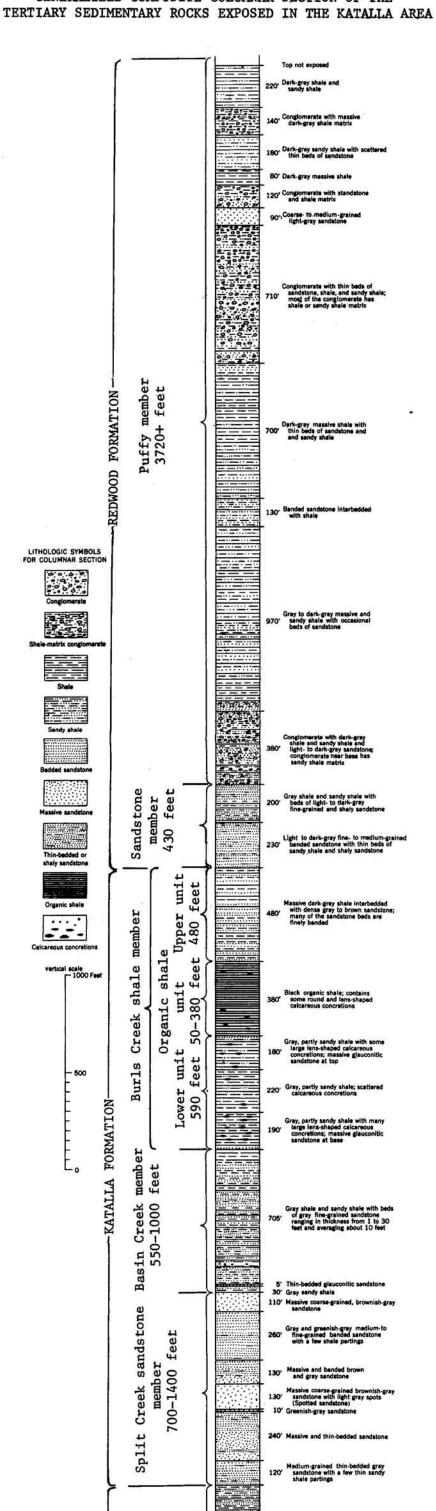
MISCELLANEOUS FIELD STUDIES

GENERALIZED COMPOSITE COLUMNAR SECTION OF THE



Derk-gray micaceous partly sandy shale with some thin beds of gra-bended fine-grained calcareous sandstone

O' Dark-gray micaceous platy shale

This map of the central part of the Katalla district is one of a series showing the geology of the Gulf of Alaska ertiary province. The onshore part of the province is made up of an arcuate belt more than 300 miles (485 km) long and 2 to 40 miles (3.2 to 64.5 km) wide in which Tertiary sedimentary rocks are exposed or are inferred to underli lowland areas covered by unconsolidated surficial deposits or ice (Plafker, 1967, 1971). Field studies were carri out intermittently by Miller and others in the central Katalla district from 1944 to 1953 as part of the Geologica Survey's continuing efforts to evaluate the petroleum and coal resources of southern Alaska. Results of investigat in the Katalla district have been made available in preliminary open-file reports (Miller, 1951, 1961). This map assembles available geologic data on this complex and critical area in a standard U. S. Geological Survey publication makes minor map revisions on the basis of newer data, and formally defines or redefines mappable time-rock units of

Geologic map and sections of the central part of the Katalla district, Alaska

Don J. Miller-

The stratigraphic sequence exposed in the central part of the Katalla district includes more than 6.000 feet (1830 m) of apparently conformable bedded marine sedimentary and volcanic rocks of probable late Eocene through Miocene age. On this map, bedded rocks are subdivided into the Tokun Formation of late Eocene and early Oligocene age, the Katalla Formation of Oligocene age, and the Redwood Formation of Oligocene(?) and Miocene age. Table 1 shows the relations of formation and member subdivisions, as used herein, with those used previously. As a result of the early reconnaissance geologic investigations of the Katalla district, Martin (1908) assigned rocks in the map area to the Katalla Formation, which he subdivided into five parts ("e" through "i") on the basis of lithology. The groupings used herein and in previous preliminary U. S. Geological Survey reports (table 1) correspond closely to those of Martin except that his unit "g" has been further split into two members and all mappable units have been assigned formation and member names as shown on table 1. On the basis of age and lithology, the Katalla Formatic is correlated with the Poul Creek Formation of the Yakataga and Malaspina districts, the Tokun Formation is probably the age equivalent of the upper part of the Kulthieth Formation of the Yakataga and Malaspina districts, and the Redwood Formation may be equivalent to the lower part of the Yakataga Formation exposed in the eastern part of the Katalla district (Suckling Hills, Kayak Island, and Wingham Island) and elsewhere in the Gulf of Alaska Tertiary province.

Tokun Formation The Tokun Formation was named by Martin (1908, p. 24, 35) for exposures on both sides of Lake Tokun in the northern part of the Katalla district and north of the map area where the unit is typically developed. Within the map area, strata assigned to the Tokun Formation include 1,080 feet (330 m) to approximately 3,500 feet (1070 m) of interbedded siltstone and sandstone of late Eocene and early Oligocene age. In the Don Miller Hills the formation is at least 1,400 feet (425 m) thick where it is exposed in structural highs south of Bering Lake and in a homoclinal section along the west shore of Redwood Bay. Approximately 1,200 feet (365 m) of the upper part of the formation is exposed on Gandil

Fieldwork and paleontologic studies near Lake Tokun have shown that a thick sandstone unit, which was included in

the upper part of the Tokun Formation by Martin (1908, p. 35-39), is the equivalent of the Split Creek Sandstone Member in the basal part of the Katalla Formation south of Bering Lake. In this report, therefore, the Tokun Formation is considered to underlie directly the Katalla Formation, and the contact is drawn at the base of the Split Creek Sandston Member. The base of the Tokun Formation is not exposed within the map area but is believed to be gradational with the underlying coal-bearing Kushtaka Formation on Charlotte Ridge, north of Bering Lake. The contact of the Tokun with the overlying Katalla Formation is sharp, through apparently conformable, at most places in the hills south of Bering Lake. It is drawn at the change from predominantly silty beds to the sandstone of the Split Creek Sandstone Member. Judging from the description and field notes of Martin, the same relation also prevails on the ridge between Lake Charlotte and Kushtaka Lake, north of the map area. At both Gandil Mountain and Nichawak Mountain the contact between the Tokun and Katalla Formations is gradational and not so sharply defined as farther west because the Split Creek, the basal member of the Katalla Formation, is more silty. Because of complex structure and poor exposures, the probable Tokun strata on Nichawak Mountain could not be differentiated on the geologic

The Tokun Formation consists predominantly of concretionary siltstone with a lesser and variable amount of interbedded sandstone. In Gandil Mountain and the type area north and northeast of Bering Lake, the formation has an upper part that is almost wholly siltstone, and a lower part (base not recognized) that is siltstone containing numerous thin interbeds and some thick beds of sandstone. Thick sandstone beds, presumably of the lower part of the formation, are exposed along the west side of Redwood Bay near Point Hey. The siltstone is medium to dark gray and massive and weathers into small angular fragments of irregular shape. Lighter gray brown-weathering calcareous siltstone and silty limestor occur within the darker siltstone as thin beds and discontinuous lenses. Spherical to oblate spheroidal concretions of hard medium- to dark-gray limestone, from an inch (2.5 cm) to 2 or 3 feet (.6 to 1 m) in largest dimension, are distributed randomly in the siltstone. The sandstone, which is generally lighter gray than the siltstone, is somewhat micaceous, finely banded, and brown weathering. The dominant grain size is commonly near the boundary between very fin

