UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geologic Map Of Southeastern Alaska

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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INTRODUCTION

Southeastern Alaska is underlain by sedimentary, volcanic, intrusive, and metamorphic rocks of Quaternary to Cambrian, and probable Proterozoic age. These rocks have been classified on the geologic map and in this pamphlet into units that emphasize the regional distribution of lithically similar and generally coeval geologic units. The distribution, age, stratigraphic or intrusive relations, and metamorphic and structural characteristics of the map units are described below in the Description of Map Units, and the temporal relations between units are shown on the Correlation of Map Units (Plate). Figure 1 shows the primary sources of information used in compiling the geologic map.

The rocks of southeastern Alaska have been classified into four main categories of map units, including: LITHOSTRATIGRAPHIC UNITS, UNDIVIDED UNITS, LITHODEMIC UNITS, and INTRUSIVE UNITS. These types of units are defined as follows:

LITHOSTRATIGRAPHIC UNITS consist of sedimentary and volcanic rocks, and their metamorphosed and (or) deformed equivalents, that generally conform to the Law of Superposition (North American Commission on Stratigraphic Nomenclature, 1983). Strata that belong to a lithostratigraphic unit are similar in general lithic-type, stratigraphic position, and age of deposition, and are, unless otherwise noted, interpreted to be correlative. Such strata comprise formations or groups, lithic components of formations or groups, or unnamed geologic units. We have classified these strata according to their general lithic-type(s), rather than by specific or local rock-types, or by formal stratigraphic nomenclature (such as formation names), in an effort to emphasize the regional distribution of correlative geologic units. The general lithic-types (and corresponding unit symbols) are listed in the Definition of Map Units (Plate). An example of a lithostratigraphic unit is "Sc," which consists of Silurian carbonate rocks that are the predominant rock-type in the Heceta Limestone, Kuiu Limestone, Kennel Creek Limestone, Willoughby Limestone, Pyramid Peak Limestone, and unnamed limestone, and are a subordinate component in units consisting predominantly of Silurian clastic strata (Bay of Pillars Formation, Point Augusta Formation, Tidal Formation, Rendu Formation, and unnamed units).

UNDIVIDED UNITS consist of sedimentary and volcanic rocks, and their metamorphosed and (or) deformed equivalents, that have not been assigned to lithostratigraphic or lithodemic units because their age, stratigraphic relations, and (or) degree of deformation or metamorphism are uncertain, or because they occur in geologic units that grade from relatively intact stratigraphic sequences to metamorphic or structural complexes. Most undivided map units probably consist of, or were derived from, several lithostratigraphic units. These units are classified according to the probable minimum and maximum depositional age and the main lithic-type(s) of their constituent strata. An example of an undivided map unit is "ROsv," which consists of metasedimentary and metavolcanic rocks of Triassic, Permian, Devonian, and probably Silurian, and Silurian and Ordovician age.

LITHODEMIC UNITS comprise rocks that have been regionally metamorphosed and (or) deformed to a degree that their primary stratigraphic relations are not preserved (i.e. the rocks do not conform to the Law of Superposition) (North American Commission on Stratigraphic Nomenclature, 1983). Two types of lithodemic units have been recognized in southeastern Alaska:

metamorphic complexes, which are denoted by a lower case "m" preceding the lithic term in the unit symbol. These units are classified according to the probable depositional age and lithic type(s) of the rocks included. The metamorphic rock-types and the nature and age of metamorphism are discussed in the Description of Map Units. For example, unit "pTmsv" represents a metamorphic complex derived from sedimentary and volcanic strata of pre-Tertiary age.

structural complexes, including a melange (denoted by a lower case "m" at the end of the unit symbol), and a complex of regionally disrupted strata (denoted by a lower-case "d" at the end of the unit symbol). Map units in the melange are classified according to the main lithic-type(s) of the constituent strata and the age of formation of the melange (rather than the age of the constituent strata). The nature of the melange, and the age of the blocks and the matrix are discussed in the Description of Map Units. For example, unit "Ksvm" represents sedimentary and volcanic rocks (and their metamorphic equivalents) belonging to a melange that formed during Cretaceous time. The complex of disrupted strata has some characteristics of a melange, but the relations between blocks and matrix material, and the degree of disruption strata in the matrix are uncertain. Map units in this disrupted complex are classified according to the main lithic-type(s) of the constituent strata, and the interpreted age of formation of the complex. The nature of the complex is described in the Description of Map Units. For example, unit "KJsd" represents a complex of regionally disrupted clastic sedimentary rocks that formed during Cretaceous and Jurassic time.

INTRUSIVE UNITS consist of intrusive rocks that are classified into map units according to their age of emplacement (following the Decade of North American Geology Time Scale (Palmer, 1983)), and their predominant rock-types (following the IUGS classification scheme (Streckheisen, 1976)). The categories of intrusive rock-types (and their corresponding unit symbols) are listed in the Definition Of Map Units (Plate).

Areas in which intrusive rocks have not been mapped separately from their country rocks are shown with a stipple pattern on the geologic map (Plate). These types of mixed rocks are referred to as "migmatites" in some of the references cited below. Where younger intrusive rock predominates, the rocks are assigned to an intrusive unit and the stipple pattern indicates that a significant proportion of the area is underlain by older country rocks. Intrusive unit "TKg," for example, is patterned where the intrusive bodies contain abundant unmapped inclusions or pendants of metamorphic rocks elsewhere assigned to unit "pTmsv." Where country rocks predominate, the rocks are assigned to the map unit of the country rocks, and the stipple pattern indicates that a significant proportion of the area is underlain by younger intrusive rock. On Admiralty Island, for example, undivided unit "Osv" is patterned where it contains a significant proportion of younger intrusive rocks.

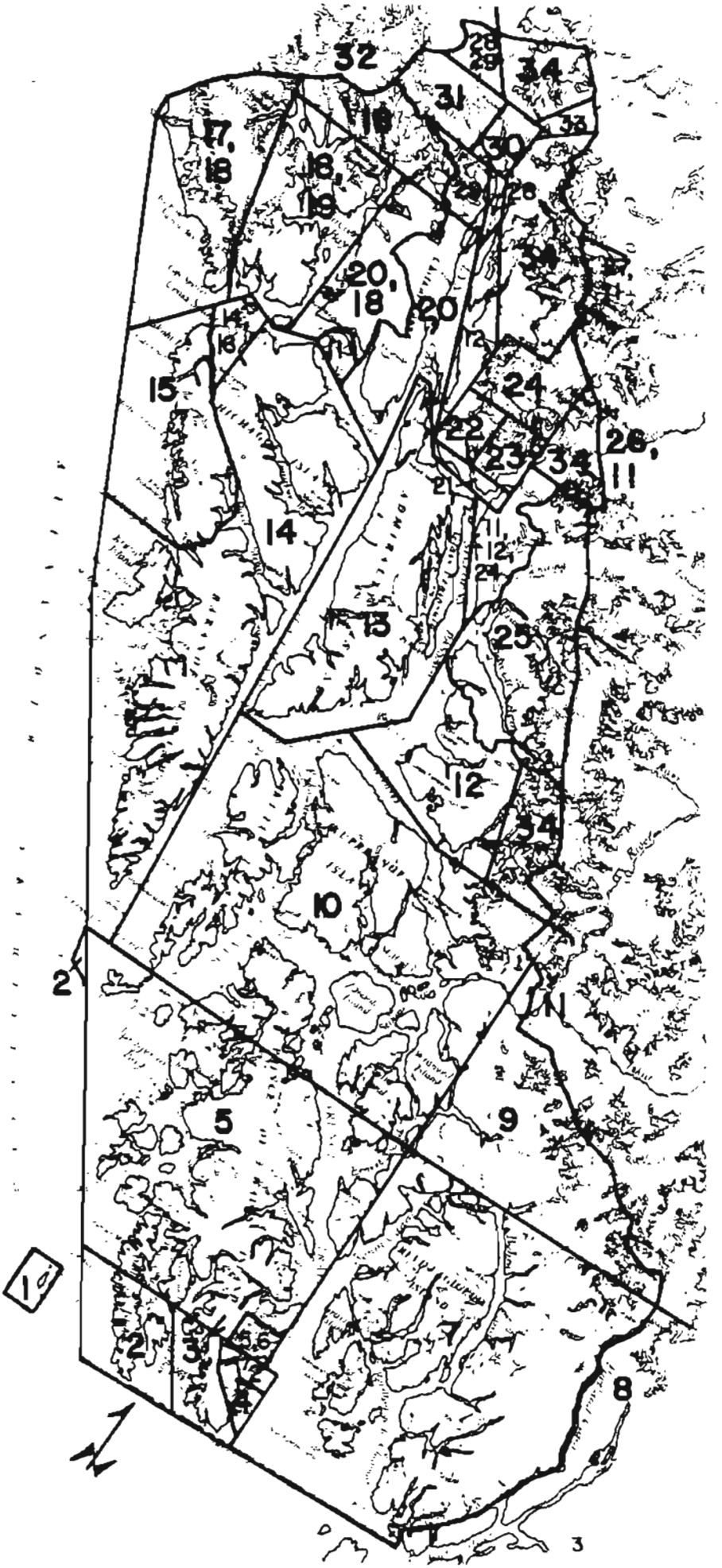

Figure 1 -- Index map of southeastern Alaska showing the primary sources of information used in compiling the geologic map

