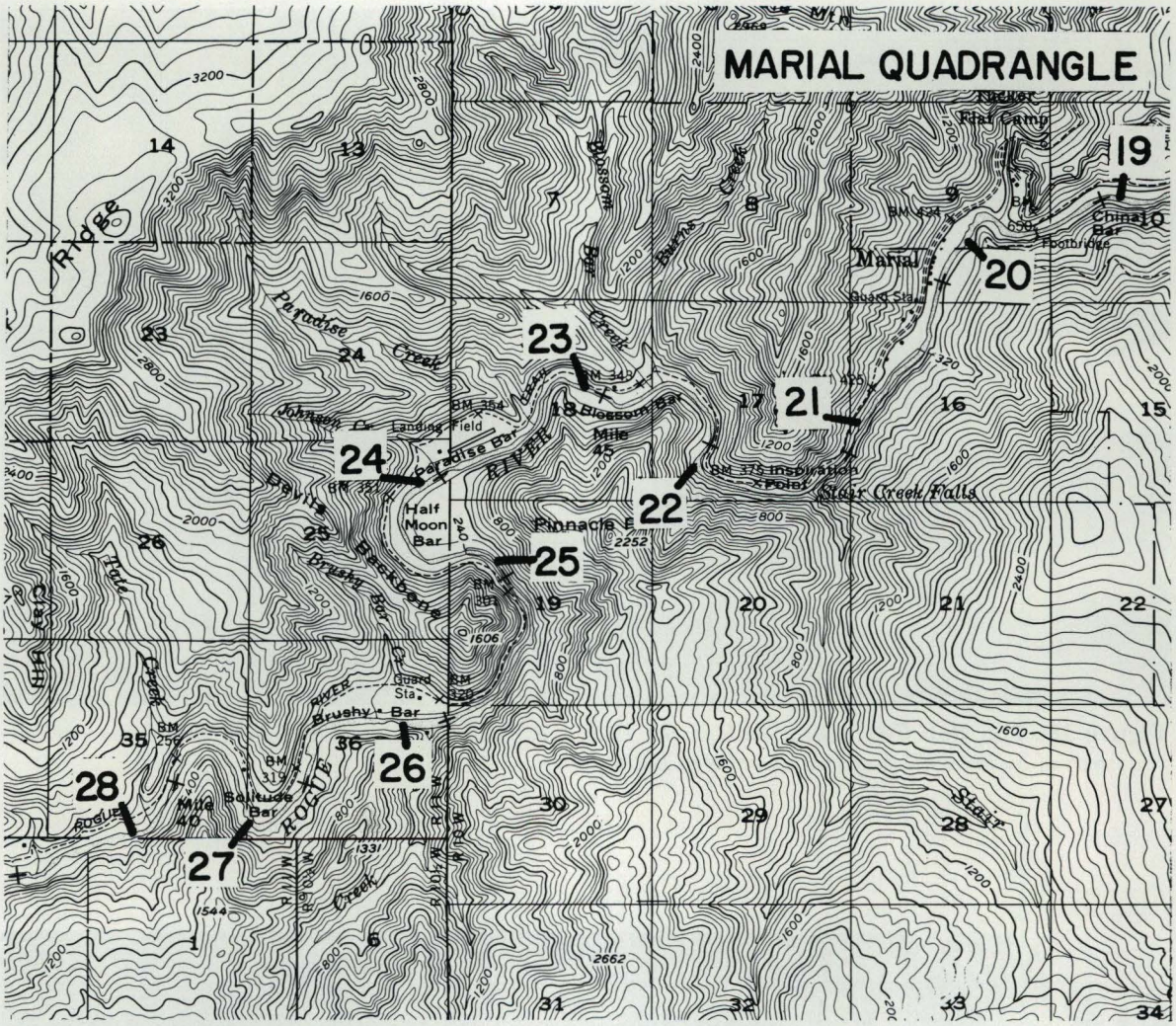


Figure 16. The rocky rubble *and fallen trees along the north bank of the river (mile 14.2) below Battle Bar result from slumping in the shale underlying the surface.*



Map 6. *Topographic map of the Rogue River from Mile 18.7 to Mile 28.8.*

added to the National Register of Historic Places, and at some future date it may be opened to the public, but for the present no tours are allowed.

Mule Creek enters the Rogue River from the north at this point. Mule Creek is named for a mule which escaped from Lieutenant R. S. Williamson in the summer of 1852. Williamson and a company of soldiers were attempting to forge a trail along the river. The mule wandered off when turned loose to graze. It is reported that Williamson found his mule several years later at Siletz.

Mule Creek, its tributaries, and the area they drain have produced a substantial quantity of gold. The first mining in this region was done by John Billings in 1891, and continued into the early 1900's. Placer gold deposits soon were traced upstream to their lode gold sources, four of which were discovered. These were: The Paradise Mine, The Lucky Boy (later known as the Marigold and the Tina H), Red River Gold Mining Co. claims, and The Mule Mountain Group of

Figure 17. Zane Grey's cabin *on Winkle Bar, mile 15.2. The famous author of Western adventure novels used the cabin frequently in the 1920's and early 1930's.*

mines. These lode deposits consist of small quartz veins containing native gold and minor sulfides of iron, copper, and lead. These are localized within the Rogue Formation volcanic rocks and associated intrusive rocks drained by Mule Creek and its tributaries. Stamp mills and cyanide plants operated at some of these properties. Production from the lode deposits was never large, and incomplete records suggest they produced only slightly more than $100,000 in gold. Though production figures for placer mines in the area are even less complete, apparently they were considerably more productive than the lode mines. The Red River Gold Mining Company operated one of the largest placers in the area on the west side of Mule Creek near its mouth and along the northwest side of the Rogue River. A large flume was constructed up Mule Creek to supply a 180-foot head for the hydraulic operation at this site. Heavy equipment was brought into the area to assist in the mining efforts. The total lack of roads in this area in the late 1800's and early 1900's dictated that this equipment should come by river. Some, such as the two-stamp mill set up at Blossom Bar to crush ore from the lode mines up Mule Creek, came up river from Gold Beach by barge, coaxed up river by a cable and hand winch. Placer pipe as much as 30 inches in diameter came down river from Grants Pass, as did a five-ton mortar box floated on a special boat built in 1910. It was reported that this

Figure 18. An osprey nest *sits atop a snag near Long Gulch Creek. Mile 17.2.*

Figure 19. The Quail Creek Burn *of 1970 denuded the soil of its vegetative cover and allowed precipitation to saturate the soil. The result is the slumping shown here along the trail below Long Gulch Creek. Mile 17.3.*

boat could still be seen at Blossom Bar in the late 1960's. Most of this equipment and much of the evidence for the mining operations, accomplished mostly prior to 1920, have been obliterated by floods of later years.

20.1 0.5 **MARIAL, a small settlement,** is situated on the north bank of the river. The Marial Lodge operated by Ted Camp caters primarily to parties accompanying commercial river guides.

MARIAL

This settlement is named after the daughter of Tom Billings, a half-Indian woman who owned and operated the Marial Lodge until 1967. A post office was established at Marial in 1903. The settlement presently consists of the lodge and a few scattered buildings, but in 1932 more than 250 people received their mail at the Marial Post Office. This was during the depression, and many people moved into the area to try and squeeze out a living by farming and mining gold.

Marial is one of the very few sites along the wild portion of the Rogue River that is accessible by public road. The road drops into the canyon from the northeast to a small forestry ranger station near the lodge. A small pioneer cemetery is located near the end of the road. The DOTHAN FORMATION sedimentary rocks at the boat landing below the Marial Lodge are shales which strike northeasterly and dip steeply to the southeast.

20.5 0.4 **Shales of the Dothan Formation** are exposed along both banks of the river, but pieces of volcanic rocks are exposed in the soil along the road above the river.