No conglomerate beds or even scattered pebbles were noted in the Tokun Formation. Thin beds of glauconitic sandstone, and siltstone with scattered sand-size grains of glauconite, occur in the upper part of the Tokun at several places in the vicinity of Bering Lake. The section exposed from Point Hey northward along the west shore of Redwood Bay is somewhat coarser grained and consists largely of light- to dark-gray fine- to medium-grained banded feldspathic sandstone intercalated with thin beds of gray sandy shale and shaly sandstone. The sandstone is similar in general appearance to the Split Creek Sandstone Member of the Katalla Formation, but it contains a larger proportion of siltstone and thin-bedded sandstone and lacks the mottled sandstone that is characteristic of the Split Creek. The massive sandstones of the Point Hey area are ighter in color, as a rule, and contain a larger proportion of feldspar. Crabs predominate in fossil collections from the Tokun Formation. Most of the crabs are in concretions in the

upper part; the mollusks are mainly in thin beds or lenses of calcareou. sandstone in the lower(?) part in the vicinity of Point Hey. The most abundant fossil in the upper part of the Tokun is the large crab Branchioplax washingtoniana Rathbun, many specimens of which have been found enclosed in spherical or ellipsoidal concretions, beautifully preserved and with the slender appendages still attached. Known occurrences of this crab in the Katalla district, with one possible exception, are in the Tokun Formation. The only other crabs known from the Tokun are Portunites alaskensis Rathbun and Raninoides fulgidus Rathbun. Portunites alaskensis is much more common in the overlying Katalla Formation, and an identical or similar species of Raninoides occurs in the Eocene Stillwater Formation north of Bering Lake.

1/Deceased. The publication in its present form was prepared by George Plafker, R. G. Tysdal, and G. R. Winkler from preliminary and open-file reports by Miller, Rossman, and Hickcox (1945) and Miller (1957, 1961), and from Miller's

The mollusks from the Tokun Formation are almost exclusively marine, with gastropods exceeding pelecypods in both the number of individuals and species. Preservation is characteristically poor. Selected species of mollusks mostly collected by Miller and identified by F. S. MacNeil are listed in table 2. Mollusks collected by earlier workers in the map area generally are not specifically identifiable, or their locations are doubtful. Few age-diagnostic mollusk: have been found in the upper part of the Tokun, and of these, only <u>Turcicula columbiana</u> Dall is regarded as specifically identifiable and possibly indicative of the age of these beds. Among the other remains of megafossils found in beds tentatively or definitely correlated with the Tokun Formation is an echinoid (<u>Linthia?</u> sp.), an apparently unde-A meager and poorly preserved foraminiferal fauna obtained from the middle and upper part of the Tokun Formation

includes species of Cyclammina, Haplophragmoides, and probably Trochammina, and other badly deformed arenaceous specimens not identifiable even to genera. A few pyritized diatoms were found in the samples. The molluscan fauna of the Tokun Formation indicates a correlation with the late Eocene "Tejon" stage and the probable early Oligocene Keasey Stage of the Pacific Coast standard section (Weaver and others, 1944). The gastropod Turcicula columbiana, from near the top of the formation, is a common form in the Keasey Formation and in other beds in Washington and Oregon that are included in the Keasey Stage of the standard section and that are regarded by most West Coast paleontologists as latest Eocene and earliest Oligocene. The crab <u>Branchioplax washingtoniana</u>, which is characteristic of the upper part of the Tokun, is a long-ranging species that has been identified by Rathbun (1926, p. 44) at several localities in Washington from beds whose present age assignments range from late Eocene (Cowlitz Formation) to early Miocene (upper part of Lincoln Creek Formation). In Prince William Sound this crab occurs in the Orca Group of probable late Paleocene age (Plafker and MacNeil, 1966; Addicott and Plafker, 1971). The marine origin of the Tokun Formation is demonstrated by the fossil remains of marine organisms, mainly mollusks

echinoids, and crabs, that are found throughout the formation. Such genera as Ficopsis, Turritella, and Pitar, which occur in the formation outside the map area, are generally regarded as indicating tropical to warm temperate water (Durham, 1950, p. 1248, 1249, 1254). The gastropod genus Conus, which was collected from "...near the end of Point Hey" (Martin, 1908, p. 30), is now mainly tropical in distribution with only a few species known in warm temperate water. Deposition under quiet bottom conditions below the lower limit of ordinary wave action is suggested by the massive concretionary siltstone and by the thin, persistent beds of uniformly banded fine-grained sandstone. The character of the bedding and the general fineness of the sediment indicate deposition well seaward from the surf zone on a continental shelf of sufficiently low gradient to preclude introduction of coarse clasts by mass-flow processes. The abundance of well-preserved remains of crabs in calcareous concretions, coupled with the absence or scarcity of these or other kinds of fossils in the enclosing noncalcareous sediment, is characteristic of the massive concretionary siltstone of the upper part of the Tokun, as well as the Basin Creek Member of the Katalla Formation. Selective preservation of crabs in concretions is believed to be due to presence of a local alkaline environment in otherwise acidic bottom sediments. The alkalinity, which is caused by slow decay of crustacean meat within the exoskeleton, caused calcium carbonate precipitation from pore-water in the sediment

The Katalla Formation was first defined by Martin (1905, p. 13) as

"a series of dark argillaceous and carbonaceous shales, with occasional thin beds of sandstone,
limestone, conglomerate, and volcanic ash * * * typically exposed in the region to the northeast
of Katalla, along the bank of the Katalla River and in the range of hills to the southeast".

In a later report Martin (1908, p. 24, 27-30, 37) described the sequence in greater detail as including five lithologic
units with a total thickness of 6,500 feet. Taliaferro (1932, p. 772-776) restricted the name Katalla Formation to the
lower three units of Martin and proposed the name Redwood Formation for the upper two units. Geologists investigating
the Katalla district on behalf of oil companies (Hanna and others, unpublished report, 1938) recognized three formations
in the area south of Bering Lake and considered the upper part of the Katalla Formation of Martin to be in fault contact
with, and older than, beds assigned by Martin to the lower part of his Katalla Formation. In a preliminary report, with, and older than, beds assigned by Martin to the lower part of his Katalla Formation. In a preliminary report, Miller, Rossman, and Hickcox (1945) provisionally divided the Katalla Formation of Martin into seven members, adopting in part the definitions and names proposed by Taliaferro (1932) and by Hanna and others (unpublished report, 1938). As a result of later work in the Katalla district, it is now considered desirable to assign the lowest of these members to the underlying Tokun Formation and to consider the coarse clastic facies of the highest member and part of the underying member as two members of a separate formation, the Redwood Formation. In this report three members of the Katalla Formation are defined and named, in ascending order, as follows: 1) Split Creek Sandstone Member; 2) Basin Creek Member; and 3) Burls Creek Shale Member. Maximum total thickness of the formation is about 5,190 feet (158 m). shows the relations of the redefined Katalla Formation to the stratigraphic subdivisions used in earlier published and