KEY TO SOURCES OF INFORMATION

1 - Clark and others, 1971
2 - G.E. Gehrels, unpub. mapping
3 - Gehrels and others, 1983
4 - MacKevett, 1963
5 - Eberlein and others, 1983
6 - Redman, 1981
7 - Berg and others, 1978
8 - Hutchison and others, 1979
9 - Elliott and Koch, 1981
10 - Brew and others, 1984
11 - Souther and others, 1979
12 - Buddington and Chapin, 1929
13 - Lathram and others, 1965
14 - Loney and others, 1975
15 - Johnson and Karl, 1982
16 - Decker and Plafker, 1982
17 - G. Plafker and T. Hudson, unpub. mapping
18 - Brew and others, 1978
19 - Rossman, 1963
20 - Lathram and others, 1959
21 - Ford and Brew, 1977
22 - Ford and Brew, 1973
23 - Brew and Ford, 1977
24 - Brew and Morrell, 1980
25 - Brew and Grybeck, 1984
26 - Souther, 1971
27 - Werner, 1978
28 - Plafker and Hudson, 1980
29 - Robertson, 1959
30 - Redman and others, 1984
31 - MacKevett and others, 1974
32 - Campbell and Dodds, 1983
33 - F. Barker and J. Arth, unpub. mapping
34 - unmapped

DESCRIPTION OF MAP UNITS

LITHOSTRATIGRAPHIC UNITS

Qs SURFICIAL DEPOSITS (QUATERNARY) — Undivided lacustrine, fluvial, colluvial, glacial, beach, and marine deposits that occur in many areas of southeastern Alaska.

QTs SEDIMENTARY ROCKS (QUATERNARY? AND TERTIARY) -- Pleistocene(?) to Miocene marine mudstone, siltstone, sandstone, and conglomerate (Yakataga Formation) northwest of Cross Sound (Plafker and Addicott, 1976; George Plafker, written commun., 1984).

QTv VOLCANIC ROCKS (QUATERNARY AND TERTIARY) — Consists of: unnamed volcanic rocks of basaltic to rhyolitic composition on islands west of Prince of Wales Island (Eberlein and others, 1983), on Revillagigedo Island and the mainland to the east (Berg and others, 1978), near the Alaska-British Columbia border east of Wrangell Island (Elliott and Koch, 1981), and on Zarembo, Kuiu, and Kupreanof Islands (Brew and others, 1984); and the Edgecumbe Volcanics (basalt, andesite, and dacite) on Kruzof Island (Loney and others, 1975). Rocks of Holocene age have been recognized east of Wrangell Island (Elliott and others, 1981) and on Kruzof Island (Loney and others, 1975), and basaltic rocks of Holocene and (or) Pleistocene age occur on southern Kupreanof Island (Brew and others, 1984), and perhaps at other localities. Most of the volcanic rocks in this unit on Zarembo, Kupreanof, and Kuiu Islands are Tertiary in age (Brew and others, 1984) and are probably correlative with volcanic rocks in unit "Tv."

Ts SEDIMENTARY ROCKS (TERTIARY) — Nonmarine sandstone, shale, and conglomerate (Kootznahoo Formation) in the Zarembo-Kuiu Islands region (Brew and others, 1984) and on Admiralty Island (Lathram and others, 1965), and marine calcareous sandstone and siltstone (Topsy Formation) of Miocene and Oligocene age northwest of Cross Sound (Brew and others, 1978). The age of the Kootznahoo Formation is reported to be Eocene and Paleocene in the Zarembo-Kuiu Islands region and Miocene to Eocene on Admiralty Island (Brew and others, 1984).

Tv VOLCANIC ROCKS (TERTIARY) — Consists of: Oligocene and Eocene basalt and andesite (Admiralty Island Volcanics) on Admiralty Island (Lathram and others, 1965); unnamed Oligocene basaltic rocks on islands in Icy Strait (Plafker and others, 1982); and basaltic rocks (Cenotaph Volcanics) of Miocene and Oligocene age along the coast northwest of Cross Sound (Brew and others, 1978). The volcanic rocks northwest of Cross Sound are interbedded with clastic strata belonging to the Topsy Formation (unit Ts) (Brew and others, 1978), and the Admiralty Island Volcanics contain clastic strata that may be in part correlative with the Kootznahoo Formation (unit Ts) (Lathram and others, 1965).

Tsv SEDIMENTARY AND VOLCANIC ROCKS (TERTIARY) — Unnamed carbonaceous shale, sandstone, and conglomerate of probable Paleogene age, and subordinate Oligocene volcanic rocks near Haines (George Plafker, written commun., 1984; Robertson, 1959; Campbell and Dodds, 1983).

Ks SEDIMENTARY ROCKS (CRETACEOUS) — Consists of sandstone and mudstone turbidites and subordinate conglomerate (Sitka Graywacke) on Baranof, Chichagof, Kruzof, and Yakobi Islands (Loney and others, 1975; Johnson and Karl, 1982; Decker, 1980), and regionally metamorphosed carbonaceous siltstone, volcanogenic graywacke, mudstone, and minor conglomerate (Valdez Group) north of Cross Sound (Brew and others, 1978; George Plafker, written commun., 1984). These strata are interpreted to be deep-marine trench, slope basin, and fan deposits. The Sitka Graywacke is moderately deformed and disrupted, regionally metamorphosed as high as greenschist facies in some

areas, and thermally upgraded to hornblende hornfels facies locally (Decker and others, 1979). Common rock-types in the metamorphosed regions south of Cross Sound include metagraywacke and argillite. Rocks north of Cross Sound are regionally metamorphosed from sub-greenschist facies to as high as greenschist to amphibolite facies, producing rock types of graywacke semischist, phyllite, slate, and layered schist, semischist, and gneiss (Brew and others, 1978). These metasedimentary rocks are correlated with strata in the Valdez Group to the northwest by lithic similarity (Brew and Morrell, 1979) and by stratigraphic continuity (Plafker and Campbell, 1979; Campbell and Dodds, 1983). The Sitka Graywacke is unfossiliferous: its minimum age is constrained by an Eocene pluton on Baranof Island (Loney and others, 1975). The Sitka Graywacke and the rocks north of Cross Sound are considered to be Cretaceous in age based on correlation with lithically similar rocks in the Yakutat Group and Valdez Group (Plafker and others, 1977; Brew and Morrell, 1979).

Kv VOLCANIC ROCKS (CRETACEOUS) -- Basalt and basaltic tuff north of Cross Sound that have been deformed and regionally metamorphosed as high as greenschist to amphibolite facies (Brew and others, 1978; George Plafker, written commun., 1984). Common rock-types include schist, gneiss, and amphibolite (Brew and others, 1978). Correlation with volcanic rocks in the Valdez Group to the northwest indicates a Cretaceous age (Plafker and Campbell, 1979; Brew and Morrell, 1979).

Ksv SEDIMENTARY AND VOLCANIC ROCKS (CRETACEOUS) — Undivided metasedimentary rocks that are correlative and continuous with strata in unit "Ks," and metavolcanic rocks that are correlative with rocks in unit "Kv." Occurs north of Cross Sound (Brew and others, 1978; Brew and Morrell, 1979; Plafker and Campbell, 1979). The age constraints, lithic types, metamorphic characteristics, and regional correlations are similar to those described above for units "Ks" and "Kv."

KJs SEDIMENTARY ROCKS (EARLY CRETACEOUS, AND LATE AND MIDDLE? JURASSIC) -- Marine graywacke, mudstone, subordinate conglomerate and andesitic to basaltic volcanic rocks, minor limestone, and the regionally metamorphosed and deformed equivalents of these strata. Metamorphic grade generally increases from sub-greenschist facies or non-metamorphosed on the southwest, to greenschist and in some areas amphibolite facies toward the northeast. Rock types in the higher grade parts of the unit are primarily phyllite, schist, and gneiss. The strata are queried on the geologic map where metamorphism and deformation, or lack of stratigraphic information, make correlation with sedimentary rocks of known Cretaceous and Jurassic age uncertain. Regional metamorphism and deformation occurred after Early Cretaceous time, and prior to the deposition of the Kootznahoo Formation (Ts) of Paleocene to Miocene age (Buddington and Chapin, 1929). Fossils recovered range in age from Late and perhaps Middle Jurassic, to Albian and perhaps Cenomanian (Berg and others, 1972; Brew and others, 1984). Consists of: the Gravina Island Formation and unnamed strata on Gravina Island (Berg and others, 1978), unnamed strata on Annette, Revillagigedo, and southern Etolin Islands, and adjacent parts of the mainland (Berg and others, 1978; Eberlein and others, 1983); the Seymour Canal Formation and its metamorphic equivalents near Etolin-Kupreanof Islands and adjacent areas of the mainland (Buddington and Chapin, 1929; Brew and others, 1984); an unnamed unit of sandstone and mudstone in Keku Strait (Muffler, 1967); the Seymour Canal Formation on Admiralty Island (Lathram and others, 1965), northern Kupreanof Island (Brew and others, 1984), and perhaps near Cape Fanshaw (Muffler, 1967; Buddington and Chapin, 1929); the Symonds and Shelter Formations on islands in southern Lynn Canal (Barker, 1957); the Treadwell Slate and unnamed strata near Juneau (Ford and Brew, 1973 and 1977); part of the Berners Formation (now obselete) northwest of Juneau (Knopf, 1911 and 1912; Martin, 1926; Buddington and Chapin, 1929; Redman, 1984a); and argillite, siltstone, and sandstone of probable Cretaceous and Jurassic age south of Haines (George Plafker, written commun., 1984).