Figure 20. Ferns are abundant *along the moist, shady tributaries of the Rogue River. This specimen of* Woodwardia fimbriata *was found along the trail at mile 19.0.*

20.8 0.3 **MULE CREEK CANYON swallows the river here.** Just above the canyon sandstones are exposed along the south bank, and on the north bank shaly material containing lenses of sandy material a few inches thick and a foot or two in length is exposed. The canyon narrows abruptly below this point, and the canyon walls are precipitous; 50 feet high in places. In the winter of 1974 high water washed out a part of the trail high above the canyon floor. Though not as disastrous regionally as the 1964 flood, the 1974 flood level was higher along this segment of the river. The water rose to the fence just below Marial Lodge, and swept away an outhouse that was untouched by the 1964 flood. The trail above Mule Creek Canyon offers a spectacular view of the river from the end of the road west of Marial to a point beyond Inspiration Point. The pronounced physiographic change of the river's canyon is due to the corresponding change in the underlying rock types. Here the river encounters massive, metamorphosed volcanic rocks (Fig. 21). These rocks are mildly metamorphosed lava flows which are easily distinguished from the sandstone and shales. They are hard, massive, pale greenish-grey, and often lack any hint of bedding. The genetic affinity of this volcanic unit is controversial. Some geologists assign the unit to the DOTHAN FORMATION, but most now agree that the unit is a segment of the ROGUE FORMATION which was thrust westward over

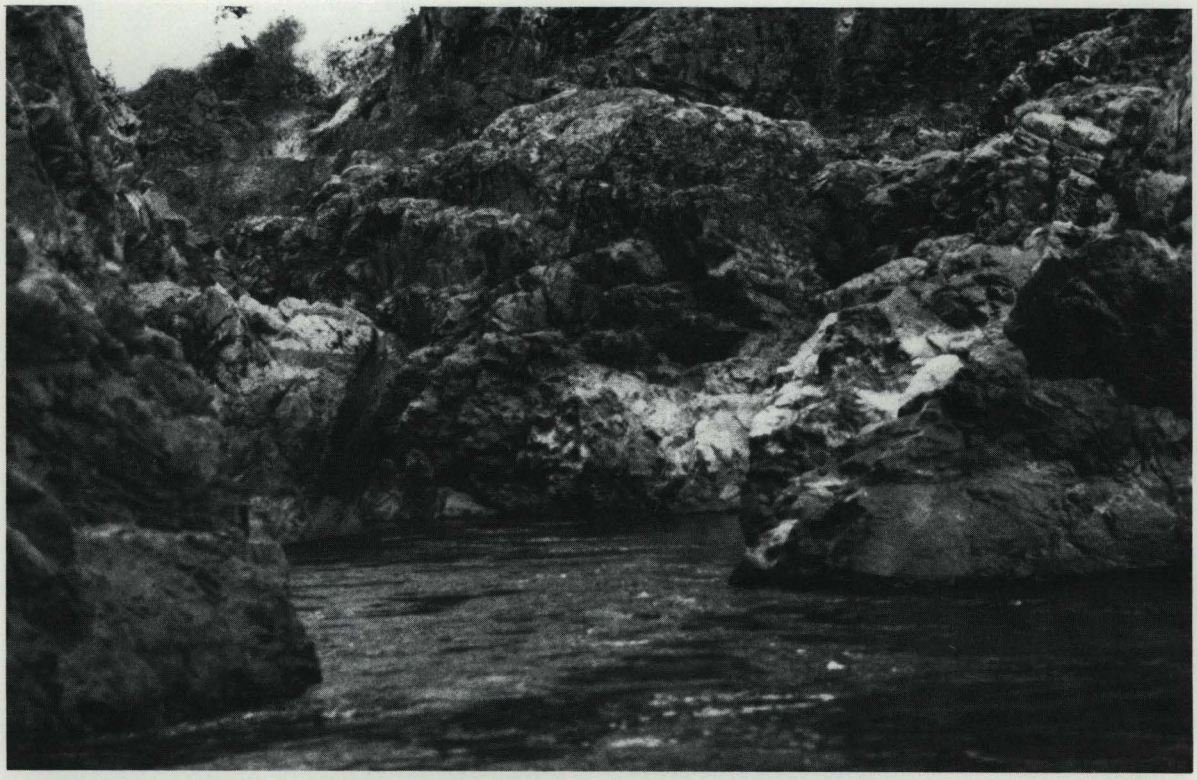


Figure 21. Mule Creek Canyon *is formed where the Rogue River is funneled between steep walls of Rogue Formation volcanic rocks. Mile 21.0.*

the younger formations as part of the Rogue thrust sheet (*i.e.*, it is the same rock that abuts the ROGUE FORMATION against the DOTHAN FORMATION at mile 4.4). It is likely that subsequent downfaulting and erosion isolated these volcanic rocks from the rest of the ROGUE FORMATION to the east. Whatever the origin of the contact here between DOTHAN FORMATION sedimentary rocks and these controversial volcanic rocks, the river is diverted from its westerly course by this resistant rock unit, and flows southwesterly for nearly two miles, its canyon following generally along the contact.

21.2 0.4 **The Coffee Pot, a semi-whirlpool** swirling between the vertical walls of volcanic rock, causes even experienced river guides to be **extremely cautious** at this point. Most guides can relate some unpleasant experiences in getting past this dangerous point. Numerous boats have been broken up by the swirling water and steep, jagged rocks. In 1967 three people were killed in a boat accident near here. The writer knows of two more recent incidents in which rafts overturned at or near the Coffee Pot and disasters were only narrowly avoided.

THE COFFEE POT

21.4 0.2 **STAIR CREEK FALLS is seen here** where Stair Creek enters the Rogue River from the south. The stream cascades over the nearly vertical rock walls to join the river just across from a prominence called Inspiration Point on the similarly steep north bank. A small campsite is situated on the beach above the waterfall. The metamorphosed lava flows just downstream from Inspiration Point have a dioritic to gab-

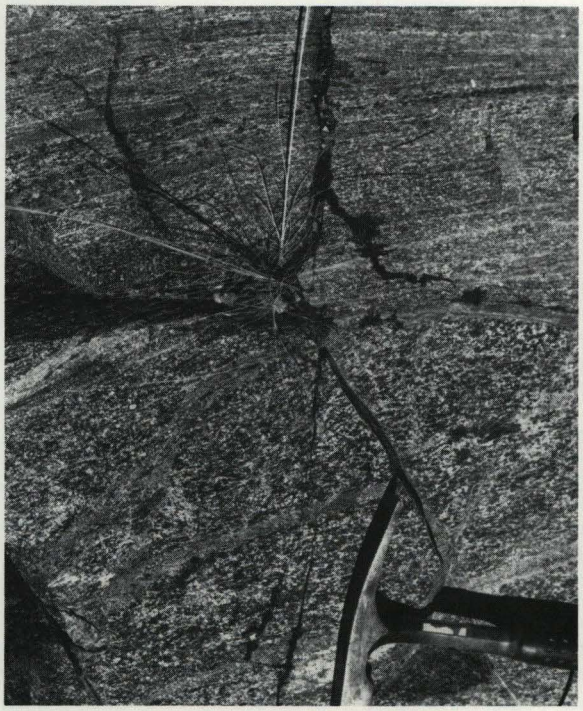


Figure 22. Banded amphibolite *of the Rogue Formation is exposed along the river banks and trail at mile 22.4.*

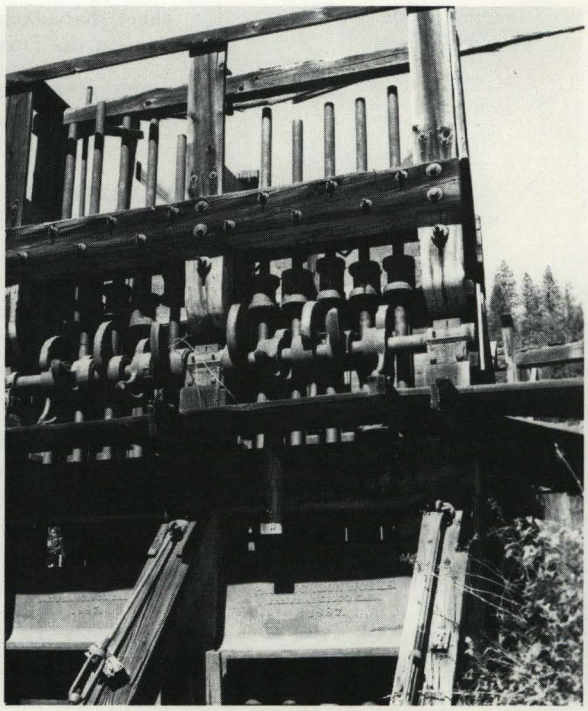


Figure 23. A stamp mill *similar to that used at Burns Creek, mile 22.6. The mill shown here is at Scott Bar, near the confluence of Mill Creek and the Scott River, in northern California.*

broic aspect. The light greenish metamorphosed volcanic rocks making up the bedrock at Stair Creek Falls are cut by dark greenish-black dikes which appear to be serpentinized. To the west-southwest a prominent peak labeled Pinnacle Point on the map can be seen rising some 1990 feet above the river. This peak is called Devils Peak and Gobblers Knob as well.