Split Creek Sandstone Member Taliaferro (1932, p. 772-773) named and defined the Split Creek Shale and Sandstone Member as a shale unit and overlying sandstone unit, both constituting the lowest member of the Katalla Formation. Taliaferro included the lowest beds exposed in the area south of Bering Lake in this member, beds that correspond to units \underline{h} and \underline{i} of Martin (1908, Miller, Rossman, and Hickcox (1945, p. 8-9) restricted Taliaferro's name to the upper (sandstone) unit and accordingly renamed it the Split Creek Sandstone Member. The underlying shale unit was considered an unnamed shale member constituting the lowest member of the Katalla Formation. In this report, Miller, Rossman, and Hickcox' (1945) restricted usage and name--Split Creek Sandstone Member--are retained, but the base of the Katalla is raised to coincide with the base of this member. The underlying shale unit is reassigned to the underlying Tokun Formation as its uppermost member because the lithology more closely resembles the gross lithology of the Tokun than that of the Katalla. The Split Creek Sandstone Member is well exposed in the valley of Split Creek and is typically developed at the head of the creek. The member is exposed extensively elsewhere in the hills south of Bering Lake, in the vicinity of Lake Tokun, in Gandil Mountain, and in the northeastern part of Nichawak Mountain. The member is a prominent ridgermer between more easily eroded silty sequences of the underlying Tokun Formation and overlying middle part of the The Split Creek Sandstone Member is 1,000 feet (305 m) thick in the type section measured at the head of Split Creek. The thickness, estimated from rough measurements made on the map or from structure sections, ranges from about 700 to 1,400 feet (215 to 425 m) in the Don Miller Hills and is at least 900 feet (275 m) in the Gandil-Nichawak Mountain

The chief rocks in the Split Creek Sandstone Member are massive thick-bedded medium- to coarse-grained brownishgray sandstone and evenly banded fine- to medium-grained thin-bedded gray to brown sandstone. The bands are formed by concentrations of dark grains, principally biotite, with or without carbonized plant remains, along bedding planes. Locally this type of sandstone is conspicuously crossbedded. Much of the massive brownish-gray sandstone is mottled with light-gray spots one-eighth to half an inch in diameter in which the matrix mineral commonly is zeolite. This mottled sandstone, called "spotted sandstone" in the field, is a reliable indicator of this member in the areas south of Bering Lake and in the vicinity of Lake Tokun but is not conspicuous in Gandil Mountain or Nichawak Mountain. Both the thick- and thin-bedded sandstones are composed principally of fresh, angular to subrounded grains of quartz, feld-spar, and biotite. Feldspar, mainly orthoclase, albite, and oligoclase, constitutes from 10 to 40 percent of several

In the ridge south of Bering Lake and west of Bering River, the Split Creek Sandstone Member includes at least two In the ridge south of Bering Lake and west of Bering River, the Spirit Creek Sandstone Heads at the Spirit Creek Sandstone in the Spirit Creek Sandstone Constituent. Along the Bering River about a third of a mile (.5 km) north of the abandoned village of Chilkat, 10 feet (3 m) or more of fossiliferous pebble conglomerate, apparently a lens, occurs about 400 feet (120 m) stratigraphically below the top of the member. Scattered pebbles and thin, lenticular beds of pebble conglomerate were seen in the member at a few other places in the district. In the Don Miller Hills the Split Creek Sandstone Member contains only a minor amount of siltstone, mainly gray sandy siltstone, as thin partings between beds of massive sandstone or thin interbeds with fine-grained banded sandstone. Gandil Mountain outcrops mapped as Split Creek are largely sandstone, but exposures are poor, and the covered interval Gandil Mountain outcrops mapped as Split Creek are largely sandstone, but exposures are publy, and the covered interved may be partly or largely siltstone. In Nichawak Mountain strata mapped as Split Creek consist of sandstone interbedded with about equal amounts of siltstone. An underlying silty unit of typical Tokun lithology was noted at a few places near the northeast end of Nichawak Mountain. These silty rocks could not be delineated, however, because they are complexly deformed and concealed extensively by vegetation and glacial deposits.

The name "Basin Creek" was used by Hanna and others (unpublished report, 1938) for interbedded sandstone and "shale" (mainly siltstone) exposed in the valley of Basin Creek, constituting the lower member of their Burls Creek Formation. Miller, Rossman, and Hickcox (1945, p. 7, 9-10) first published the name Basin Creek Member and assigned it to the Katalla Formation, a usage retained in this report. Only the lower part of the Basin Creek Member is exposed in the valley of Basin Creek, the type locality, but the member is typically developed and well exposed in the ridge forming the divide between the valleys of Split Creek, Redwood Creek, and Burls Creek. A section measured on this ridge is The Basin Creek Member crops out in a continuous belt extending from Redwood Creek to Chilkat Creek and is exposed

Ine basin creek Member crops out in a continuous belt extending from Redwood Creek to Chilkat Creek and is exposed also in the ridges between the Katalla River and Redwood Creek and between Chilkat Creek and the Bering River. The unit is exposed in one small area on Gandil Mountain and is extensively exposed, although not mapped separately from the Burls Creek Shale, in the southwestern part of Nichawak Mountain. In resistance to erosion the Basin Creek Member is, on the whole, intermediate between the underlying Split Creek Sandstone Member and overlying Burls Creek Shale Member. In detail the sandstone units form low ridges, alternating with flat areas or small valleys developed on the siltstone. This results in a finely ribbed texture that shows up clearly on the aerial photographs at some places. his results in a finely ribbed texture that shows up clearly on the aerial photographs at some places. The Basin Creek Member consists largely of gray hard very fine grained massive sandstone interbedded with softer massive siltstone. The sandstone and siltstone alternate in beds or groups of beds 1 to 50 feet (.3 to 15 m) thick with an average thickness of about 10 feet (3 m) for the sandstone and about 25 feet (7.5 m) for the siltstone. The sandstone and siltstone have about the same color and general appearance, both consisting of angular grains of feldspar and quartz imbedded in a finer grained matrix. In the Don Miller Hills glauconite occurs as scattered grains in both sandstone and siltstone and locally forms thin beds of dark-glive-green sandstone. stone and siltstone and locally forms thin beds of dark-olive-green sandstone.

At two sections measured at the head of Split Creek and at the east margin of the valley of Burls Creek the thickness of the Basin Creek Member is 740 feet (226 m) and 550 feet (168 m). Elsewhere in the Don Miller Hills the thickness, as estimated from measurements made on the map, ranges from about 550 feet (170 m) to about 1,000 feet (300 m). In Nichawak Mountain beds of typical Basin Creek lithology in the undifferentiated Basin Creek-Burls Creek sequence at least 1,000 feet (300 m) thick. The most characteristic feature of the Basin Creek Member is its "cannonball" concretions which are abundant in the siltstope. The concretions are gray hard silty-limestone spheres or oblate spheroids tions, which are abundant in the siltstone. The concretions are gray hard silty-limestone spheres or oblate spheroids from 1 to 6 inches (2.5 to 15 cm) in diameter, many of which contain fossil crabs.