KJv VOLCANIC ROCKS (EARLY CRETACEOUS, AND LATE AND MIDDLE? JURASSIC) -- Andesitic to basaltic flows, flow breccia, agglomerate, and tuff (generally with conspicuous clinopyroxene phenocrysts), subordinate graywacke and mudstone, and the regionally metamorphosed and deformed equivalents of these strata. Greenschist-facies metamorphism in some areas has yielded common rock-types of greenstone and greenschist. Age is constrained by intertonguing stratigraphic relations with the Cretaceous and Jurassic sedimentary rocks (KJs) described above. Geologic and geochemical considerations suggest that these volcanic rocks are genetically related to the Early Cretaceous zoned ultramafic bodies in unit "Kum" (Irvine, 1974), and possibly to the Early Cretaceous and (or) Jurassic diorite and gabbro in units "KJd" and "KJgb" (Berg and others, 1978). Consists of: volcanic rocks in the Gravina Island Formation on Gravina Island (Berg and others, 1978); unnamed rocks on Annette and Revillagigedo Islands and adjacent areas of the mainland (Berg and others, 1978; Eberlein and others, 1983); unnamed rocks in the Etolin-Kupreanof Islands region and adjacent areas of the mainland (Brew and others, 1984; Buddington and Chapin, 1929); the Douglas Island Volcanics and the Brothers Volcanics on and near Admiralty Island (Lathram and others, 1965) and in the Juneau area (Ford and Brew, 1973 and 1977); and part of the Berners Formation (now obselete) northwest of Juneau (Knopf, 1912; Martin, 1926).

KJsv SEDIMENTARY AND VOLCANIC ROCKS (EARLY CRETACEOUS, AND LATE AND MIDDLE? JURASSIC) -- Moderately deformed and metamorphosed graywacke, mudstone, sandstone, and andesitic to basaltic rocks near Juneau that are the undifferentiated equivalents of the Treadwell Slate (KJs) and the Douglas Island Volcanics (KJv) (Ford and Brew, 1973 and 1977).

Rs SEDIMENTARY ROCKS (LATE AND MIDDLE TRIASSIC) -- Consists of: unnamed, moderately deformed and metamorphosed graphitic limestone and slate of late Ladinian (latest Middle Triassic) age on Revillagigedo Island (Silberling and others, 1982); Late Triassic conglomerate, limestone, and calcareous siltstone and sandstone (Burnt Island Conglomerate) west of Etolin Island (Karl, 1984) and on northwestern Kupreanof Island (Muffler, 1967); and unnamed silty limestone of Late Triassic age on small islands between Etolin Island and northern Prince of Wales Island (Brew and others, 1984). Based on regional stratigraphic relations and the slightly older age, Silberling and others (1982) follow the suggestion of Berg and others (1972) that these strata on Revillagigedo Island are not correlative with other Triassic sedimentary rocks assigned to this unit or unit "Rsv."

Rv VOLCANIC ROCKS (RHYOLITIC TO BASALTIC) (LATE TRIASSIC) -- Basaltic rocks are generally pillow flows, pillow breccia, and breccia, except near Haines where massive flows predominate; rhyolitic rocks include tuff with calcareous interbeds, flow breccia, and banded ash-flow tuff; and subordinate andesitic rocks include breccia and aquagene tuff. Rocks in most areas are moderately recrystallized and deformed. Fossils recovered from near the top of the section near Haines are Karnian in age (Plafker and Hudson, 1980), and fauna from interbedded rocks or from conformable adjacent strata in other areas indicate deposition during Karnian and Norian time. Based on regional stratigraphic relations, Plafker and Hudson (1980) argue that the strata near Haines are probably not correlative with the other volcanic rocks in this unit. Consists of: unnamed rhyolite on Annette Island and the Puppets Formation (rhyolite) on Gravina Island (Berg, 1982); the Chapin Peak Formation (basalt) on Gravina Island (Berg and others, 1978); the Keku Volcanics (rhyolite and subordinate basalt) and the Hound Island Volcanics (basalt and andesite) in Keku Strait (Muffler, 1967; Brew and others, 1984); and unnamed basalt near Haines (Plafker and Hudson, 1980; Redman and others, 1984; Robertson, 1959).

Rsv SEDIMENTARY AND BASALTIC ROCKS (LATE TRIASSIC) -- Black shale, shaly limestone, siltstone, sandstone, conglomerate, and limestone; felsic, intermediate, and basaltic flows; and minor black chert. Rocks range from relatively unmetamorphosed to as high as greenschist facies. Common rock-types in the higher grade areas include

phyllite, slate, semischist, marble, greenschist, and greenstone. Consists of unnamed strata on Annette and Gravina Islands (Berg and others, 1978); the Nehenta Formation on Gravina Island (Berg and others, 1978); unnamed strata interpreted to occur as blocks in a disrupted sedimentary unit (KJsd) on Kupreanof and Zarembo Islands (D.A. Brew, in U.S. Geological Survey, 1982; Brew and others, 1984; Berg and Grybeck, 1980); and the part of the Hyd Formation on Admiralty Island that has been reliably separated from the Cannery Formation (Ps) (Lathram and others, 1965).

Rc — CARBONATE ROCKS (LATE TRIASSIC) — Massive to thick-bedded limestone and minor dolomite in most areas, but in Keku Strait it also includes thin-bedded dark gray limestone, and on Chichagof Island it consists of massive white to gray marble (Whitestripe Marble). Diagnostic fossils recovered from the limestone and dolomite are Late Triassic in age; the marble on Chichagof Island is interpreted to be Late Triassic by correlation with the Chitistone Limestone in the Wrangell Mountains of southern Alaska (Plafker and others, 1976: Jones and others, 1977). These workers also suggest that the Whitestripe Marble is not correlative with the other carbonate rocks in this unit. Consists of unnamed, generally recrystallized limestone on Annette and Gravina Islands (Berg, 1982), the Cornwallis Limestone and Hamilton Island Limestone on northern Kuiu and Kupreanof Islands (Muffler, 1967; Brew and others, 1984), and the Whitestripe Marble on Chichagof Island (Loney and others, 1975; Johnson and Karl, 1982).

Rb — BASALTIC ROCKS (LATE AND (OR) MIDDLE TRIASSIC) — Basaltic flows and flow breccia (Goon Dip Greenstone) on Chichagof and Yakobi Islands that were deposited, at least in part, in subaerial environments (Loney and others, 1975; Johnson and Karl, 1982). Plafker and others (1976) and Jones and others (1977) correlate the Goon Dip Greenstone and overlying Whitestripe Marble with the Late and (or) Middle Triassic Nikolai Greenstone and overlying Late Triassic Chitistone Limestone in the Wrangell Mountains of southern Alaska.

Ps — SEDIMENTARY ROCKS (EARLY PERMIAN AND PERMIAN) — Black argillite, graywacke, calcareous siltstone, chert, and minor basaltic rocks, limestone, and conglomerate. Consists of part of the Halleck Formation of Early Permian age near Keku Strait (Muffler, 1967; Brew and others, 1984; Jones and others, 1981), the Cannery Formation on southern Admiralty Island, where it is reported to be Early Permian in age (Lathram and others, 1965), and unnamed Permian strata northeast of Glacier Bay (Brew and others, 1978). Strata are locally metamorphosed to slate and phyllite.

Pv — VOLCANIC ROCKS (EARLY PERMIAN AND PERMIAN) — Early Permian basalt (part of the Halleck Formation) on northern Kuiu Island (Muffler, 1967) and unnamed Permian basaltic(?) rocks northeast of Glacier Bay (Brew and others, 1978). Age is constrained by interbedded Early Permian clastic strata (Ps) on Kuiu Island and interbedded Permian carbonate rocks (Pc) in the Glacier Bay area.

Pc — CARBONATE ROCKS (EARLY PERMIAN AND PERMIAN) — Consists of: greenschist facies, massive to thin-bedded marble of Early Permian age on Revillagigedo Island (Silberling and others, 1982; Berg and others, 1978) and of Permian(?) age on the mainland east of Admiralty Island (Brew and Grybeck, 1984); medium-bedded dolomite, limestone, and subordinate gray chert beds and nodules (Pybus Formation) on northern Kuiu and Kupreanof Islands (Early Permian) (Muffler, 1967; Brew and others, 1984), Admiralty Island (Permian) (Lathram and others, 1965), and a small island between northern Prince of Wales Island and Etolin Island (Early Permian) (Brew and others, 1984); and unnamed fossiliferous gray limestone, cherty limestone, and limestone conglomerate of Permian age northeast of Glacier Bay (Brew and others, 1978) and along the west shore of Lynn Canal (Lathram and others, 1959). The marble in this unit on Revillagigedo Island and on the mainland east of Admiralty Island may or may not be correlative with Permian carbonate rocks elsewhere in the map area (Silberling and others, 1982).