21.7 0.3 **Evidence of an old mining operation** can be seen at this point. A large rusty pipe angles down toward the river from the south bank, and there are signs of construction above it. Apparently water from the mining operation on the bank was drawn from the river through this pipe.

22.0 0.3 **A nearly horizontal fracture** is exposed on the south wall in a steep-walled, narrow portion of the river. The rocks above the fracture are a bit more greenish (serpentinized ?) than the darker grey rocks below. The rocks here appear to dip to the northeast, though this appearance may be due to a fracture pattern in the rock rather than actual bedding. Just downstream the height of the river bank diminishes and the river broadens appreciably.

22.4 0.4 **Gneissic amphibolites are exposed** on the north side of the river (Fig. 22). These rocks are aligned with Pinnacle Peak (Gobblers Knob) and strike northeasterly and dip vertically. These rocks are very similar to those exposed at Rainie Falls (mile 1.8), and it has been postulated that they are contained within a down-faulted wedge of the same thrust

sheet that places the ROGUE FORMATION amphibolites at Rainie Falls against the DOTHAN FORMATION downstream.

22.5 0.1 **A large steel plate** is situated on the north bank of the river. This plate is part of a stamp mill brought here in about 1910 or 1915 to crush rock mined at this site.

22.6 0.1 **Remnants of the Old Stamp Mill** are found along the trail just east of Burns Creek (Fig. 23). Several pieces of heavy mill equipment are scattered about. Parts are labeled with the manufacturer's name and locality (Portland, Los Angeles). Portions of a 15-inch-diameter water pipe along the east side of Burns Creek can be seen partially buried by debris. Evidence of an old road down the west side of the creek is visible, as are sites of former buildings. Apparently assaying was formerly done at this site as some old ceramic assay pots are strewn about.

22.7 0.1 **BLOSSOM BAR RAPIDS** (Fig. 24) provides the most difficult white-water on the river. **Only experienced boatmen should attempt to run this rapid.** The water is swift and the obstacles formidable. A few very large conglomerate blocks litter the stream bed. These apparently are derived from the RIDDLE FORMATION and were transported at least a mile down Blossom Bar Creek. The bedrock in this area consists of typical ROGUE FORMATION volcanic rocks. Along the trail Blossom Bar Creek provides plenty of water, a good swimming hole, and a partially developed campsite, with outhouses. Blossom Bar Rapids is the rapid that prevents boats from further progress up river. The "mail boats," some of which actually carry mail as well as tourists, come up the river approximately 45 miles from Gold Beach on the coast, as far as Paradise Bar Lodge (mile 23.6), one mile below Blossom Bar Rapids. Evidence of mining is faintly evident on the banks high above Blossom Bar.

BLOSSOM BAR RAPIDS

22.9 0.2 **Devils Stairstep, a series of pour-offs** constitute a drop of 30 feet over a distance of 0.2 miles. Power boats usually do not try to go all the way to the top of the stairs.

23.0 0.1 **Fine-grained, altered volcanic rocks** are exposed along the river. These differ from the amphibolite encountered earlier on the trail.

23.1 0.1 **The river cuts through rocks** which appear on some geologic maps as serpentinite. However, examination of the greenish rock reveals the outcrops here are composed of the same altered lava flows (greenstone) as those encountered in the canyon upstream. Serpentinite may occur in small amounts, however.

23.3 0.2 **Considerable fracturing is evident** in the altered volcanic rocks just above Paradise Creek, on the south bank. Iron oxide is abundant there, and stains the rock with yellow, brown, and orange colors. Directly across the river on the north bank the rock is intricately sheared. The shear fractures strike northeasterly and dip seventy degrees to the northwest. A large slide has resulted from the highly fractured nature of the rock on the south bank. Very large blocks of altered volcanic rock have slid down to river level.

23.4 0.1 **PARADISE CREEK forms a small waterfall** as it plunges into the river from the north.

23.5 0.1 **Serpentine-altered volcanic rock** exposed at the north end of the 2200-foot airstrip at Paradise Bar is highly sheared. These shears strike northwesterly and dip forty-five degrees to the southwest. In 1964 the

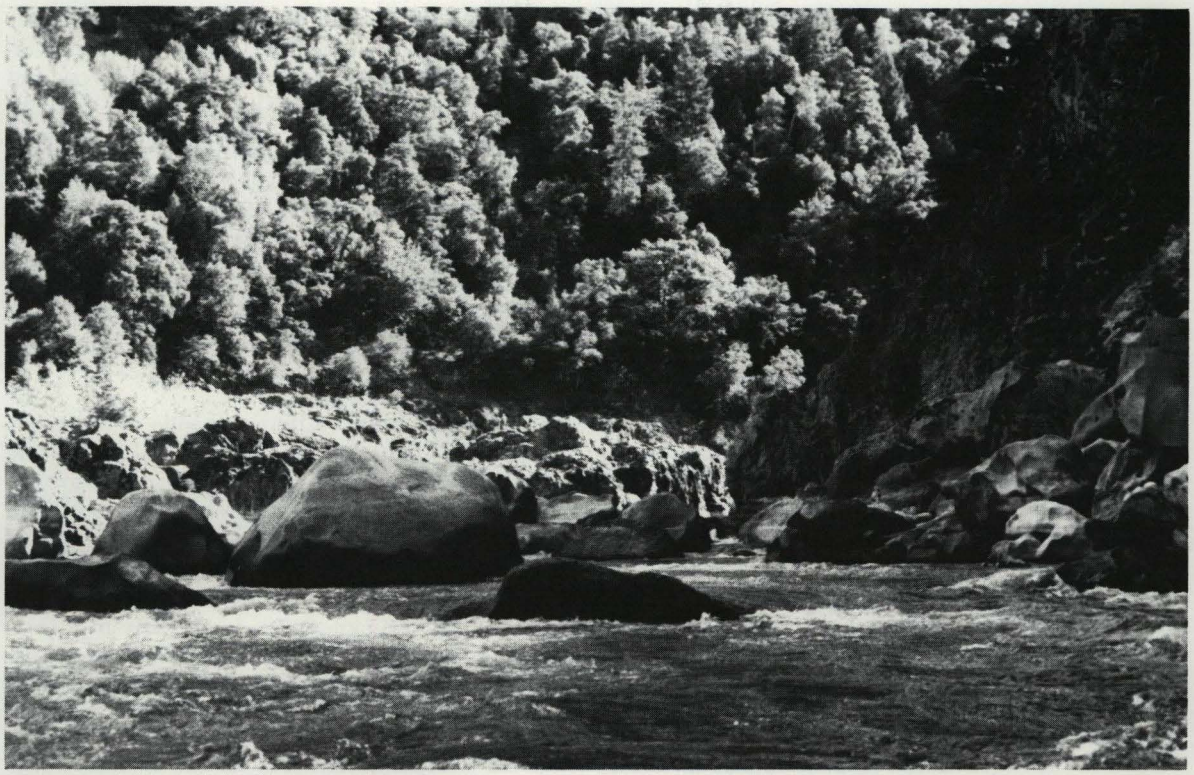


Figure 24. View upstream at Blossom Bar Rapids, *mile 22.7. Most of the large rocks in the river channel are conglomerate of the Riddle Formation, the closest exposures of which are at least a mile up Blossom Bar Creek. This rapid forms the obstacle that stops upriver traffic, including the mail boats from the coast.*

flooding Rogue River rose to the very base of Paradise Bar Lodge, which was under construction at the time. There are quite a few private cabins along the stretch of the river below Paradise Bar, and a couple of them have small airstrips.