In Nichawak Mountain the Basin Creek Member includes much green fragmental volcanic material, in part water-laid and interbedded with sandstone and siltstone and in part as lenticular or roughly cylindrical bodies that show some intrusive relations with the enclosing siltstone. One of these intrusive bodies, which forms the south peak of Nichawak Mountain, was described by Taliaferro (1932, p. 779-780, fig. 11)2/ as a laccolith of basalt, but this body consists at least in part of coarse volcanic breccia and tuff with poorly developed stratification. The stratification is roughly concordant with that of the enclosing sedimentary rocks, mostly siltstone, which show no alteration. The titles of figures 13 and 14 in Taliaferro (1932) are reversed.

Burls Creek Shale Member

Talliaferro (1932, p. 772-774) named and defined the Burls Creek Shale Member as the upper member of his Katalla Formation, corresponding to Martin's unit g and including the predominantly shaly sequence exposed in the valley of Burls Creek between his Split Creek Shale and Sandstone Member and Point Hey Sandstone Member. In this report the Burls Creek Shale Member of the Katalla Formation is restricted to the siltstone and associated sandstone and volcanic rocks that comprise the upper part of the Burls Creek Shale Member of Taliaferro. The interbedded sandstone and siltstone now designated as the Basin Creek Member are excluded. Three subdivisions of the Burls Creek are recognized an apped locally and are here referred to as: 1) the lower unit, 2) the organic shale unit, and 3) the upper unit. urls Creek is typically developed at its type locality, the divide between the west fork of Burls Creek and east for Redwood Creek. The upper contact here is gradational with the overlying sandy member of the Redwood Formation. In a Don Miller Hills the Burls Creek Shale Member, with a maximum thickness of 2,790 feet (850 m), is exposed extensively in the valley of Burls Creek, along the east fork of Redwood Creek, along Chilkat Creek and the ridge to the east, and on the ridge between Redwood Creek and the Katalla River valley. The unit also forms nearly all of Mount Campbell and the southwest end of Nichawak Mountain.

Lower unit.--In the type area, the lower unit of the Burls Creek Shale Member consists predominantly of concretion-siltstone, with variable amounts of glauconitic sandstone and fragmental volcanic rocks. The siltstone is massive, medium- to light-gray on fresh surface, weathering into small angular roughly equidimensional dark-gray fragments. The contact between the Burls Creek Shale Member and the underlying Basin Creek Member is not sharply defined on Nichawak: Mountain because fragmental volcanic rocks occur interpedded in both units; for this reason and lack of outcrops, it was not feasible to map the contact, and the units are grouped together on the geologic map. The thickness of the lower unit of the Burls Creek ranges from 160 to 590 feet (50 to 180 m) in sections measured in the valley of Burls Creek, and it may be 1,000 feet (300 m) or more on the ridge west of Redwood Creek. Concretions of dense medium-gray limestone are rather sparsely but evenly distributed throughout the siltstone

of the concretions are lenticular or oblate spheroids, with pocked surfaces, and are much larger than concretions of the underlying and overlying member; they average more than 2 feet (.6 m) and are as much as 10 feet (3 m) or more in major diameter. Large limestone concretions are well exposed in the southwestern part of Nichawak Mountain and on the northwest_flank of Mount Campbell. Many of the larger concretions show septarian structure, the cracks being filled by calcite. The lenticular or oblate concretions ordinarily have their larger dimensions parallel to bedding and commonly provide the only clue to the attitude of small outcrops of massive siltstone. The glauconitic sandstone is dark olive green to almost black on fresh surfaces, weathering reddish brown. It is hard and massive and consists of angular to subrounded grains of glauconite in a brownish-green silt- and clay-size matrix. Pyrite is a common constituent. The glauconitic sandstone forms massive beds that show rapid lateral change o 60 feet (18 m) thick at the top and base of the lower unit and locally forms a third bed a few feet (m) thick near the middle of the unit. On the ridge west of Redwood Creek, the lower unit includes several beds of glauconitic sand stone, one with a maximum thickness of 40 feet (12 m). Only a few thin beds of glauconitic sandstone were noted on

Nichawak: Mountain, and none were seen on Mount Campbell. No glauconitic sandstone was found in the member in the ridge

Organic shale unit.--A black shaly unit, the "organic shale" described by Taliaferro (1932, p. 772-774), was mapped of provisionally designated as a member of the Katalla Formation in the preliminary report on the area south of Bering Lake (Miller and others, 1945). The black shale was not found east of a fault along Chilkat Creek in this area, althou equivalent stratigraphic interval is presumably present there. Later work indicated that the black shale is variable in its lithologic character and also in its stratigraphic position relative to the top and bottom of the sequence here included in the Burls Creek Shale Member. At some places it occurs at more than one horizon, and at others it is absent or not markedly different from the prevailing dark siltstone of the upper part of the Burls Creek. Over most of the Don Miller Hills the medium- to light-gray siltstone and associated glauconitic sandstone making the lower unit of the Burls Creek are overlain by the organic shale unit. This unit, with a maximum total thickness f 380 feet (115 m) includes 50 to 200 feet (15 to 60 m) or more of black argillaceous rock, predominantly claystone but noluding also siltstone and mudstone. The contact of the black shale with the underlying glauconitic sandstone or lighter colored siltstone is sharp; the contact with the prevailingly dark-gray siltstone of the upper unit of the Burl A maximum thickness of about 180 feet (55 m) of the organic shale unit is exposed at the north margin of the isolated hill at the southwest end of Nichawak Mountain. The contact with the dark siltstone of the upper unit of the Burls Creek is gradational at this locality; the lower contact with the lighter siltstone of the lower unit of the Burls Creek

The organic shale unit is notably incompetent and at many places is strongly contorted and sheared, breaking down into small, irregularly shaped fragments that have shiny, slickensided surfaces and resemble coal. Where undisturbed, the shale is massive and compact. Limestone concretions, mostly lenticular or oblate spheroids and ranging from an inch (2.5 cm) to 2 feet (.6 m) in largest dimension, are common in the shale unit. A sample of partly weathered black shale matter and about 0.8 gallon of oil per ton (analysis by W. W. Brannock, U. S. Geological Survey, Jan. 9, 1945). The shale at some outcrops emits a strong odor of petroleum when struck with a hammer. Black shale, much like that exposed in the Don Miller Hills, crops out at many places in the vicinity of the oil seeps at the southwest end of Mount Campbell and also along the northwest flank of the mountain. This shale is believed to occur at two or more horizons in the Burls Creek Shale Member. Along the east fork of Redwood Creek and the west fork of Burls Creek the light-gray to black siltstone of the lower unit and the organic shale unit of the Burls Creek Shale Member contain tabular and irregularly shaped masses of rock that show some intrusive relations to the enclosing sediments but consist wholly or in large part of fragmental volcanic material. The largest of these is an irregularly shaped body in black siltstone on the west fork of Burls Creek, albout a mile (1.6 km) above the junction with the east fork. This was shown as an intrusive body on the prelimnary map (Miller and others, 1945) although the large proportion of included fragments of unaltered sedimentary rock the lack of alteration of the country rock at the contacts, and other nonigneous features were noted. Later study of thin sections showed that some parts of the supposed intrusive body consisted of angular fragments of sedimentary and volcanic rocks imbedded in the country rock (the black shale) or cemented by calcite. In other parts of the body, however, the matrix appears to consist of basaltic glass. Some of the tabular bodies of volcanic material are clearly
bedded and are concordant with the enclosing sediments. Many of the dikelike and irregularly shaped masses are believed
to represent fragmental material deposited with the enclosing sediments. During later folding larger masses like the
one exposed on the west fork of Burls Creek acted as competent "knots" around which the enclosing sediments flowed, and both the large and small bodies at places were shattered and injected into the enclosing sedimentary rocks along frac-tures in a manner analogous to the formation of sandstone dikes. Fluid igneous material may have later invaded some the larger bodies. Several dikes of light-gray medium-grained sandstone, ranging in thickness from 1 to 4 inches (2.5 to 10 cm), were found in the Burls Creek in the ridge between Chilkat Creek and the Bering River.