PPs SEDIMENTARY ROCKS (PENNSYLVANIAN) -- Early and middle Pennsylvanian sandstone and siltstone with minor limestone and chert-pebble conglomerate (Klawak Formation) on west-central Prince of Wales Island (Eberlein and others, 1983).

PPc CARBONATE ROCKS (PENNSYLVANIAN) -- Massive limestone and minor dolomite with light-gray chert nodules (Ladrones Limestone) on west-central Prince of Wales Island (Eberlein and others, 1983), and unnamed, medium-bedded to massive crinoidal limestone on northern Kuiu Island (Brew and others, 1984). Fossils recovered indicate deposition during early and middle Pennsylvanian time.

Mc CARBONATE ROCKS (MISSISSIPPIAN) -- Thin- to thick-bedded dark gray limestone, subordinate beds and nodules of light gray chert, and minor shale interbeds and gypsum. Consists of the Peratrovich Formation on western Prince of Wales Island (Eberlein and others, 1983), and the locally gypsum-bearing Iyoukeen Formation on Chichagof Island (Loney and others, 1975). Strata were deposited during early and late Mississippian time.

MDsv SEDIMENTARY AND VOLCANIC ROCKS (MISSISSIPPIAN AND LATE DEVONIAN) -- Tuffaceous argillite and graywacke, and subordinate chert, limestone, and andesitic volcanic rocks (Cannery Formation) on northern Kupreanof Island (Muffler, 1967; Brew and others, 1984; Jones and others, 1981).

Ds SEDIMENTARY ROCKS (EARLY DEVONIAN, DEVONIAN, AND DEVONIAN?) -- Siltstone, shale, sandstone, graywacke, and subordinate limestone breccia, arkose, conglomerate, and volcanic rocks. Consists of: unnamed Early Devonian strata in the Annette-Gravina Islands area (Berg and others, 1978; Gehrels and others, 1984), on southern Prince of Wales Island (Herreid and others, 1978; Gehrels and others, 1983; Savage and Gehrels, 1984), on west-central Prince of Wales Island (Eberlein and others, 1983), and on smaller islands west of Prince of Wales Island (Eberlein and others, 1983); unnamed Devonian(?) graywacke, argillite, and arkose on northern Kuiu Island (Brew and others, 1984); and the undivided part of the Devonian Cedar Cove Formation on northeastern Chichagof Island (Loney and others, 1975).

Dv VOLCANIC ROCKS (LATE DEVONIAN, EARLY DEVONIAN, AND DEVONIAN) -- Basaltic and subordinate andesitic pillow flows, breccia, aquagene tuff, and minor sedimentary interbeds. Consists of: the volcanic part of the Port Refugio Formation (Late Devonian) on west-central Prince of Wales Island (Eberlein and others, 1983); Early Devonian rhyolite in Kasaan Bay on east-central Prince of Wales Island (Eberlein and others, 1983); the Late Devonian Freshwater Bay Formation on Chichagof Island (Loney and others, 1975); unnamed volcanic rocks in Glacier Bay (Brew and others, 1978); and unnamed Silurian(?) to Devonian rocks in the Chilkat Range (Lathram and others, 1959). We interpret the volcanic rocks in Glacier Bay and in the Chilkat Range to be correlative with the Freshwater Bay Formation on Chichagof Island based on their similarity in lithology and apparent stratigraphic position.

Dsv SEDIMENTARY AND BASALTIC ROCKS (LATE DEVONIAN, DEVONIAN, AND DEVONIAN?) -- Siltstone, shale, volcanogenic graywacke, conglomerate, and minor limestone that are interbedded with basaltic pillow flows, breccia, and aquagene tuff. Consists of the Coronados Island Volcanics (Devonian), the St. Joseph Island Volcanics (Devonian?), and part of the Late Devonian Port Refugio Formation, all of which occur on western Prince of Wales Island and adjacent islands (Eberlein and others, 1983).

Dcg CONGLOMERATIC ROCKS (EARLY DEVONIAN AND DEVONIAN) -- Conglomerate and sedimentary breccia interbedded with sandstone, siltstone, shale, and minor graywacke, limestone, and volcanic rocks. Sedimentary structures and the occurrence of red-beds and thick sections of coarse conglomerate suggest that the strata in the Prince of Wales

Island region were deposited in subaerial to shallow-marine environments (Ovenshine, 1975; Gehrels and others, 1983). The argillite-rich section on Chichagof Island was probably deposited in a shallow marine environment (Loney and others, 1975). Consists of: unnamed Early Devonian strata on southern Prince of Wales Island (Gehrels and others, 1983; Savage and Gehrels, 1984); the Early Devonian Karheen Formation on central Prince of Wales Island (Eberlein and others, 1983); unnamed Devonian strata on east-central Prince of Wales Island (Eberlein and others, 1983); and the lower part of the Cedar Cove Formation on Chichagof Island (Loney and others, 1975).

Dc — CARBONATE ROCKS (DEVONIAN AND DEVONIAN?) -- Thin-bedded to massive gray limestone with minor shale interbeds. Consists of: the late Early to Late Devonian Wadleigh Limestone on west-central Prince of Wales Island and unnamed Early Devonian limestone on east-central Prince of Wales Island (Eberlein and others, 1983; Savage and Gehrels, 1984); unnamed Early and Middle Devonian strata interpreted to occur as blocks in a disrupted sedimentary unit (KJsd) on Kupreanof Island (D.A. Brew, in U.S. Geological Survey, 1982; Brew and others, 1984); the upper part of the Cedar Cove Formation (Middle and Late Devonian) on Chichagof Island (Loney and others, 1975); part of the Black Cap Limestone (Middle Devonian) in Glacier Bay (Rossman, 1963; Brew and others, 1978); unnamed Devonian strata on the west shore of Lynn Canal (Lathram and others, 1959; Loney and others, 1975); and unnamed strata in the Chilkat range (Lathram and others, 1959; Brew and others, 1978) that we interpret to be Devonian in age based on similarities in lithology and stratigraphic position with rocks on northeastern Chichagof Island.

Sc — CARBONATE ROCKS (SILURIAN) -- Massive, thin- to thick-bedded, and locally reefoidal light-gray limestone, and subordinate shale interbeds and layers and lenses of polymictic conglomerate. Consists of: unnamed Silurian limestone and marble on Dall and Long Islands that are locally metamorphosed to greenschist facies (Eberlein and others, 1983; G.E. Gehrels, unpub. mapping, 1984); part of the Late and Early Silurian Heceta Limestone on Prince of Wales Island (Eberlein and others, 1983; Brew and others, 1984); the Late Silurian Kuiu Limestone and limestone layers in the Late(?) and Early Silurian Bay of Pillars Formation on Kuiu Island (Muffler, 1967; Brew and others, 1984); the Kennel Creek Limestone (Devonian and (or) Silurian: probably Silurian) and limestone layers in the Late(?) Silurian Point Augusta Formation on Chichagof Island (Loney and others, 1975); the Willoughby Limestone, Pyramid Peak Limestone, and limestone layers in the Tidal Formation (all considered to be Silurian by Rossman, 1963) in the Glacier Bay area (Rossman, 1963; Brew and others, 1978); and unnamed Silurian(?) to Devonian limestone in the Chilkat Range (Lathram and others, 1959). Loney and others (1975) correlate limestones in the Chilkat Range along the west shore of Lynn Canal with the Willoughby Limestone and the Pyramid Peak Limestone in Glacier Bay, and the Kennel Creek Limestone on northeastern Chichagof Island. Based on these correlations and the apparent similarity in stratigraphic position, we correlate the limestones in both the "limestone and marble" unit and the "siliceous argillite and volcanic" unit of Lathram and others (1959) with the Kennel Creek Limestone and limestone layers in the Point Augusta Formation on Chichagof Island. The stratigraphic relations and fossil content of rocks in this map unit indicate deposition primarily during Silurian time. Strata in some areas, however, may be in part of Early Devonian age.

Scg — CONGLOMERATIC ROCKS (SILURIAN) -- Polymictic pebble and cobble conglomerate and subordinate sedimentary breccia, olistostromal deposits, sandstone, graywacke, mudstone, and limestone. Clasts consist of porphyritic andesite, limestone, graywacke, mudstone, granitic to gabbroic intrusive rocks, chert, and other rocks derived from various Silurian, and Silurian and Ordovician units. Consists of unnamed polymictic conglomerate on northern Prince of Wales Island (Brew and others, 1984) and conglomeratic layers and lenses in: the Heceta Limestone and the Bay of Pillars Formation on Prince of Wales Island (Eberlein and others, 1983; Brew and others, 1984), the Kuiu Limestone and the Bay of Pillars Formation on Kuiu Island (Brew and others,

1984), and the Kennel Creek Limestone on Chichagof Island (Loney and others, 1975). Interbedded Silurian carbonate rocks (Sc) and clastic sedimentary rocks (Ss) indicate deposition during Silurian time.