23.6 0.1 **PARADISE BAR LODGE is open all year.** Meals and groceries may be purchased here, but are of necessity expensive. In the summer of 1974 it was possible to purchase a beer at the lodge for 75 cents.

23.9 0.3 **JOHNSON CREEK is the last source of potable water** until the hiker reaches Brushy Bar some 2 miles downstream.

24.1 0.2 **Several small slides** may be seen occurring from the foot trail on the west side of the river. Occasionally a slide is seen above the trail as well, and it is reported that the trail is often blocked by such slides in the winter months.

24.5 0.4 **Dioritic amphibolite** is exposed at river level.

24.7 0.2 **HUGGINS CANYON is entered by the river.** This stretch of the Rogue River presumably was named for Andy Huggins, a hunter and guide whom Zane Grey wrote of meeting at Solitude Bar in 1925. Huggins told Grey that coyote and black bear were numerous thereabouts, the grey timber wolf also inhabited the region, but grizzly bears were scarce.

HUGGINS CANYON

25.0 0.3 **ROGUE FORMATION volcanic rocks** are exposed along the river banks, and they are only moderately altered. It appears that these volcanic rocks abut against the RIDDLE FORMATION rocks to the west, and become progressively altered toward that boundary.

25.7 0.7 **At Sturgeon Hole the canyon walls are steep and narrow,** and according to some river guides the water is 100 feet deep at this point. The canyon widens immediately downstream. Closely spaced fractures in the bedrock may be seen. They strike east-west and dip towards the south.

25.8 0.1 **EAST CREEK enters the river** from the south. Directly across the river from the confluence on the north bank is a good exposure of altered and fractured volcanic rock.

26.0 0.2 **BRUSHY BAR is shown on the map** on the north side of the river. However, local guides apply the name to the broad gravel bar on the south bank of the river. A prolonged forest fire burned over this area in 1905, and for many years thereafter the area was covered with low dense brush, hence the name Brushy Bar (Fig. 25). An extensive mining operation occurred here at about the same time, and evidence of it may yet be seen in the ditches that are still visible. At this site there is a developed campsite sufficient to accommodate a large party of hikers. A developed water supply and toilets are located along the trail, which is about 300 yards from the river at this point. Trail marker "Mile 9" is located on the trail at the campsite.

26.2 0.2 **Dioritic bedrock material** is exposed here, but altered volcanic rocks reappear just downstream. Mining activities were carried on in the past on the north bank, and one can see the rivulets of iron-stained waters flowing into the river.

26.8 0.6 **The site of Tichenor's defeat** is identified by a sign along the trail.

TICHENOR'S DEFEAT

Captain Tichenor's troops were ambushed while enroute to Illahe to rescue whites from an Indian attack during the 1855-56 Rogue River Indian War when the Indians drove them back by rolling rocks down hill on the soldiers.

Captain William Tichenor was, in fact, a sea captain who is credited with settling Port Orford in 1851. He sailed his vessel down the Oregon Coast looking for a port south of the Columbia River from which mail and mining supplies could be transported to the miners and settlers in western Oregon. He left a small group of men at the present site of Port Orford, but they were driven off by Indians in the battle of Battle Rock. Captain Tichenor returned later with a larger group of settlers who decided to stay in spite of the hostile Indians. Captain Tichenor's name emerges frequently in historical accounts of the activities of the settlers in southwestern Oregon. He is described as a "special agent" assisting Lieutenant Ihrie of the military in rounding up Indians in the Rogue River Indian War of 1855-56 and forcing them onto the reservation.

26.9 0.1 **AT SOLITUDE BAR the bedrock is greenish,** altered volcanic rock, thoroughly shattered and laced with white quartz veinlets. Solitude Rock is a monolith of similar rock perched in the center of the river.

SOLITUDE ROCK

About 1885 Solitude Bar was the site of considerable mining activity. Rubble piles produced by these operations are situated above the trail. At the head of Solitude Bar on the south side of the river is

Figure 25. This stand of conifer trees, *mostly Douglas fir, has grown on Brushy Bar since fire denuded the bar in 1905. Mile 26.1.*

a portion of an old arrastra (Fig. 26), consisting of a concrete disc approximately 8 feet in diameter. It is located a couple of hundred feet from the river at the head of a marshy patch of equisetum, or horsetails. An arrastra is a large grinding device used to pulverize ore so that the valuable metals may be more easily extracted from the rock. The ore was usually spread over a stone floor and ground beneath heavy stones suspended from a vertical shaft. Arrastras were often driven by horses, oxen, or waterwheels. They are indicative of lode gold mining, as placer mines generally contain free gold which has already been separated from the rock by natural weathering processes. Zane Grey wrote of coming across an old flume of the Solitude Gold Mine, situated high on the mountainside above Solitude Bar. The flume consisted of a wooden structure bridging gulleys alternating with ditches. The system was designed for drawing water from a nearby creek to facilitate mining operations. Grey's novel **Rogue River Feud** was centered around Solitude Bar.

27.0 0.1 **Mounds of rocky rubble** above and below the trail mark an old mining operation.

Figure 26. A portion of an old concrete arrastra *is near the upper end of Solitude Bar, mile 26.9. An arrastra is a large grinding wheel used to crush ore so the valuable minerals can be extracted more readily.*

27.3 0.3 **SOLITUDE CAMP, the sign along the trail announces.** However, there are no campsite developments and no water available.

27.4 0.1 **SANDSTONES OF THE Riddle Formation** can be seen ahead from the river and the trail. These sandstones dip downstream and overlie the altered volcanic rocks of the ROGUE FORMATION.

27.5 0.1 **Coarse-grained dioritic rocks** are included in the ROGUE FORMATION as one approaches the contact with the RIDDLE FORMATION. These rocks contain occasional dark-colored inclusions. Some geologists feel that serpentinite and diorite such as that seen here are related to the edges of the Rogue thrust sheet.

27.6 0.1 **A distinctive change in topography** reflects the changes in rock type on the slopes just above Tate Creek. The rocks at river level are altered volcanics of the ROGUE FORMATION, but boulders of conglomerate and sandstone of the RIDDLE FORMATION (lower part of the MYRTLE GROUP) is younger than the underlying volcanic rocks of the ROGUE FORMATION. The lower portion of the RIDDLE FORMATION consists of massive chert-pebble conglomerate with some greenstone pebbles, probably derived from the underlying ROGUE FORMATION. Above these massive conglomerates the RIDDLE FORMATION consists of thin to medium bedded siltstone and sandstone alternating with conglomerate layers. Dips observed are usually moderate to steep toward the west and quartz veins

Figure 27. A ruffed grouse *blends into the background along the trail at mile 28.1.*