interbedded with varying proportions of fine-grained sandstone in the Don Miller Hills, in the isolated hi at the southwest end of Nichawak Mountain, and in Mount Campbell. Concretions are rare, although light-gray limestone occurs in thin beds and lenses. Lenses of limestone containing a coquina of broken pelecypod shells are a characteristic feature of the upper part of the Burls Creek. The sandstone for the most part is in thin beds, gray or brown, and The contact of the Burls Creek with the overlying strata is rather sharply defined by the transition from a predominantly silty to a predominantly sandy sequence at most places in the western part of the Don Miller Hills, at the south-west end of Nichawak Mountain, and in Mount Campbell. In the valley of Burls Creek, however, the contact is gradational and is arbitrarily drawn at the transition from predominantly silty sediments to interbedded sandstone and siltstone. The upper unit of the Burls Creek Shale Member is about 480 feet (145 m) thick in the type section at the head of the west fork of Burls Creek but appears to thicken westward to at least 2,000 feet (610 m) in the vicinity of the Katalla oil field and probably thickens eastward also in the valley of Burls Creek. It is about 1,000 feet (305 m) thick in the hill at the southwest end of Nichawak Mountain and possibly as thick as 1,750 feet (535 m) in Mount Campbell.

er unit.--The upper unit of the Burls Creek Shale Member consists of dark-gray commonly sandy massive to plan

Fossils are relatively rare and poorly preserved in the Katalla Formation, except for the crabs in concretions of the Basin Creek Member. Dall (in Martin, 1908, p. 39) prefaced each of his reports on the early collections with remarks on the poor state of preservation of the fossils, and Taliaferro (1932, p. 781-782) noted the scarcity of fossils in the Katalla [Formation as compared to beds of approximately the same age in the Yakataga district. The scarcity of identifiable fossils is reflected in the uncertainty that has existed as to the age and stratigraphic position of the units that make up the formation. Among the age-diagnostic megafossils collected from the Katalla Formation, pelecypods and gastropods are most abundant in number of specimens and variety of species. H. E. Vokes made a preliminary study of the mollusks collected during the 1944 and 1945 field seasons. F. S. Mackeil later restudied all of the mollusks in the U. S. Geological Survey's collections from the Katalla district, making tentative identifications of selected species, which

The distinctive crab " Eumorphocorystes" naselensis Rathbun occurs abundantly in the "cannonball" concretions of the Basin Creek Member and seems to be restricted to this member and beds of equivalent age in the Katalla district. At some localities as many as half of the concretions that were broken open were found to contain well-preserved specimens of this crab. A species of swimming crab <u>Portunites alaskensis</u> Rathbun and the pelecypods <u>Nemocardium weaveri</u> (Anderson and Martin) and <u>Pitar</u> sp. aff. <u>P. dalli</u> (Weaver) are most common in, but not restricted to, the <u>Basin Creek</u>. The Burls Creek Shale Member is characterized by one or more species of a mud pecten Hyalopecten (Delectopecten) and several species of deep-water pelecypods of the genera Pleurophopsis?, Phreagena, Calyptogena, and Solemya (Achara). The concretions in this part of the Katalla Formation, unlike those of the Basin Creek Member, rarely contain fossils. Gastropods are conspicuously scarce in collections from the Burls Creek. addition to the mollusks and crabs, the megafauna of the Katalla Formation includes a few poorly preserved specimens of starfish, a possible coral, shark vertebrae and teeth, and fish-scale impressions. The egg case of a chimaroid fish, one of the few known in the fossil record, was found in the Split Creek Sandstone Member (Brown, 1946), and carbon ized plant remains are abundant. F. S. MacNeil, after making a study of all Katalla mollusks in the U. S. Geological Survey collections, concluded that the Katalla Formation is of Oligocene age and suggested the following tentative age assignment and correlation for "The Split Creek Sandstone Member is approximately middle and possibly lower Lincoln (middle

Oligocene) in age. It may be equivalent in part to the lowest part of the Poul Creek Formation or it may all be slightly older. The Basin Creek Member is probably lower Blakeley (late Oligocene) and possibly upper Lincoln (middle Oligocene) in age. The Burls Creek Shale Member The crab "Eumorphocorystes" naselensis Rathbun, according to H. B. Stenzel (undated written commun., circa 1945), is a specialized form and is regarded as a reliable guide fossil. This species, which is characteristic of the Basin Creek Member of the Katalla Formation, has been reported from unnamed beds assigned to the Lincoln Stage on Vancouver Island

(Jeletzky, 1954), along the Nasel River in southwestern Washington (Weaver, 1942, p. 558), and from the Keasey Shale and unnamed equivalent beds of the Keasey Stage or lower part of the Lincoln Stage in northwestern Oregon (Warren and others, 1945; Vokes and others, 1954). The Katalla Formation in the map area is correlated with the lower and middle parts of the Katalla Formation west of the Katalla River in the Suckling Hills (Miller, 1961) and with the Katalla Formation of Kayak and Wingham Islands Plafker, 1974) on the basis of both paleontological and lithological evidence.

Thin evenly bedded fine- to medium-grained sandstone units of the Split Creek Sandstone Member, together with their associated marine invertebrate fauna, are interpreted as evidence of deposition in relatively shallow but quiet water. Beach or even fluvial environments may be represented by some of the massive mottled arkosic sandstones of this member, for similar beds are associated with coal in the Kushtaka Formation in the northern part of the Katalla district. The massive concretionary siltstone and fine-grained muddy sandstone of the Basin Creek and Burls Creek members were probably deposited in deeper marine waters and under quiet bottom conditions. Intermittent mafic submarine volcan-ism during Basin Creek and much of Burls Creek time is indicated by the abundance of water-laid pyroclastic material interbedded with the clastic sediments of the Basin Creek and lower part of the Burls Creek. The environmental significance of the crab-bearing concretions, so abundant in the Basin Creek, was discussed in the section on the Tokun Forma-tion. The black, highly organic siltstone and shale of the Burls Creek was formed in closed basins with restricted_ bottom circulation and foul bottom waters that retarded or prevented destruction of organic matter before burial. The rite-bearing glauconitic sandstones are also indicative of restricted circulation. A depth of considerably more than DO fathoms (183 m) at times during deposition of the Basin Creek and Burls Creek members of the Katalla Formation is suggested by the occurrence of the vesicomyacid pelecypod genera <u>Phreagena</u> and <u>Calyptogena</u>; living representatives of the latter genus have been dredged at depths ranging from 183 to 680 fathoms (335 to 1244 m). A sparse foraminiferal fauna recovered from the more silty rocks of the Katalla Formation is considered by Ruth Todd to indicate deposition in moderately deep water, ranging possibly from 50 to 500 fathoms (90 to 915 m).