Ss — SEDIMENTARY ROCKS (SILURIAN) — Graywacke and mudstone turbidites, and subordinate olistostromal deposits and layers and lenses of limestone and conglomerate. Consists of most of the Bay of Pillars Formation (Late and Early Silurian) on northern Prince of Wales Island and Kuiu Island (Brew and others, 1984), the Late(?) Silurian Point Augusta Formation on Chichagof Island (Loney and others, 1975), the Late Silurian Tidal and Rendu Formations in Glacier Bay (Rossman, 1963; Brew and others, 1978), and the Silurian(?) to Devonian "graywacke, argillite, and limestone" unit of Lathram and others (1959) in the Chilkat Range (interpreted to be Late Silurian by Loney and others, 1975). Although stratigraphic relations and fossils indicate that most of the strata in this unit are Silurian in age, deposition of strata in some areas may have continued into Early Devonian time.

Sv — VOLCANIC ROCKS (SILURIAN AND SILURIAN?) — Mafic to intermediate-composition volcanic breccia, agglomerate, and flows, and greenschist and greenstone derived from these rocks. Strata are known to be Silurian in age where they occur in the Bay of Pillars Formation (Ss and Sc) on southern Kuiu Island. On northern Kuiu Island rocks in this unit occur in a fault slice and are interpreted to be Silurian in age (Brew and others, 1984).

SOs — SEDIMENTARY ROCKS (EARLY SILURIAN TO EARLY ORDOVICIAN) — Mudstone and graywacke turbidites, subordinate conglomerate, sandstone, and shale, and minor limestone, chert, and basalt flows and breccia. Consists of: unnamed strata of Early Silurian to Middle Ordovician age on Sukkwan and Dall Islands (Eberlein and others, 1983; G.E. Gehrels, unpub. mapping, 1984); unnamed strata of Silurian and (or) Ordovician age on Forrester Island (Clark and others, 1971); unnamed strata of Early Silurian to Early Ordovician age on southern Prince of Wales Island (Eberlein and others, 1983; Gehrels and others, 1983; G.E. Gehrels, unpub. mapping); part of the Early Silurian to Early Ordovician Descon Formation on northern Prince of Wales Island (Eberlein and others, 1983; Brew and others, 1984); and thin-bedded black argillite, black chert, and black impure limestone of Ordovician age (Hood Bay Formation) on southern Admiralty Island (Lathram and others, 1965; Carter, 1977).

SOv — VOLCANIC ROCKS (EARLY SILURIAN TO EARLY ORDOVICIAN) — Basaltic pillow flows, pillow breccia, and aquagene tuff; massive andesitic pyroclastic breccia; felsic breccia and tuff; subordinate interbeds of mudstone and graywacke turbidites; and the metamorphic equivalents of these strata. Consists of: unnamed basaltic to felsic rocks on southern Prince of Wales Island (Gehrels and others, 1983; G.E. Gehrels, unpub. mapping); unnamed felsic and basaltic rocks and their greenschist- and amphibolite-facies equivalents on Long and southern Dall Islands (G.E. Gehrels, unpub. mapping, 1984); and basaltic rocks (part of the Descon Formation) and unnamed andesitic breccia on central Prince of Wales Island (Eberlein and others, 1983). Age is constrained by stratigraphic relations with Early Silurian to Early Ordovician strata, intrusive relations with plutons of Early Silurian and Late Ordovician age, and Late Ordovician and Early Silurian K-Ar apparent ages of the volcanic rocks (Eberlein and others, 1983; Gehrels and others, 1983; G.E. Gehrels and J.B. Saleeby, unpub. data). The higher grade metamorphic rocks on southern Dall Island are primarily schist and gneiss, and may be in part correlative with the pre-Ordovician Wales Group (pOmsv).

SOsv — SEDIMENTARY AND VOLCANIC ROCKS (EARLY SILURIAN TO EARLY ORDOVICIAN) — Undivided mudstone and graywacke turbidites, basaltic and andesitic volcanic rocks, and the metamorphic equivalents of these strata. Consists of: part of the Descon Formation on Prince of Wales Island (Eberlein and others, 1983); unnamed rocks on Annette and Duke Islands and adjacent parts of the mainland that are metamorphosed in

most areas to greenschist facies (Berg and others, 1978; Gehrels and others, 1984; G.E. Gehrels and J.B. Saleeby, unpub. data); conglomerate, agglomerate, and volcanic breccia belonging to the Bay of Pillars Formation (probable Early Silurian age) on northern Prince of Wales Island (Brew and others, 1984); and chlorite schist, sericite schist, phyllite, and black slate in the Chilkat Range (Lathram and others, 1959). The rocks in the Chilkat Range are interpreted herein to occupy a similar stratigraphic position to the Early Silurian to Early Ordovician Descon Formation of Prince of Wales Island.

SOsvc SEDIMENTARY, VOLCANIC, AND CARBONATE ROCKS (EARLY SILURIAN AND ORDOVICIAN) — Interbedded graywacke, mudstone, basaltic to felsic volcanic rocks, and limestone, that have been regionally metamorphosed as high as greenschist facies (G.E. Gehrels, unpub. data, 1984). Occurs on the west coast of Dall Island and on Long Island.

UNDIVIDED MAP UNITS

KPs SEDIMENTARY ROCKS (CRETACEOUS? AND JURASSIC?, TRIASSIC, TRIASSIC?, PERMIAN, AND PERMIAN?) — Carbonaceous shale, mudstone, graywacke, and subordinate limestone, chert, conglomerate, and andesitic or basaltic and minor felsic volcanic rocks, that have been metamorphosed and deformed in much of the area. Regional metamorphic grade in these strata and in associated map units (KPv, KPsv, and KPc) generally increases from sub-greenschist or greenschist facies on the southwest, to amphibolite facies toward the northeast. There are also significant changes in metamorphic grade along the northwesterly trend of these map units. Common rock-types in the higher grade strata include phyllite, schist, and gneiss. Late Triassic fossils have been recovered from carbonaceous slate and limestone assigned to this map unit near Juneau (Ford and Brew, 1977; H.C. Berg, unpub. data, 1981), and similar strata (locally subdivided into unit "Rs") on Revillagigedo Island have yielded latest Middle Triassic fauna (Silberling and others, 1982). On Revillagigedo Island phyllite and metagraywacke are locally in depositional contact with crinoidal marble of known Permian age (unit Pc), and are interbedded with crinoidal marble of probable Permian age (Berg and others, 1978; H.C. Berg, unpub. data, 1975). Some strata included in this unit are probably Cretaceous or Jurassic in age: Berg and others (1978) report that metasedimentary rocks in this unit on Revillagigedo Island are locally identical in protolith to Cretaceous and Jurassic strata (KJs) on Annette and Gravina Islands; Brew and others (1984) suggest that some rocks in this unit on the mainland east of Kupreanof Island may have Cretaceous or Jurassic protolith ages; and Buddington and Chapin (1929, p. 74) report that conglomerate and phyllite in this unit on the mainland east of Admiralty Island are lithologically similar to conglomerate and slate of Cretaceous and Jurassic age (KJs) on eastern Admiralty Island. The contact between rocks of probable Cretaceous and Jurassic age (units KJs, KJv, and KJsv) and rocks in this and associated map units (KPv, KPsv, KPc) is drawn along the northeastern side of relatively homogeneous meta-graywacke and phyllite. Intrusive bodies of Late Cretaceous age (Kgt) place a younger age limit on the depositional age of these strata. The age of metamorphism and deformation has traditionally been interpreted to be Late Cretaceous and (or) early Tertiary (Buddington and Chapin, 1929). However, recognition of: 1) an unconformity separating metamorphosed strata belonging to associated map unit "KPsv" from less-metamorphosed Cretaceous and Jurassic strata northwest of Juneau (Redman, 1984a), and 2) a greater degree of metamorphism and deformation in this and associated units than in strata of probable Cretaceous and Jurassic age on Revillagigedo Island (G.E. Gehrels and J.B. Saleeby, unpub. mapping, 1984) suggest that Triassic and Permian rocks in this unit may have been initially metamorphosed and deformed prior to the deposition of the Cretaceous and Jurassic strata. Consists of unnamed rocks on Revillagigedo Island (Berg and others, 1978), and on the mainland east of Kupreanof Island (Brew and others, 1984) and east of Admiralty Island (Brew and Grybeck, 1984; Buddington and Chapin, 1929; Ford and Brew, 1973 and 1977; Brew and Ford, 1977).

KPv VOLCANIC ROCKS (CRETACEOUS? AND JURASSIC?, TRIASSIC, TRIASSIC?, PERMIAN, AND PERMIAN?) — Andesitic or basaltic flows and locally fragmental rocks, subordinate clastic strata and carbonate, and the metamorphosed and deformed equivalents of these rocks. Regional metamorphism of these strata is similar to that described above for unit "KPs." Common rock-types in higher grade regions include schist, gneiss, and amphibolite, although some of this amphibolite may be meta-gabbro (see unit "KPsv" below). Graphitic slate assigned to this unit contains Late Triassic fossils near Juneau (Brew and Grybeck, 1984, p. 31), and marble intercalated with metavolcanic rocks contains Permian and Permian(?) fossils near Juneau, along the coast southeast of Juneau, and in Endicott Arm (Buddington and Chapin, 1929, p. 73 and 119; Ford and Brew, 1973; Brew and Grybeck, 1984, p. 30-31). The minimum depositional age is constrained by interbedded rocks belonging to unit "KPs" (described above), and by crosscutting Late Cretaceous intrusive bodies (Kgt). Consists of unnamed rocks on

Revillagigedo Island (Berg and others, 1978), and on the mainland east of Kupreanof Island (Brew and others, 1984) and east of Admiralty Island (Brew and Grybeck, 1984; Buddington and Chapin, 1929; Ford and Brew, 1973 and 1977; Brew and Ford, 1977).