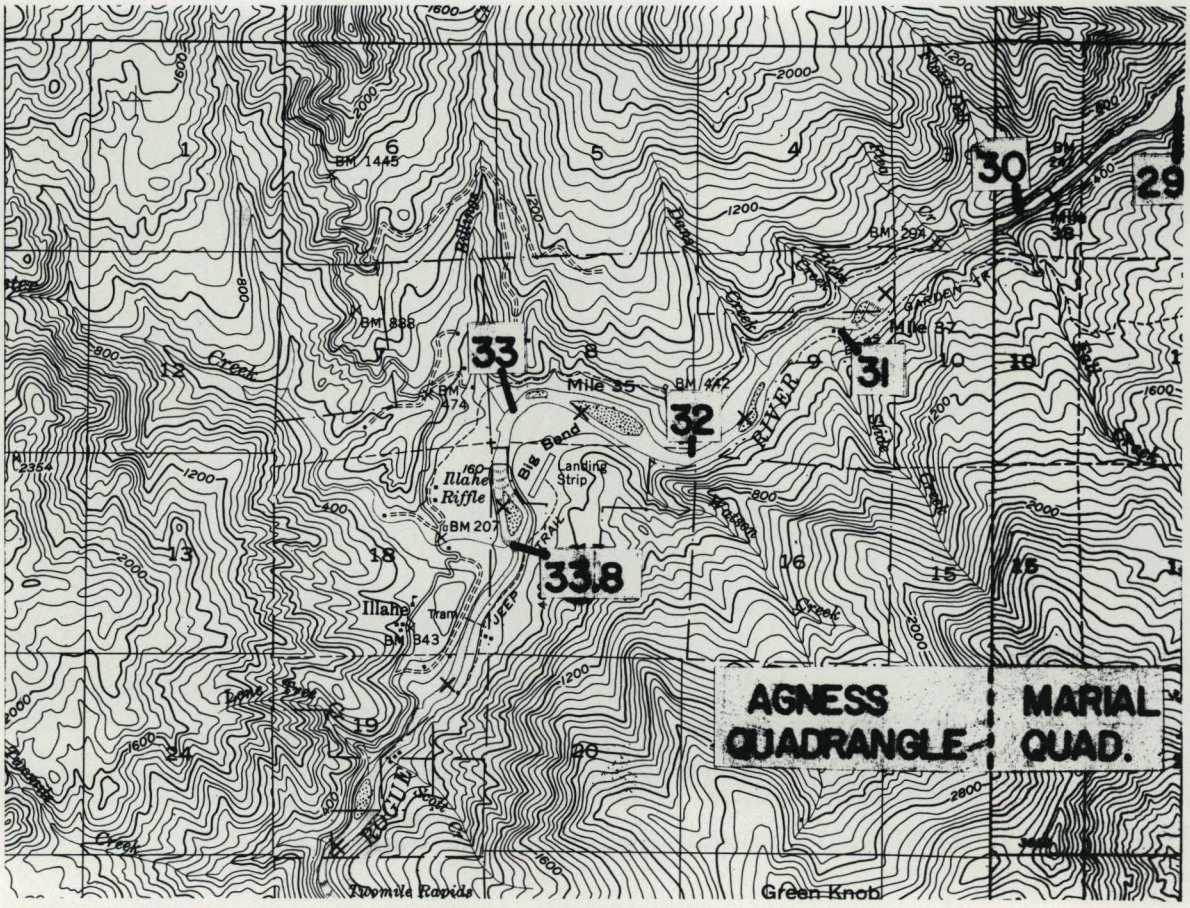
are common throughout the formation. This contact has been mapped as a depositional contact between the down-faulted ROGUE FORMATION of the thrust sheet and the FLOURNOY FORMATION. A small outcrop of the MYRTLE GROUP is mapped as faulted against the FLOURNOY FORMATION a short distance downstream. However, fossil clams (*Buchia*) of Jurassic or Cretaceous age are contained within the beds immediately above the contact with the ROGUE FORMATION rocks, and it is likely therefore that these beds represent the MYRTLE GROUP.

27.8 0.2 **Looking back upstream** one can see a prominent ledge just below the skyline. The ledge reflects a resistant sandstone and conglomerate layer of the FLOURNOY FORMATION which overlies the RIDDLE FORMATION to the west.

27.9 0.1 **TATE CREEK cascades over steep walls** of RIDDLE FORMATION sandstone to plunge fifty feet to the river level below (Plate III). The sandstone beds here strike northwesterly and dip thirty-two degrees to the west.

TATE CREEK

28.0 0.1 **SLIDE CREEK enters the Rogue River** from the south. Immediately downstream from Tate Creek the contact between the volcanic rocks of the ROGUE FORMATION and the overlying RIDDLE FORMATION is well exposed on the south side of the river. The RIDDLE FORMATION here consists of thick-bedded sandstone with individual beds a few feet thick. The sandstone contains interbedded lenses of conglomerate pebbles up to four inches in diameter. This rock weathers to a light greyish-green



Map 7. *Topographic map of the Rogue River from Mile 28.8 to Mile 33.8.*

color, and is worn quite smooth at river level, where some potholes are developed. The ledgy bedding is accentuated in some places by the river erosion, and the general appearance of the sandstone is quite distinct from that of the shattered, fragmented, and altered volcanic rocks of the ROGUE FORMATION. The sandstone beds strike northeasterly and dip toward the northwest at thirty-five degrees.

28.2 0.2 **Thin-bedded shale** is exposed along the trail. This shale contains sparse fossil clams (*Buchia*), and the dip quickly flattens downstream from nearly vertical to forty-five degrees to the west.

28.3 0.1 **BEDS OF THE Riddle Formation** strike northeasterly and dip forty-five degrees toward the southeast. There is a rock slide here on the north side of the river just at the head of Tacoma Rapids. The hillside is rather barren and the material underlying it is shaly. The trail crosses a series of slumps in the shattered shale, which displays variable attitudes. A resistant conglomerate layer at river level produces Tacoma Rapids.

28.5 0.2 **The confluence of Clay Hill Creek** with the Rogue River is located just below Tacoma Rapids. This is the site of the Clay Hill Lodge, also called Barbarian Lodge since about 1962. The Lodge is owned by Tom Staley, and currently is operated by Court Boice. The rock exposed at the foot of the stairs leading up to the lodge is siltstone. Mr. Taylor

Figure 28. Conglomerate of the Flournoy Formation *is exposed along the trail at mile 29.1.*

CLAY HILL CREEK

Cain, a former manager of Clay Hill Lodge, has collected some rock specimens which are displayed on the porch of the lodge. One of them contains small, ridged clam shells, another contains some oyster shells, and belemnites (straight, cigar shaped marine fossils). A third contains petrified wood. Mr. Cain claims all of these samples were collected nearby.

28.6 0.1 **An abrupt change in the topography** and the vegetation readily can be noted just downstream from Clay Hill Lodge (Plate IV). This change reflects the contact between the RIDDLE FORMATION and overlying FLOURNOY FORMATION. The RIDDLE FORMATION here consists of thin bedded sandstone and siltstone. These beds strike northerly and dip toward the west. These layers are overlain by a more massive greenish-grey marine sandstone unit with pebbly lenses, which represents the lowermost FLOURNOY FORMATION beds. These beds also strike northerly and dip westward. The lowermost FLOURNOY FORMATION sandstones are overlain by a thick conglomerate layer which is poorly cemented and whose cobbles consist mostly of sandstone. The contact between the RIDDLE and FLOURNOY formations lies at the base of the prominent grassy slope that is obvious from the river and the trail.

28.8 0.2 **The River Log passes from Map 6 to Map 7.**

29.0 0.2 **Massive conglomerates of the Flournoy Formation** (Fig. 28) are exposed here above the river level. The strike is still northeasterly and the dip about forty degrees toward the northwest. This massive, resistant layer can be traced visually up the hillside to the prominent bluff

on the skyline. A short distance down river there are some narrow caves eroded into the conglomerate beds, the result of weathering along the bedding planes. The bedding planes in this region become flatter, and the dip is only fifteen or twenty degrees to the west.

29.2 0.2 **THE FLOURNOY FORMATION conglomerate** is at least 300 feet thick at this point.

29.8 0.6 **The conglomerates of the Flournoy Formation** exposed here are quite coarse and contain pebbles and cobbles up to six inches or slightly more in diameter. The rock has dull grey color where washed by the river.

30.0 0.2 **The cliffs along the river banks** are composed of conglomerate layers which here appear to be essentially horizontal as viewed from the river, but actually dip gently northward.