The Redwood Formation was named by Taliaferro (1932, p. 774-776) for a clastic marine sequence roughly 4,500 feet (1370 m) thick that overlies the Katalla Formation. Taliaferro recognized two units within the formation, a lower member consisting predominantly of sandstone with subordinate interbedded siltstone, which he named the Point Hey Sandstone Member, and an upper member--his Puffy Shale Member--of interbedded massive mudstone or siltstone that is in part conglomeratic, true conglomerate, and sandstone. The Redwood Formation is typically developed and well exposed along the crest of the ridge between Puffy and Redwood Creeks. The predominantly sandstone sequence exposed in the vicinity of Point Hey, which was previously thought to be younger than the Burls Creek Shale Member of the Katalla Formation, is now considered on the basis of its micro- and megafauna to be at least in part equivalent to the Tokun Formation. Accordingly, it is shown as Tokun and probable Tokun on the geologic map; usage of the name "Point Hey Sandstone Member" as a time-rock unit should be discontinued. Thus, Taliaferro's nomenclature is followed herein except that the name of the lower unit is changed from Point Hey Sandstone Member to the sandstone member. At the head of Puffy Creek in the Don Miller Hills, the sandstone member of the Redwood Formation is 430 feet (130 m) thick and consists of about two-thirds sandstone and one-third siltstone. It becomes progressively more silty eastward in the outcrop belt between Redwood Creek and Burls Creek. In the isolated hill at the southwest end of Nichawak Mountain the sandstone member includes about 400 feet (126 m) of gray and brownish-gray fine- to medium-grained andstone. The unit is well exposed along several creeks at the southeast margin of Mount Campbell, where it consist of thick units of sandstone alternating with thinner units of sandy siltstone with a total thickness of about 500 feet

The Puffy Member of the Redwood Formation is made up of about 50 percent massive siltstone, mudstone, and claystone, 30 percent conglomeratic mudstone and conglomerate, and about 20 percent sandstone in the type area. The conglomeratic beds, which characterize the Puffy Member, show complete gradation from true conglomerate in which the coarse clasts predominate and are in contact with one another to conglomeratic mudstone or sandstone in which the coarse clasts are scattered in the matrix, similar to plums in a pudding. The clasts are predominantly of pebble and cobble size and are well rounded to subrounded. In most beds they appear to have a fairly definite upper size limit, generally from 1 to 3 inches (:2.5 to 7.5 cm), with a few clasts exceeding 6 inches (15 cm) in diameter. No large angular boulders or striated clasts were found in the Puffy Member, although Taliaferro (1932, p. 775) described the Puffy as containing boulders and angular blocks, like the Yakataga Formation in the Yakataga district. Possibly equivalent beds elsewhere in the Katalla district, in the Suckling Hills, and on Kayak and Wingham Islands contain conglomeratic mudstone with large, angular clasts that have been assigned to the Yakataga Formation (Plafker, 1967, 1974). The nonconglomeratic siltstone, mudstone, and claystone of the Puffy Member are similar in appearance to the massive, fine-grained rocks of the Basin Creek and Burls Creek Members of the Katalla Formation but contain few or no concretions and are generally more sandy, harder, and more resistant to erosion. The sandstone is predominantly light gray to light brown and fine to medium grained. It occurs in thin beds in the siltstone and in thicker and more massive beds associated mainly with the conglomeratic

Age and depositional environment Megafossils within the Redwood Formation are scarce, and collections are small. The sparse fauna available suggests to F. S. MacNeil (written commun., Oct. 23, 1963) tentative correlation with part of the "Blakeley" Stage (late Oligocen to early Miocene) of the Pacific Northwest. It is accordingly considered to be Oligocene(?) and Miocene. The fauna and lithology reflect deposition mainly below wave base in cold water at depths that range from middle neritic to probable bathyal. The high degree of rounding of the pebbles in the conglomerate and mudstones indicates that the coarser clastic material was abraded by beach and possibly stream processes before being deposited in an offshore basin.

Dioritic intrusive rocks with unknown contact relations crop out in isolated small hills rising above the alluvium just west of the Nichawak Hills. Sandstone in the Katalla Formation in the nearest outcrops about half a mile (.8 km the east shows no contact alteration. In thin section the digrite has an intergranular panidiomorphic texture. I s made up of about 45 percent plagioclase in broad laths up to 2.5 mm long, 30 percent anhedral augite and enstatite about 20 percent anhedral chlorite in large clusters, and 5 percent subhedral magnetite and ilmenite. The plagioclass is highly saussuritized, but extinction angles on relict albite twinning indicate a composition of about andesine. Ferroaugite (CAZ 44° , $2V = 45^{\circ}$) is commonly intergrown with enstatite. Some enstatite crystals are partly rimmed with green chlorite. The rock may best be described as an altered pyroxene-bearing diorite or diabase. Its unusual mineralogy indicates a lack of chemical equilibrium, probably owing to contamination during emplacement. Small tabular dikes and sills or irregularly shaped bodies of dark-colored mafic igneous rock too small to delinsive bodies are associated with the silty Basin Creek Member of the Katalla Formation; a few are in the upper part of the Tokun Formation. Most of the mafic intrusive bodies appear to be closely related in composition and time of emplacement to the bedded volcanic rocks of the Basin Creek Member and the lower unit of the Burls Creek Shale Member of the atalla Formation; and, as noted under the discussion of these members, there seem to be all gradations from unquestionably intrusive igneous rocks through extrusive pyroclastic deposits and lava flows to possible flow injection of fragented igneous material. Thin sections reveal that these rocks are mainly diabase, commonly with calcite- and chloritefilled vesicles averaging 0.4 mm diameter, in an obscure groundmass of plagicclase microlites up to 0.7 mm long, chlorite, calcite, abundant iron ore, and clusters of sphene.

The characteristic pattern of folding in the Tertiary rocks of the south-central Katalla district is one of closely