KPsv SEDIMENTARY AND VOLCANIC ROCKS (CRETACEOUS? AND JURASSIC?, TRIASSIC, TRIASSIC?, PERMIAN, and PERMIAN?) — Undivided shale, mudstone, graywacke, andesitic or basaltic rocks, subordinate chert and carbonate rocks, and the regionally metamorphosed equivalents of these strata. The nature and age of metamorphism is similar to that described above for unit "KPs." Protolith age is indicated by stratigraphic relations with metasedimentary and metavolcanic rocks of Cretaceous(?) to Permian age (KPs and KPv) described above. Metasedimentary and metavolcanic rocks in the stippled area in this unit southeast of Revillagigedo Island are intruded by a deformed and metamorphosed gabbro (recrystallized to amphibolite) that is apparently related to the foliated tonalitic rocks in unit "TKt" (G.E. Gehrels and J.B. Saleeby, unpub. mapping, 1984). The Work Channel amphibolite to the southeast in British Columbia (Hutchison, 1982), and some of the amphibolite in Cretaceous(?) to Permian map units to the northwest, may consist in part of correlative meta-gabbro. Unit occurs on Revillagigedo Island and on adjacent areas of the mainland to the southeast (Berg and others, 1978) and the northwest (Elliott and Koch, 1981), on the mainland east of Admiralty Island (Buddington and Chapin, 1929; Brew and Grybeck, 1984; Brew and Ford 1977; Ford and Brew, 1973 and 1977), and on the east side of Lynn Canal (Buddington and Chapin, 1929; Redman, 1984a).

KPc CARBONATE ROCKS (CRETACEOUS? AND JURASSIC?, TRIASSIC?, AND PERMIAN?) — Unfossiliferous, metamorphosed and deformed carbonate rocks that are intercalated with andesitic or basaltic metavolcanic rocks of Cretaceous(?) and Jurassic(?) age on the mainland northwest of Revillagigedo Island (H.C. Berg, unpub. data, 1975), and are associated with metasedimentary and metavolcanic rocks of Cretaceous(?) to Permian age east of Etolin and Zarembo Islands (Brew and others, 1984).

KPsvc SEDIMENTARY, VOLCANIC, AND CARBONATE ROCKS (CRETACEOUS TO PERMIAN?, AND PRE-PERMIAN?) — Consists of: unnamed fossilliferous argillite of Cretaceous age; variably metamorphosed chert, tuffaceous sandstone, felsic tuff, argillite, and light-gray thinly bedded limestone of Mesozoic or Paleozoic age; highly sheared metasedimentary, metavolcanic, and granodioritic rocks of Mesozoic and Paleozoic(?) age; and amphibolite, gneiss, schist, and marble of Mesozoic or Paleozoic age (Johnson and Karl, 1982; Loney and others, 1975). Occurs on Chichagof, Baranof, and Yakobi Islands. Areas that may be underlain by a significant proportion of intrusive rock are shown with a stipple pattern.

JMsv SEDIMENTARY AND VOLCANIC ROCKS (JURASSIC TO MISSISSIPPIAN?) — Diverse assemblage of sedimentary and volcanic rocks and their metamorphic equivalents. Occurs in the Coast Mountains near the British Columbia-Alaska border northeast of Revillagigedo Island (Berg and others, 1978; Koch and Elliott, 1981), and east of Juneau (Souther and others, 1979; Souther, 1971). Consists of: unnamed Middle Jurassic rhyolite and andesite; Early Jurassic andesite, basalt, conglomerate, and sandstone of the Hazelton Group; Late Triassic andesite and clastic sedimentary rocks; Permian limestone; and Carboniferous greenstone, limestone, and clastic sedimentary rocks (Hutchison and others, 1979; Berg and others, 1978; Souther and others, 1979; Souther, 1971). Rocks in this unit are locally metamorphosed to semischist, phyllite, and schist. Map unit "pTmsv" probably consists in large part of the higher grade equivalents of these strata.

RPsv SEDIMENTARY AND VOLCANIC ROCKS (TRIASSIC AND PERMIAN) — Andesitic to basaltic pillow flows, breccia, and tuff, felsic tuff, graywacke, mudstone, shale, chert, conglomerate, carbonate, and the metamorphic equivalents of these strata. This unit occurs only on Admiralty Island and consists of the Barlow Cove Formation (Barker,

1957) and of strata originally mapped by Lathram and others (1965) as parts of the Hyd Formation (Late Triassic) and the Cannery Formation (Early Permian). Phyllite, greenstone, greenschist, and marble are common rock-types in this unit, but the nature and age of the metamorphism are poorly known.

ROsv SEDIMENTARY AND VOLCANIC ROCKS (TRIASSIC TO ORDOVICIAN) — Clastic sedimentary rocks, subordinate mafic to felsic volcanic rocks, thin- to thick-bedded gray carbonate, chert, and minor ultramafic rocks, that have been regionally metamorposed to slate, phyllite, greenschist, schist, gneiss, and marble in many areas. The age and grades of this metamorphism have not been reliably determined. Rocks assigned to this unit on Admiralty Island belong to the Gambier Bay Formation, the Retreat Group, and the "undifferentiated metamorphic rocks" and the "migmatite, gneiss, and feldspathic schist" units of Lathram and others (1965). Devonian fossils have been recovered from marble in the Gambier Bay Formation; the Retreat Group has been inferred to be Devonian in age based on correlation with the Gambier Bay Formation; and the undivided metamorphic rocks are undated (Lathram and others, 1965). The Triassic to Ordovician age assignment on Admiralty Island reflects our interpretation that this map unit consists primarily of regionally metamorphosed and deformed strata correlative with the Late Triassic Hyd Formation (Rsv), the Permian Pybus Dolomite (Pc) and Cannery Formation (Ps), the Ordovician Hood Bay Formation (SOs), and various strata elsewhere assigned to Devonian, Silurian, and Silurian and Ordovician units. Rocks in part of this unit may also belong to the complex of disrupted strata (KJsd) in the Kupreanof Island region (D.A. Brew, in U.S. Geological Survey, 1982). Areas on Admiralty Island that may be underlain by a significant proportion of younger intrusive rock are shown with a stipple pattern.

In the Chilkat Range west of Haines this unit consists of unnamed metasedimentary and metavolcanic rocks (MacKevett and others, 1974; Robertson, 1959; Redman, 1984b) that are of mid to late Paleozoic and probable Triassic age (Berg and Grybeck, 1980; Redman, 1984b). These rocks herein are interpreted to be correlative with sedimentary and volcanic rocks of Permian, Devonian, and Silurian age in Glacier Bay (Brew and others, 1978) and in the Chilkat Range (Lathram and others, 1959), and Triassic to Ordovician strata that adjoin rocks in this unit along the British Columbia-Alaska border north of Glacier Bay (Campbell and Dodds, 1983).

ROc CARBONATE ROCKS (TRIASSIC? TO ORDOVICIAN?) -- Carbonate rocks that are regionally metamorphosed to gray marble (MacKevett and others, 1974; Lathram and others, 1959). Fossils of Pennsylvanian(?) or Permian(?), Paleozoic(?), and possibly of Silurian or Devonian age have been recovered from this unit west of Haines (MacKevett and others, 1974). Adjacent units in British Columbia consist of carbonate rocks of Ordovician, Silurian, Devonian, and Triassic age (Campbell and Dodds, 1983). The age of the strata in this unit on Admiralty Island is constrained by stratigraphic relations with Triassic to Ordovician clastic strata (ROsv). Regional map patterns suggest that most of the carbonate rocks in this map unit are of Silurian age, and are correlative with the Kennel Creek Limestone, Pyramid Peak Limestone, and Willoughby Limestone (Sc) in the Chichagof Island-Glacier Bay area.

PDs SEDIMENTARY ROCKS (PENNSYLVANIAN AND DEVONIAN) -- Saginaw Bay Formation on Kuiu Island, which consists, from youngest to oldest, of: silty limestone, calcareous chert and limestone, black chert, and massive aquagene tuff and pillow breccia (Muffler, 1967). The silty limestone and the calcareous chert and limestone are known to be Pennsylvanian; the age of the black chert is not known directly; and the volcanic rocks have yielded earliest Late to latest Early Devonian conodonts (Brew and others, 1984).