30.1 0.1 **The River Log passes from the Marial Topographic Quadrangle to the Agness Quadrangle.**

30.3 0.2 **At the confluence of Flora Dell Creek** with the river the well bedded conglomerates of the FLOURNOY FORMATION strike northeasterly and dip ten or fifteen degrees to the northwest. From the trail one sees Flora Dell Creek plunging over a thirty foot vertical sandstone face to form a falls with a plunge pool below. Just above the trail the sandstone strikes northeasterly and dips gently to the northwest. There is a developed campsite on the beach.

30.4 0.1 **NEAR FLEA CREEK the conglomerate** dips below the river level and massive sandstone appears on the river banks. The rocks here strike northwesterly and the dip is nearly vertical.

FLEA CREEK

30.7 0.3 **Rapid changes in the attitude** of the rock layers is observed in this region. On the north bank, thin-bedded, shaly material is exposed which dips to the northeast, but on the south bank the beds appear vertical. A little farther downstream the dip is steep toward the west and weathered blocks of sandstone are seen above the shaly beds on the south bank, while on the north bank are exposed nearly horizontal, blocky sandstone layers. Still farther downstream shales are exposed on the south bank. These contain some interbedded siltstone layers up to a foot and a half thick. These beds dip steeply upstream (northeast) and thus appear to dip beneath the massive sandstones. The beds are nearly vertical on the south side of the river and horizontal on the north side.

30.8 0.1 **The trail diverges from the river** and extends through areas where blackberry bushes abound.

30.9 0.1 **HICKS CREEK flows into the river** at the head of Billings Rapid. On the north bank are exposed interbedded siltstones and shales. The dip is variable, but generally low and upstream (northeast) at the north end of the exposure. At the foot of the rapids on the south bank are exposed well layered sandstones striking parallel to the rapids and dipping northward. The dip of the beds increases rapidly toward a fault which extends north-south across the river at this point. Bending of the rock layers exposed on both sides of the river suggest the rocks to the east (up river) of the fault were displaced downward.

31.0 0.1 **A shale-siltstone sequence** is exposed here (Fig. 29), apparently horizontal.

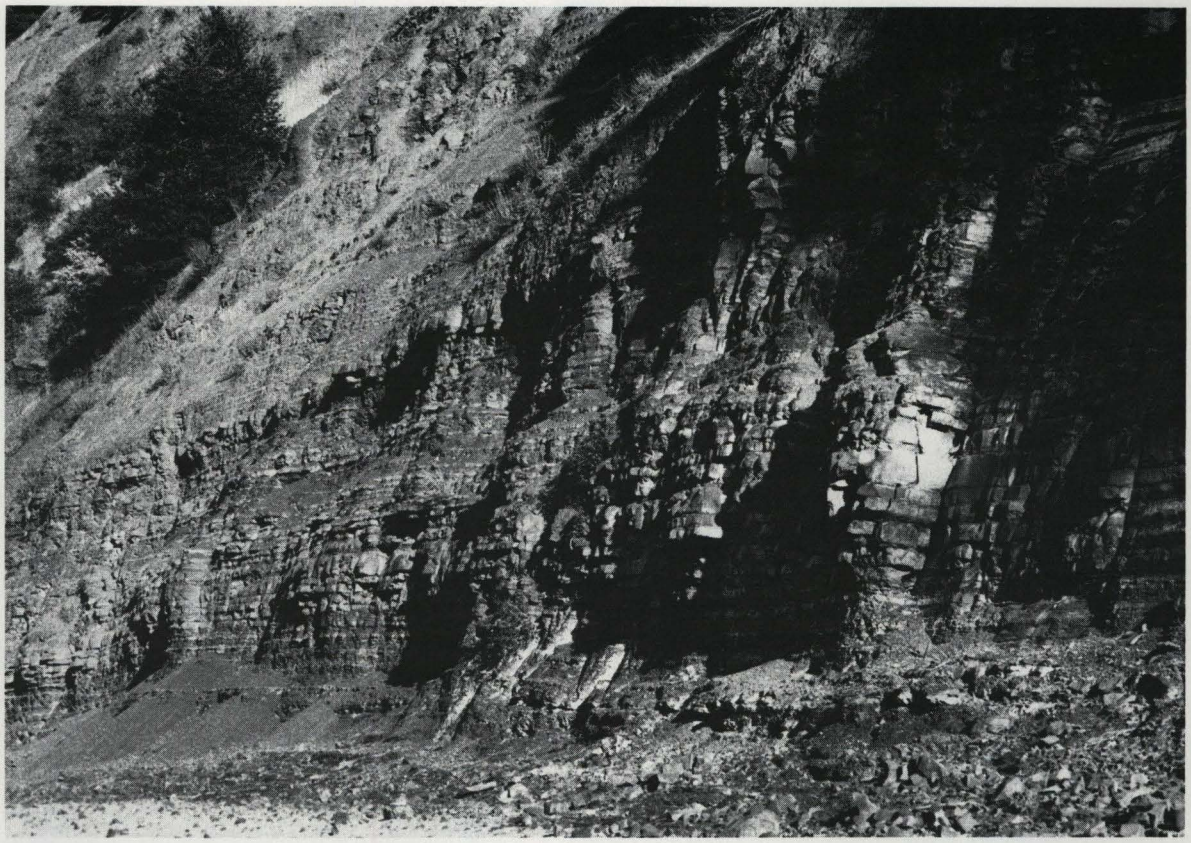


Figure 29. Thin-bedded sandstone, *siltstone, and shale of the Flournoy Formation are exposed on the north bank of the river just west of Hicks Creek, mile 31.0.*

31.1 0.1 **PEYTON PLACE LODGE,** also called Wild River Lodge, is situated on the south bank of the river. The lodge is managed by Court Boice, and caters to commercial guides and some private parties. The lodge serves as a lunch stop for some mail boat excursions.

31.2 0.1 **A thin-bedded shale-siltstone sequence** is well exposed on both banks. The beds dip gently downstream (southwest). A well developed rectangular fracture pattern is evident in the siltstone on the south bank.

31.6 0.4 **Massive sandstone** is exposed here, dipping westerly.

32.0 0.4 **A thick conglomerate layer** overlies the siltstone and shales exposed upstream, and is parallel to those rocks. The conglomerate looks very much like the conglomerate seen up river between mile 28.6 and mile 30.4. The conglomerate is between 100 and 500 feet thick, and the dip flattens to nearly horizontal where exposed on the north bank, then flexes upward again to give the impression of a broad synclinal fold at mile 32.0. The finer-grained material exposed upstream thus reappears downstream, striking about north-south and dipping easterly. These beds are well exposed on both banks.

BIG BEND 32.5 0.5 **BIG BEND is the name given** to this stretch of the river. Here the river is diverted from its southwesterly course to swing an arc to the northwest, then west, before resuming its southwesterly course. This deflection probably is due to the river encountering rock layers of

Figure 30. A doe photographed from the trail near mile 33.0.

differing hardness, or possibly a fractured zone. One geologic map shows the contact between the FLOURNOY FORMATION and the LOOKING-GLASS FORMATION extending approximately along Billings Creek and crossing the river at this point.

Big Bend was the site of the decisive battle of the Rogue River Indian War of 1855-56. Following months of skirmishing in the Rogue River Canyon, the Indians had been trapped between Army forces up and down river. At a council held in May, 1856, Colonel Buchanan attempted to get the Indians to surrender, and though some agreed, one chief vowed to fight. On May 27, 1856, several parties approached the Army camp, ostensibly to surrender, but would not surrender their weapons. Soon the Army troops found themselves surrounded by over 150 threatening braves, and the battle began. The Army troops were outnumbered, and suffered more than twenty casualties before reinforcements arrived thirty hours later. The Indians were driven away in disorder. Two days later several bands of Indians surrendered, and within a month virtually all the Indians in the area had turned themselves over to the Army. Nearly 1200 Indians from southwestern Oregon were taken to the Grande Ronde Reservation, 175 miles north on the western edge of the Willamette Valley.