IGNEOUS ROCKS

spaced and tightly compressed anticlines and synclines of equal width and small lateral extent. Most of the folds are symmetric or overturned, with their axial planes dipping north or west. Overturning to the north or northwest has been are much more common than dips of 30° or less. All faults on which the attitude could be determined with any degree of certainty dip steeply north or west or are vertical. The west or north side has moved relatively up on many of the faults, but on some faults either the opposite sense of dip-slip displacement or a large component of lateral displace The structure of the Don Miller Hills area, excepting the parts north of Split Creek and south of the Katalla oil field, may be described generally as a southward-plunging synclinorium in which the superimposed lesser folds trend mostly north or slightly east of north. A northeasterly to easterly grain of deformation is dominant in the vicinity of Split Creek. Elsewhere it is represented by an abrupt change in the plunge of north-trending folds as along the east fork of Burls Creek, or by areas in which the prevailing strike is east as in the ridge between Puffy Creek and Redwood Creek. As shown by the structure sections (A-A' through E-E') the intensity of folding and the shape of the folds and attitude of their axial planes vary greatly, not only between folds but also along the axis of individual folds. Flank dips measured in the Split Creek Sandstone Member at approximately equal distance from the axis of the relatively large anticline along Split Creek range from 30° to 70° N. on the north flank and from 30° S. through vertical to 60° overturned to the south on the south flank. The intensity of folding generally increases to the south, with overturning to the west in the ridge east of Chilkat Creek but to the east elsewhere. One of the most open folds in the area, however, s the south-plunging syncline between Point Hey and Cave Point. Major faults along Redwood and Chilkat Creeks are indicated by discordant structural trends and by stratigraphic evidence. The attitude of the fault planes and, at places, the location of the faults are uncertain. No exposures of the Redwood fault plane were seen, but the trace of the fault at the head of Redwood Creek valley and the stratigraphi relations of the rocks on either side of it indicate that it dips west and is downthrown on the west side. This inter pretation is supported also by evidence of relative left-lateral movement along three east-trending faults that intersect the Redwood fault and cross the ridge to the west. Other smaller faults with the same trend as the Redwood fault, some th the west side relatively up and others with the west side relatively down, were mapped to the east of Redwood Creek he Chilkat fault is thought to dip steeply to the west, with the relative movement of the west side either up or south. or both up and south. The abrupt and even scarps facing the Katalla River Valley on the west and the Bering River on the east suggest the possibility that the Don Miller Hills are bounded by faults along their east and west margins. Gandil Mountain, Nichawak Mountain, and Mount Campbell constitute a structural unit in which the grain of folding Gandil Mountain, Nichawak Mountain, and Mount Campbell constitute a structural unit in which the grain of folding is uniformly northeast. The lowlands between these three northeast-trending ridges may lie along faults, but if so, the displacement along them probably is not large. The folds in Gandil Mountain are relatively broad, plunge southwest, and are offset by a northwest-dipping thrust fault that cuts across the fold axes at a low oblique angle (section F-F'). The folds in the main part of Nichawak Mountain are more tightly compressed and more closely spaced than those in Gandil Mountain (section G-G'). The fold axes plunge southwest near the southwest end of the mountain but farther northeast are about horizontal. The isolated hill at the southwest end of Nichawak Mountain consists of a broad syncline and narrower anticline whose axes plunge about 40° southwest. In Nichawak Mountain several vertical or steeply dipping transverse faults with variable strikes intersect fold axes at angles ranging from low oblique to nearly perpendicular. The structure of Mount Campbell is complex and not well known. It is probably a southeast-dipping homocline with some repetition of beds in tight folds that are in part overturned southeast and with possibly considerable repetition of beds on the northwest flank by faulting (section H-H'). Most of the mountain consists of massive siltstone without distinctive or persistent beds. The dip, where it can be determined, is extremely variable, and sedimentary features dicative of bedding tops are scarce. A fault dipping steeply to the west was observed along several streams on the

UNCONSOLIDATED DEPOSITS

A variety of Holocene glacial, glaciofluvial, fluvial, and shoreline deposits occur within the mapped area. Their distribution and physical characteristics are given by Kachadoorian (1960). Only the more extensive unconsolidated

northwest slope of Mount Campbell

Oil and gas seeps were discovered in the Katalla district about 1896, and active exploration for petroleum began shortly after that (Martin, 1921, p. 11-34). The locations of wells drilled for oil and all known seeps in the area are shown on the geologic map. Data for the wells are given in table 4. In 1902, the second of two wells drilled near the Katalla discovery seeps struck oil at a depth of 366 feet (112 m). Between 1902 and 1931, 28 wells were drilled in the Katalla field (inset map), and 16 wells were drilled at nearby locations in the district. In the period 1902 through 1933, the Katalla field produced about 154,000 bbl of paraffin-base oil with a gravity of 41-45° Baume; producing depths ranged from 360 to 1,750 feet (110 to 534 m). The oil accumulation as probably largely in fracture porosity in a fault zone cutting steeply dipping, well-indurated sandstone and siltston f the Katalla Formation. Production ended in 1933 when a fire destroyed the small refinery at the field. In 1961 and 962, the Richfield Oil Corporation drilled two dry exploratory wells in the map area. The first well, located on the Illuvial flats west of Bering River (well no. 45), penetrated 6,175 feet (1883 m) of Tokun and Kushtaka(?) strata; the second well, located at the edge of the hills near the outlet of Bering Lake (well no. 46), penetrated 6,019 feet (1836 m) of the Katalla and Tokun Formations. Both holes were drilled into complex faulted structures with steep to

t probable source beds are the carbonaceous shaly parts of the Katalla Formation. Sandstone within the Katalla Formation as well as the sandstone and conglomerate of the overlying Redwood Formation are the most favorable potential reservoirs. Most of the outcrop samples, however, have fairly low porosity and permeability, mainly because of a fine-grained matrix of silt, primary and authigenic phyllosilicates, and carbonate. Oil seepages from the Tokun Formation outcrop area could be due to juxtaposition of the older rocks over the Katalla Formation by faulting. Outcrop samples of Tokun sandstone are generally compositionally and texturally immature. They appear to have poor reservoir character stics because they are compacted and are tightly cemented with zeolite, carbonate, and authigenic silica. Anticlinal structures exposed in the map area have proved to be either inaccessible or too small and complex to justify exploratory lling to date. Because of the structural complexity and scarcity of good reservoir sands, it is unlikely that large accumulations of petroleum occur in the map area although it is entirely possible that small commercial deposits may be

On the basis of the stratigraphic units in which most of the pil seeps and other indications of petroleum are found.

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-- Selected gastropods from the Redwood, Katalla Formation Katalla, and Tokun Formations, showing tentative identifications and stratigraphic ranges. (Identifications by F. Stearns MacNeil) shall ded the cek U.S. Geological Survey fossil locality number Ancistrolepis teglandae (Weaver) ---Antiplanes cf. A. thurstonensis (Weaver) ---Bruclarkia cf. B. columbianum (Anderson and Martin) 15346, 15347 Bruclarkia cf. B. fulleri Durham ---Bruclarkia? -----Clavatula n. sp. aff. C. arnoldi (Van Winkle) ---4322 Echinophoria cf. E. fax Tegland -----Epitonium aff. E. condoni Dall -----4316, 4325, 15344 to 15346, 15349, 15350, 15359, 15366, 15371, 15373, 15377, 1538 15355, 15382 Galeodea cf. G. trituberculata (Weaver) -----Molophorus aff. M. anglonana (Anderson) -----15796 Molophorus cf. M. dalli Anderson and Martin ----Siphonalia aff. S. bicarinata Dickerson -----Turcicula columbiana Dall -----Turcicula sp. (wide apical angle) -----Turritella aff. I. lompocensis Arnold -----Turritella cf. T. uvasana stewarti (Merriam) ---Whitneyella cf. W. gabbi (Dickerson) -----Whitneyella lincolnensis (Van Winkle) -----4316, 15346 Whitneyella cf. W. olympicensis (Durham) -----Whitneyella cf. W. pittsburgensis (Durham) -----Whitneyella cf. W. sinuata aragoensis Turner -----