DSsc CARBONATE AND CLASTIC SEDIMENTARY ROCKS (DEVONIAN AND SILURIAN) — On north-central Prince of Wales Island this unit consists of unnamed limestone, sandstone, calcareous mudstone, and polymictic conglomerate that are interpreted to be facies-equivalents of the Silurian Heceta Limestone and associated clastic strata (Sc, Ss, and

Scg), and the Early Devonian Karheen Formation (Dcg) (Eberlein and others, 1983). In the Chilkat Range consists of unnamed siliceous argillite, conglomerate, graywacke, and subordinate thin limestone beds and basalt and andesite flows, agglomerate, and tuff (Lathram and others, 1959). In Glacier Bay consists of unnamed clastic sedimentary and minor carbonate and volcanic rocks (Brew and others, 1978). The strata in this unit in the Chilkat Range and in Glacier Bay are probably correlative with the Devonian Cedar Cove Formation (units Ds, Dcg, and Dc) and the Late? Silurian Point Augusta Formation (Ss and Sc) on northeastern Chichagof Island, and the Tidal and Rendu Formations (Ss and Sc) in Glacier Bay.

DOsv SEDIMENTARY AND VOLCANIC ROCKS (DEVONIAN TO ORDOVICIAN) -- Graywacke, mudstone, shale, limestone, and subordinate mafic to intermediate-composition volcanic rocks, that have been metamorphosed in most areas to hornfels, schist, amphibolite, marble, gneiss, and granofels. Consists of unnamed rocks on northeastern Chichagof Island and in the Glacier Bay area. Loney and others (1975) suggest that the metamorphic rocks on Chichagof Island were derived mainly from the Point Augusta Formation (Ss) and from Devonian volcanic rocks of the Freshwater Bay Formation (Dv). In the Glacier Bay area the rocks are probably the metamorphic equivalents of Devonian and Silurian strata that occur nearby (units Ds, Dv, Dcg, Ss, and Sc) (Brew and others, 1978). Ordovician strata occur in contiguous map units northwest of Glacier Bay in British Columbia (Campbell and Dodds, 1983); we therefore suggest that this unit probably includes rocks of Ordovician age as well. On northeastern Chichagof Island the strata were metamorphosed to hornblende hornfels facies during emplacement of the adjacent Cretaceous intrusive rocks (Loney and others, 1975). Metamorphism in the Glacier Bay area is also interpreted to have occurred during Cretaceous time (Brew and others, 1978).

DOc CARBONATE ROCKS (DEVONIAN TO ORDOVICIAN) -- Carbonate rocks that have been metamorphosed to thin- to thick-bedded, dark gray to white marble. Consists of unnamed rocks on northeastern Chichagof Island and in the Glacier Bay area. Loney and others (1975) suggest that the marble on Chichagof Island was derived primarily from limestone in the Point Augusta Formation (Sc). The marble in the Glacier Bay area was derived in large part from limestone of Devonian (Dc) and Silurian (Sc) age (Brew and others, 1978). Some marble in this unit may be correlative with Ordovician limestone in map units along the British Columbia-Alaska Border northwest of Glacier Bay (Campbell and Dodds, 1983). Metamorphic relations are the same as in unit "DOsv," described above.

LITHODEMIC UNITS

Ksvm MELANGE (SEDIMENTARY AND MAFIC VOLCANIC ROCKS) (CRETACEOUS) — Rocks in this map unit and in associated units "Ksm" and "Kvm" comprise a melange of regionally disrupted, deformed, and metamorphosed marine sedimentary and volcanic rocks. This unit consists of: 1) blocks up to several kilometers in length of marine sedimentary and volcanic rocks, and their metamorphic equivalents, that are bounded by faults or shear zones, and 2) blocks up to several tens of meters in length, and perhaps larger, of marine sedimentary and volcanic rocks, and their metamorphic equivalents, that are enclosed in a matrix of moderately metamorphosed and penetratively sheared graywacke, argillite, tuff, and pillow breccia. Common lithic-types in the blocks include tuffaceous argillite, tuff, greenstone, graywacke, chert, limestone, marble, phyllite, schist, and minor granitic rocks. Fossils recovered from blocks in this unit are Early Cretaceous, Late Jurassic, and possibly Jurassic or Triassic in age (Loney and others, 1975; Johnson and Karl, 1982). The minimum age of the unit is constrained by: 1) mid-Cretaceous K-Ar apparent ages on metamorphic minerals in the melange on Chichagof Island (Decker and others, 1980), 2) Early Cretaceous fossils in sedimentary matrix material near Sitka on Baranof Island (Plafker and others, 1976), and 3) Early Cretaceous fossils in matrix material near the coast northwest of Cross Sound (Plafker and others, 1977; George Plafker, written commun., 1984). The Cretaceous age assigned to this unit therefore refers to the time during which the melange is interpreted to have formed. Metamorphic grade is primarily sub-greenschist, greenschist, and, south of Cross Sound, glaucophane-schist facies (Decker and others, 1980). On Chichagof Island this unit consists of the Khaz Formation, which is a melange of blocks enclosed in a sedimentary and volcanic matrix, and the Freeburn assemblage, which consists of fault-bounded blocks of sedimentary and volcanic rocks (Decker, 1980; Johnson and Karl, 1982; Karl and others, 1982). The Freeburn assemblage comprises rocks described by Loney and others (1975) as the Pinnacle Peak Phyllite and an unnamed schist unit in the Kelp Bay Group. On Baranof Island this unit consists of rocks described by Loney and others (1975) as the Khaz Formation, part of the undivided Kelp Bay Group, and an unnamed "schist, gneiss, amphibolite, and greenschist" unit (Karl and others, 1982). Northwest of Cross Sound the unit consists of: melange between the Brady Glacier and Border Ranges faults (Tarr Inlet suture zone) that is continuous and probably correlative with part of the melange on Chichagof and Baranof Islands (Decker and Plafker, 1982), and; the melange facies of the Yakutat Group west of the Fairweather Fault (Plafker and others, 1977; George Plafker, written commun., 1984).

Ksm MELANGE (SEDIMENTARY ROCKS) (CRETACEOUS) — Melange of predominantly metasedimentary rocks that resembles unit "Ksvm" (described above) in structural and metamorphic characteristics. Common lithic-types include dark-gray phyllite, light-gray quartzite, and graywacke semischist. The age of formation of this melange unit is constrained by close stratigraphic and structural association with rocks in unit "Ksvm." Fossils have not been recovered from these metasedimentary rocks. Consists of unnamed rocks mapped by Loney and others (1975) as the "phyllite," and the "graywacke semischist" units on Baranof Island.

Kvm MELANGE (MAFIC VOLCANIC ROCKS) (CRETACEOUS) — Melange of predominantly mafic metavolcanic rocks that resembles unit "Ksvm" (described above) in structural and metamorphic characteristics. Common lithic-types include greenstone, greenschist, and minor phyllite, graywacke semischist, marble, and metachert. The age of formation of this melange unit is constrained by close stratigraphic and structural association with rocks in units "Ksvm" and "Ksm." Consists of the Waterfall Greenstone on western Chichagof Island, which has yielded radiolaria of Early Cretaceous age (Johnson and Karl, 1982), and unnamed metavolcanic rocks on Baranof Island that are referred to as the "greenschist and greenstone" unit by Loney and others (1975).

pTmsv METAMORPHIC COMPLEX (DERIVED FROM SEDIMENTARY AND VOLCANIC ROCKS) (PRE-TERTIARY) -- Amphibolite- and locally granulite-facies metasedimentary, metavolcanic, and subordinate metaplutonic rocks, that belong to a metamorphic complex. Common rock-types include pelitic, semipelitic, and quartzo-feldspathic schist and gneiss, and subordinate amphibolite, quartzite, marble, and calc-silicate. Protoliths are interpreted to have been argillaceous marine strata, limestone, chert, subordinate mafic to felsic volcanic rocks, and minor intrusive rocks. Areas in which there may be a significant proportion of unmapped Cretaceous or Tertiary intrusive rocks are shown with a stipple pattern. Such areas comprise "migmatite" map units in some reports listed below. The minimum age of the rocks in this unit is constrained by cross-cutting tonalitic bodies of Paleocene and Late Cretaceous age (TKt) in the Coast Mountains (Gehrels and others, 1985). Protolith ages of Cretaceous(?), Jurassic(?), Triassic, Permian(?), Carboniferous(?), and Proterozoic(?) are interpreted from: 1) relations along the British Columbia-Alaska border east of Juneau, which suggest that rocks in this unit grade into strata of Triassic and older age, and that these Triassic rocks locally contain clasts of older metamorphic rocks (Souther, 1971), 2) a preliminary Rb/Sr apparent isochron of Proterozoic age (R.L. Armstrong and L.J. Werner, oral commun., 1984) determined on high-grade metamorphic rocks along the British Columbia-Alaska border north of Juneau (Souther and others, 1979; Werner, 1978), 3) relations in the Coast Mountains between Portland Canal and Terrace (southeast of the map area) which suggest that analagous metamorphic rocks were derived from Cretaceous(?) and Jurassic(?) strata (Douglas, 1983), the Jurassic Bowser Lake Group (Woodsworth and others, 1983, p. 13), and perhaps pre-Permian strata (Hutchison, 1982, p. 23-24), and 4) the probability that rocks in this unit were derived in part from Jurassic to Mississippian(?) strata in unit "JMsv." Regional metamorphism of rocks in this complex occurred during Late Cretaceous to Early Tertiary time (Forbes and Engels, 1970; Smith and Diggles, 1981; Gehrels and others, 1985), in part prior to Late Triassic time (Souther, 1971), and perhaps at other times. Consists of unnamed metamorphic rocks in the Coast Mountains east of Ketchikan (Berg and others, 1978; Elliott and Koch, 1981), east of Petersburg (Brew and others, 1984; Souther and others, 1979), near Tracy Arm (Brew and Grybeck, 1984), near Juneau (Ford and Brew, 1973; Brew and Ford, 1977; Souther and others, 1979; Brew and Morrell, 1980), southeast of Haines (Souther and others, 1979; Werner, 1978), and near Skagway (Redman and others, 1984).

pTmc METAMORPHIC COMPLEX (DERIVED FROM CARBONATE ROCKS) (PRE-TERTIARY) -- Amphibolite- and locally granulite-facies carbonate rocks and carbonate-rich clastic strata that occur as discontinuous marble lenses, as thick, continuous marble layers, and as calc-silicate gneiss. Age is constrained by intercalation with the pre-Tertiary metasedimentary and metavolcanic rocks (pTmsv) described above. Occurs in the Coast Mountains northeast of Petersburg (Brew and others, 1984), and southeast of Juneau (Brew and Grybeck, 1984).