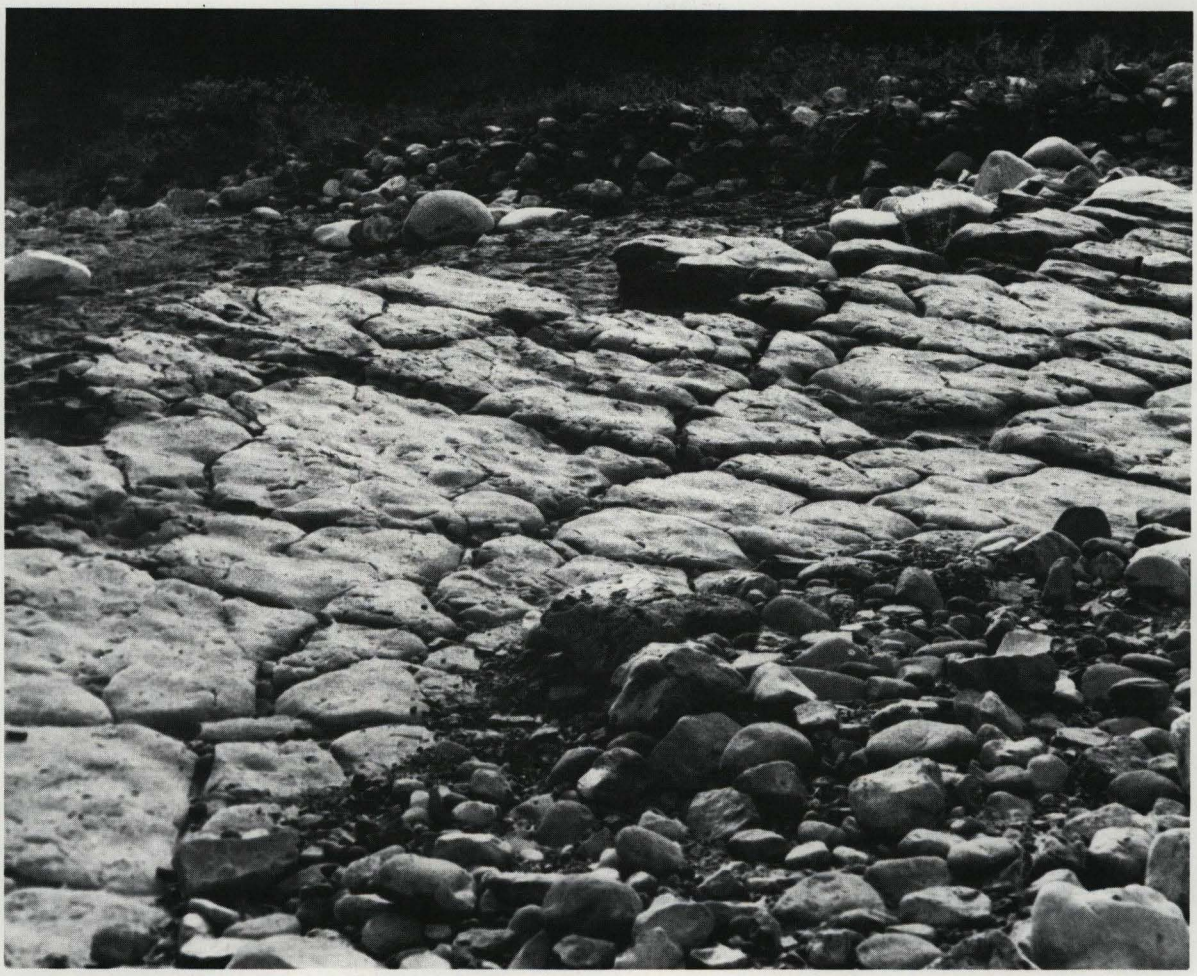


Figure 31. Jointing in a standstone bed *of the Flournoy Formation produces this polygonal pattern at Foster Bar, the take out point for many boats traversing the wild reach of the Rogue River. Mile 33.8.*

33.1 0.6 **ILLAHE LODGE is above the trail** on the west bank, several hundred yards above the river. The Lodge is privately owned, and advance reservations are required.

33.2 0.1 **At the head of the riffle** on the east bank, and extending a half mile or so downstream are excellent exposures in a nearly vertical cutbank of the thin bedded shales and siltstones. This exposure persists to the take-out point at Foster Bar. The trail from this point to Foster Creek varies from 300 yards to a half mile from the river. It leads to a dirt road which crosses Foster Creek one-half mile upstream from the river.

33.8 0.6 **FOSTER BAR** (Fig. 31) is a very broad gravel bar on the right (west) side of the river. This is a popular take-out point for boats traversing this section of the Rogue River. In 1976 a cement boat ramp was constructed to aid in the loading and unloading of boats, but it is a very steep ramp and loading operations with drift boats are difficult. There is a great deal of room for maneuvering boat trailers and parking on the bar, though there is very little shade. Foster Bar is approximately thirty-five miles upriver from Gold Beach, where the Rogue River empties into the Pacific Ocean.

FOSTER BAR

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MEANINGS OF TECHNICAL TERMS

alluvial—Pertaining to or composed of alluvium.

alluvium—A general term for loose clay, silt, sand, and gravel deposited in comparatively recent geologic times by streams.

altered—Refers to a rock that has undergone changes in its chemical and mineralogic composition since its original deposition.

ammonite—Organisms belonging to an order of cephalopods characterized by a thick, strongly ornamented shell with sutures having finely divided lobes and saddles.

amphibole—A group of dark, rock-forming aluminum silicate minerals containing iron, magnesium, and other elements.

amphibolite—A metamorphic rock consisting mainly of amphibole and plagioclase feldspar.

anadromous—A term applied to fish which ascend rivers from the sea, at certain seasons, for breeding. Steelhead and salmon are anadromous fishes.

anticline—A fold, the core of which contains the older rocks; it is convex upward.

attitude—The position of a flat or curved surface relative to the horizontal expressed quantitatively by both strike and dip.

banded—This term describes a layered effect present in some rocks.

bed—An individual layer of relatively homogeneous material within a group of sedimentary layers.

bedding—The arrangement of sedimentary rock in beds or layers of varying thickness and character.

bedrock—A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

biotite—A rock-forming aluminum silicate mineral of the mica group. It is usually black or dark green or dark brown. It is common in igneous and metamorphic rocks.

breccia—A coarse-grained rock composed of angular fragments greater than 2 millimeters in diameter. These fragments are cemented together in a finer grained matrix.

calcite—A common rock-forming mineral composed of calcium carbonate.

carbonaceous—Describes a rock or sediment that is rich in carbon, also describes a sediment containing organic matter.

cephalopod—A mollusk belonging to the class Cephalopoda. Octopuses, squids, and cuttlefish are common living cephalopods.

chert—A hard, extremely dense, fine-grained variety of quartz. It often occurs as nodules in sedimentary rocks, and less commonly as layered beds which may represent original deposition of chert or a replacement product.

chromite—An oxide mineral containing iron and chromium. It usually originates in certain igneous rocks such as dunites (consisting mostly of the mineral olivine), and upon weathering often accumulates in black sands along a river course. It is the principal ore of chromium.

conglomerate—A coarse-grained sedimentary rock composed of rounded fragments greater than 2 millimeters in diameter set in a finer-grained matrix.

contact—A plane or irregular surface between two different types or ages of rocks.

cyanide plant—A plant designed to extract free gold from its ores. The crushed ore is passed through a solution of potassium cyanide to dissolve the gold. The gold solution then is passed through a precipitating filter containing zinc that precipitates the bullion which is then purified and cast into bricks. This method is used only for concentrating free gold; it cannot be used to extract gold from sulfides or tellurides.

dendritic—Describes a drainage pattern in which the streams branch irregularly in all directions, and at almost any angle, resembling in map view the branching habit of certain trees, such as oaks and maples.