-- Selected pelecypods from the Redwood and Katalla Formations, showing tentative Burls Creek Shale Member identifications and stratigraphic ranges (Identifications by F. Stearns MacNeil) U.S. Geological Survey fossil locality number Acila cf. A. shumardi (Dall) --15346, 15349, 15351, 4318 4312, 4329, 15387, 15408, 15836 Calyptogena n. sp. 1 ----4436, 15385, 15397 Calyptogena n. sp. 2 -----Cardita (Cyclocardia) aff. C.(C.) hannibali (Clark) Cardium aff. C. alaskensis Clark --Chione cf. C. securis alaskensis Clark ---Clinocardium sp. -----Crenella cf. C. porterensis Weaver ----15381, 15383, 15394 Hyalopecten (Delectopecten) -----Lima cf. L. twinensis Durham -----4312, 4436, 15403, 15833, 15835 Lucina cf. L. hannibali (Clark) ------4318, 15349, 15796 Mya salmonensis Clark -----Nemocardium cf. M. lorenzanum (Arnold) -----Nemocardium weaveri (Anderson and Martin) ---uculana aff. N. merriami (Dickerson) -----Nuculana cf. N. washingtonensis (Weaver) ----Pandora cf. P. washingtonensis Weaver -----Phreagena n. sp. 1 -----Pitar sp. aff. P. dalli (Weaver) -----4312, 15387, 15399, 15408 seudamusium? aff. P. vanwinkleae (Clark) ---Solemya (Acharax) cf. S. (A.) dall1 Clark ----4436, 15833 Solemya (Acharax) sp. -----4318, 15349, 15351, 15354, 15386, 15788, 15800, 15816 Solena cf. S. eugenensis (Clark) ------4315, 4435, 15343, 15345, 15346, 15349, 15351, 15796, 15798 Spisula aff. S. pittsburgensis Clark ---hracia cf. T. trapezoides Conrad ----Thyasira cf. T. bisecta (Conrad) -----Yoldia aff. Y. akanensis Uozumi ----Yoldia chehalensis Arnold -----Yoldia sp. aff. Y. montereyensis Dall -----Yoldia aff. Y. thraciaformis Storer ----

No. Company and well name or number Location Year Feet (Metres) Formation penetrated Katalla field---- 1901 270 (82.4) Katalla Formation----- Abandoned; tools lost. Show of oil. 3 ASCAPS (2) -----do------ 1903 1,000± (305±) -----do------ 011 at 700 ft (213.5 m). Produced Alaska Petroleum 6 Coal Co. 2 Katalla River---- 1903 280 (85.4) Quaternary unconsolidated 7 ASCAPS (3) ----- Katalla field---- 1904 900± (274.5±) Katalla Formation----- Produced 1912-33. 8 ASCEPS (B) ------ Not known; probably abandoned at shal-10 ASCAPS (103) ------ Chilkat Creek---- 1904 400± (122±) ----------------------- Abandoned; tools lost. 11 ASCSPS (104) ------ Near mouth of Chilkat Creek--- 1904 650± (198.2±) -----do----------12 ASC&PS (105) ------ Shows of oil and gas; not tested for 13 ASCAPS (108) ------ Hitcher Creek --- 1904 1,000± (305±) ------------------ Show of oil; not tested for production. 141/ Alaska Petroleum & Coal Co. 3 Near Katalla ---- 1904 1,500± (457.5±) -----do------ Abandoned 15 Clarence Cunningham 1 (106) Near Point Hey --- 1904 -- -- Quaternary unconsolidated - Abandoned at shallow depth. 16 Clarence Cunningham 2 (107) ------do------ 1904 -- -- Tokun Formation------ Abandoned at depth of several hundred Near Katalla ---- 1905-6 -- Katalla Formation----- Abandoned at depth probably exceeding 181/ Rathbun well (101) ----- West shore of Bering Lake --- 1905-6 1,700: (518.5:) Eocene, Tokun(?) Formation Abandoned; small flow of gas in 1945. 19 Alaska Petroleum & Coal Co. 5 Near Katalla (114) ------ Slough ------ 1907 1,600 (488) Katalla Formation----- Abandoned. 201/ Alaska Coal Oil Co. 1 (115) --- Mirror Slough --- 1911-17 1,040 (317.2) Orca Group(?)----- Abandoned. Shows of oil and gas at 710 fc (216.6 m). 23 Amalgamated Development Co. (4) Katalla field --- 1912 690 (210.4±) Katalla Formation----- 011 between 400 and 500 ft (122 and 24 Amalgamated Development Co. (5) ------do------ 1912 1,000± (305±) ------do------- 0il at 650 and 800 ft (198.2 and 244 28 St. Elias Oil Co. (9) -----do------ 1917 1,810 (552) -----do------31 St. Elias Oil Co. (12) ------do------ 1918 903 (275.4) ------do-------- 0il at 330, 430, and 590 ft (100.6, 131.2, and 180 m); produced 1918-33. 32 St. Elias 0il Co. (13) ----- 1918-19 900 (274.5) ------do------ 0il at 635 and 770 ft (193.7 and 234.8 34 Chilkat Oil Co. (16) ----- Katalla Field ---- 1920 740? (225.7?) Miocene and (or) Oligocene, Oil at 365, 510, and 740 ft (111.3, Katalla Formation 155.6, and 225.7 m); produced 1920-33. 40 Chilkat Oil Co. (22) -----do------ 1923? 1,280 (390.4) ------do------- Produced 1923?-33. 43 Chilkat Oil Co. (25) ----- Near Katalla Field 1931-32 2,005 (611.5) ------------------------- Abandoned. Show of gas. 44 Alaska Gulf Syndicate

Johnson 1 (111) ------ Nichawak Mountain 1930 190 (58) ------------------------- Abandoned. 45 Richfield Oil Corp. ------ East side Bering
River ------ 1961 6,175 (1,883.4) ------do-------- Dry and abandoned. 46 Richfield Oil Corp. ---- Near outlet of Bering Lake --- 1961-62 6,019 (1,835.8) -----do------ Dry and abandoned

TABLE 4 .-- Wells drilled for petroleum in the Katalla area, Alaska, through 1969.

TABLE 1 .-- Inferred relation of formation and member subdivisions proposed for Tertiary sequence exposed in the Don Miller Hills.

			ler, Rossman, and Hickcox, reliminary report (1945)		Hanna and others, unpublished report (1938)		Ta	Taliaferro (1932)		Martin (1908)	
Formation	Puffy Member			Puffy Member			Puffy Shale with con- glomerate lenses	rmation	Puffy Shale Member		Conglomerate and conglomeratic sandstones inter-
Redwood Fo						ormation Split C on)	Puffy Conglomerate	od Fo	P-22 Who company		bedded with shale and sandstone
	Sandstone member			Point Hey	Sandstone	I & E T	Point Hey Sandstone	Redwoo	Point Hey Sand- stone Member	1	f. Flaggy sandstone
Katalla Formation	Burls Creek Shale Member	Upper unit	ion	Member	Interbedded shale and sandstone	11 0 0	Point Hey Shale		Burls Creek Shale Member	lla Formation	Soft shale with calcareous con- cretions and with bed of glauconitic sandstone near base
		Organic shale unit	- II	Organic	shale member		Cannon-ball Shale	icted)			
		Lower unit	la F	Burls Cree	k Shale Member			restr			
	Basin Creek Member		Katal	(A)	reek Member	Forma Forma	Basin Creek interbedded sandstone and shale	rmation (Kata]	_
	Split Creek Sandstone Member			Split Creek Sandstone Member		Split Creek Formation	Split Creek Sandstone	8	Split Creek Shale and		h. Sandstone
okun Formation, Upper part				Unnamed shale member			Split Creek Shale	Katalla	Sandstone Member		i. Soft shale

The Redwood Formation was considered by Hanna and others to be in fault contact with and older than their Split Creek Formation, but is placed at top of column here to facilitate comparison with other columns.

GEOLOGIC MAP AND SECTIONS OF THE CENTRAL PART OF KATALLA DISTRICT, ALASKA

Outside area of the geologic map

2/Not located on map.

Don J. Miller