dike—A sheet-like igneous intrusion that cuts across the layers or structures of the surrounding rock.

diorite, dioritic—A coarse grained igneous rock composed of amphibole, pyroxene, and plagioclase feldspar of intermediate composition.

dip—The angle that a structural surface such as a bedding surface or a fault plane makes with the horizontal, measured perpendicular to the strike of the surface.

discharge—The rate of flow of a stream, expressed as a volume of water passing a given point during a specified unit of time, for example, cubic feet per second.

discordance—Lack of parallelism between adjacent rock layers. It implies some geologic activity such as folding or faulting occurred between the time of deposition of the units so described.

epidote—A greenish mineral common in certain types of metamorphic rocks. It is a silicate mineral containing calcium, iron, and aluminum.

fault—A surface or zone of rock fracture along which the rocks have moved.

feldspar—A group of abundant rock-forming minerals. They are aluminum silicates usually containing potassium, sodium, or calcium. Feldspars are the most abundant minerals on the earth's surface, comprising nearly half the rocks exposed on the surface.

fold—A curve or bend of a planar structure such as a sedimentary bed. It is usually the product of deformation of the rock.

gabbro—A dark-colored, coarse-grained igneous rock composed mostly of calcium-rich plagioclase feldspar and pyroxene, with or without olivine.

gastropod—A mollusk belonging to the class Gastropoda. Snails are examples of this class.

garnet—A group of silicate minerals of variable composition. Garnets are found in small amounts in igneous, and more commonly, in metamorphic rocks.

gneiss, gneissic—A metamorphic rock with a planar arrangement produced by alternating layers of granular minerals and minerals having flaky or elongate prismatic shapes. It commonly contains quartz and feldspar, and often micas and/or amphibole.

granite, granitic—A coarse-grained igneous rock which contains abundant quartz, potassium feldspar, and sodium plagioclase feldspar.

greenstone—A compact, dark green, altered igneous rock such as basalt, gabbro, or serpentinite. It owes its color to the growth of green minerals such as chlorite, hornblende, and epidote.

hornblende—The commonest mineral of the amphibole group. Its composition is variable, but includes calcium, iron, aluminum and silicon and oxygen.

hornblendite—An igneous rock composed almost entirely of hornblende.

intrusion—The process of emplacement of molten rock material into preexisting rocks.

intrusive—Describes the process of igneous intrusion and the rock so formed.

jointed—Describes a rock which contains fractures along which there has been no movement of the rocks on either side.

lode—A mineral deposit consisting of a zone of veins; a mineral deposit in consolidated rock as opposed to placer deposits.

massive—Describes a stratified rock that occurs in very thick, homogeneous beds, or igneous or metamorphic rocks with homogeneous structure.

matrix—The finer-grained material surrounding larger mineral grains or rock fragments in a rock.

meander—One of a series of sinuous bends or curves along a stream's course. It is also used as a verb to describe the wandering of a stream channel as it flows down slope.

medium bedded—A term applied to a sedimentary bed whose thickness is intermediate between thin-bedded and thick-bedded.

metamorphic, metamorphosed—Pertaining to the process of metamorphism or its results.

metamorphism—The mineralogical and structural adjustment of solid rocks to changes in their physical and chemical environment.

monolith—A large, upstanding, mass of rock.

mudstone—A compacted mud having the texture and composition, but lacking the fine lamination of shale.

orogenic—The adjective of orogeny, which means the process of formation of mountains.

pegmatite—An exceptionally coarse-grained igneous rock with interlocking crystals, usually found as irregular dikes, lenses, or veins. They are often found in or near large igneous intrusions.

pelecypod—A mollusk belonging to the class Pelecypoda. Clams belong to this class.

pillow lavas—A lava characterized by pillow-shaped masses ranging from a few centimeters to more than a meter in diameter. They result from eruption of lava into water or wet sediments.

placer—A surficial mineral deposit formed by mechanical concentrations of mineral particles, such as gold flakes and nuggets, from weathered debris.

plagioclase—A group of sodium- and calcium-bearing feldspars.

point bars—A series of low, arcuate ridges of sand and gravel developed on the inside of a growing meander.

pyroxene—A group of dark, rock-forming silicate minerals. They usually contain calcium, sodium, magnesium, and iron.

quartz—Crystalline silica, an important and abundant rock-forming mineral containing silicon and oxygen. After feldspar, it is the most common mineral in the earth's crust. It occurs as the major constituent in most sands, and is common as a vein filling in all kinds of rock.

quartzite—A metamorphic rock composed mostly or entirely of quartz. It is usually derived from sandstone or chert.

riparian—Pertaining to or situated on the bank of a body of water, especially of a water course such as a river.

rodingite—A calcium-enriched gabbroic rock containing calcium garnet and calcium pyroxene.

sandstone—A sedimentary rock composed of fragments between 1/16 and 2 millimeters in diameter.

schist—A strongly layered metamorphic rock that can be split into slabs due to the parallelism of the mineral grains it contains.

sediment—Fragmental material that originates from weathering of rocks and is transported by air, water, or ice, or that is accumulated by chemical precipitation from solution.

sedimentary—Pertaining to or containing a sediment.

serpentine—A group of rock-forming minerals. They are water-bearing silicates containing iron and magnesium.

serpentinite—A rock consisting almost entirely of serpentine minerals which are usually derived from alteration of other silicate minerals such as olivine and pyroxene.

serpentinization, serpentinized—The process of alteration by which magnesium-rich silicate minerals such as olivine and pyroxene are converted to serpentine minerals.

shale—A fine-grained sedimentary rock composed of fragments less than 1/256 millimeter in diameter, which is characterized by finely-stratified structure.

shear—A fracture caused by compressive stress.

silicification—The introduction of or replacement by silica, generally resulting in the formation of fine-grained quartz, chalcedony, or opal, which may both fill pores and replace existing minerals.

siltstone—A fine-grained sedimentary rock composed of fragments between 1/16 and 1/256 millimeter in diameter.

slate—A compact, fine-grained metamorphic rock formed from such rocks as shale or volcanic ash, which have the property of fracturing along closely spaced, parallel planes independent of the original bedding.

sluice box—A long narrow trough, usually constructed of wood, with thin wooden strips called riffles across the bottom used by miners to separate placer gold from stream gravels. The gold bearing gravel is dumped into the trough and water is flushed through it, washing away the gravel and leaving behind the heavier gold trapped behind the riffles.

stamp mill—A device for crushing rock so that the valuable minerals may be more easily extracted. Generally it consists of a row of vertical rods with heavy weights or hammers on the bottom. These are attached to a shaft which is rotated by an engine or water wheel, driving the hammers up and down.

stratigraphic—Pertaining to stratigraphy, the branch of geology that deals with the correlation of rock units or layers of equivalent age.

strike—The direction or trend that a structural surface such as bedding or fault plane takes as it intersects the horizontal.

syncline—A fold, the core of which contains the younger rocks; it is concave upward.

tectonic—Pertaining to tectonics, the branch of geology dealing with the broad architecture of the upper part of the earth's crust, i.e., the regional assembling of structural or depositional features.

terraced—Describes a horizontal or gently sloping surface, generally created by a geologic process such as prolonged stream erosion or wave erosion.

thrust sheet—The body of rock that forms the block on top of a thrust fault. It has been pushed over

the rocks below along the fault that forms the base of the sheet.

tuff—A compacted volcanic rock composed largely of volcanic ash and dust.

unconformity—A substantial break or gap in the geologic record where a rock unit is overlain by another which is not next in the stratigraphic succession, such as an interruption in the continuity of a depositional sequence of sedimentary rocks.

vein—A mineral filling in a fracture in an older rock. It usually has a tabular or sheet-like form.

veinlet—A small vein.

volcanic—Pertaining to the activities, structures, or rock types of a volcano.

zeolites—A group of water-bearing aluminum silicate minerals, usually containing sodium, calcium, or potassium. They frequently are found as secondary fillings in cavities in dark-colored igneous rocks.

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