KJsd DISRUPTED UNIT (SEDIMENTARY ROCKS) (CRETACEOUS AND JURASSIC) -- Regionally deformed, disrupted, and metamorphosed graywacke, siltstone, mudstone, and subordinate chert, limestone, and volcanic and intrusive rocks, that belong to a structural complex in the Kupreanof-Etolin Islands area (Brew and others, 1984). Common metamorphic rock-types include sub-greenschist- to greenschist-facies graywacke semischist, phyllite, argillite, slate, and subordinate greenstone, greenschist, and marble. The complex consists of blocks up to several kilometers in length of Triassic sedimentary and volcanic rocks (Rsv), Permian carbonate (Pc), and Devonian carbonate (Dc) enclosed in a matrix of strata belonging to the Stephens Passage Group (Cretaceous and Jurassic), and perhaps the Cannery Formation (Mississippian and Late Devonian: Jones and others, 1981) and other Mesozoic or Paleozoic units (D.A. Brew, in U.S. Geological Survey, 1982; Brew and others, 1984; H.C. Berg, unpub. field data, 1978). The complex probably formed by tectonic and (or) sedimentary processes operating during deposition of the Stephens Passage Group (KJs) (D.A. Brew, in U.S. Geological Survey, 1982). We have therefore assigned an age of Cretaceous and Jurassic

for the formation of the complex. Faulting during Tertiary time may have further disrupted the complex. These rocks are not referred to as a melange because the structural and stratigraphic relations between the blocks and the matrix, and the degree to which the matrix strata are disrupted, are uncertain.

KJvd DISRUPTED UNIT (VOLCANIC ROCKS) (CRETACEOUS AND JURASSIC) — Regionally deformed, disrupted, and metamorphosed intermediate to mafic and minor felsic volcanic rocks that belong to a structural complex on Kupreanof, Zarembo, and adjacent smaller Islands (Brew and others, 1984). Rocks are generally metamorphosed to greenschist and greenstone. Relict pyroxene phenocrysts suggest that the metavolcanic rocks were probably derived from Cretaceous and Jurassic volcanic rocks in unit "KJv" (Brew and others, 1984). Metavolcanic rocks of Triassic (Rv) and Mississippian and Late Devonian (MDsv) age may also be included.

pOmsv METAMORPHIC COMPLEX (DERIVED FROM SEDIMENTARY AND VOLCANIC ROCKS) (PRE-ORDOVICIAN) — Greenschist- and locally amphibolite-facies basaltic to andesitic pillow flows, pillow breccia, and tuff breccia, volcaniclastic graywacke and mudstone, and minor limestone and felsic volcanic breccia and tuff, that belong to a metamorphic complex. Common rock-types include greenschist, greenstone, quartzo-feldspathic schist, and marble. Radiometric age constraints suggest that the metamorphism occurred during Early Ordovician to Middle Cambrian time (Turner and others, 1977; J.B. Saleeby and G.E. Gehrels, unpub. data; M.A. Lanphere, oral commun., 1984). A pre-Ordovician depositional age is indicated by metaplutonic rocks (O€dg) on eastern Prince of Wales Island that have yielded preliminary U/Pb (zircon) apparent ages of Cambrian (J.B. Saleeby, oral commun., 1983). Consists of part of the Wales Group on south-central Prince of Wales Island (Eberlein and others, 1983; Gehrels and others, 1983; Redman, 1981), and unnamed rocks on small islands south of Gravina Island (G.E. Gehrels, unpub. mapping, 1984).

pOmc METAMORPHIC COMPLEX (DERIVED FROM CARBONATE ROCKS) (PRE-ORDOVICIAN) — Greenschist- and locally amphibolite-facies marble layers and lenses that belong to a metamorphic complex. A pre-Ordovician depositional age and an Early Ordovician to Late Cambrian metamorphic age are indicated by intercalation with the metamorphic rocks described above in unit "pTmsv." Consists of part of the Wales Group on southern Prince of Wales Island (Eberlein and others, 1983).

INTRUSIVE UNITS

Tgb GABBRO (MIOCENE AND OLIGOCENE) -- Layered and locally zoned bodies of two-pyroxene +/- olivine +/- biotite +/- hornblende +/- quartz gabbro, and subordinate troctolite, peridotite, leucogabbro, diorite, and tonalite. Consists of stocks on Revillagigedo Island and the adjacent mainland (Berg and others, 1978; Koch and Elliott, 1984), northern Kupreanof and Kuiu Islands (Brew and others, 1984), Chichagof Island (Johnson and Karl, 1982; Loney and others, 1975), and north of Cross Sound (Brew and others, 1978). The stocks on Revillagigedo Island and adjacent areas of the mainland have yielded K-Ar apparent ages of late Oligocene and early Miocene (Smith and Diggles, 1981), and the large body (La Perouse gabbro) northwest of Cross Sound has yielded an Oligocene Ar^{40}/Ar^{39} apparent age (Loney and Himmelberg, 1983).

Tgr GRANITE (MIOCENE AND OLIGOCENE) -- Biotite +/- hornblende +/- pyroxene granite, alkalai granite, quartz monzonite, and subordinate syenite, granodiorite, and diorite. Consists of stocks on the mainland southeast of Revillagigedo Island that have yielded K-Ar apparent ages of early Miocene and Oligocene (Berg and others, 1978), large plutons of Miocene and (or) Oligocene age on Etolin, Zarembo, Kupreanof, and Kuiu Islands (Brew and others, 1984), and part of the Oligocene Tkope River intrusions along the Alaska-British Columbia border north of Glacier Bay (MacKevett and others, 1974; Campbell and Dodds, 1983).

Tgd GRANODIORITE (OLIGOCENE AND EOCENE) -- Biotite +/- hornblende +/- muscovite +/- garnet granodiorite, granite, quartz monzonite, tonalite, and quartz diorite. Consists of muscovite- and locally garnet-bearing granodiorite, granite, and tonalite on Baranof and Chichagof Islands and in Glacier Bay. Where dated, these intrusive bodies have yielded Eocene K-Ar apparent ages (Loney and others, 1975; Decker and Plafker, 1982; Johnson and Karl, 1982; Brew and others, 1978). In the Chilkat Range and on southeastern Baranof Island the intrusive bodies consist of biotite- and hornblende-bearing quartz diorite and granodiorite that have yielded Oligocene K-Ar apparent ages (Loney and others, 1975; MacKevett and others, 1974).

Tg GRANODIORITE (EOCENE) -- Biotite-dominant, hornblende- and sphene-bearing granodiorite and subordinate quartz monzonite, quartz diorite, and leucogranite that occurs in the Coast Mountains (Berg and others, 1978; Elliott and Koch, 1981; Brew and others, 1984; Brew and Grybeck, 1984; Brew and Ford, 1977; Brew and Morrell, 1980; Souther and others, 1979; Redman and others, 1984; Fred Barker and Joe Arth, written commun., 1984). Concordant K-Ar apparent ages on hornblende and biotite (Forbes and Engels, 1970; Smith and others, 1979) and preliminary U/Pb (zircon) apparent ages (Gehrels and others, 1985) indicate emplacement during Eocene time.

Tgt GRANODIORITE AND TONALITE (PALEOCENE) -- Biotite-dominant, hornblende-bearing granodiorite and tonalite with local foliation and layering. Preliminary U/Pb (zircon) geochronometry indicates emplacement during Paleocene time (Gehrels and others, 1985). Occurs in the Coast Mountains east of Petersburg (Brew and others, 1984), east of Juneau (Brew and Ford, 1977; Gehrels and others, 1985), and near Skagway (Fred Barker and Joe Arth, written commun., 1984).

TKg GRANODIORITE (PALEOCENE? AND CRETACEOUS?) -- Diverse assemblage of generally foliated and layered granodiorite, quartz monzonite, and tonalite, and their metamorphic equivalents. May include a significant component of pre-Tertiary metasedimentary and metavolcanic rocks (pTmsv) in some areas. Where recognized, such areas are indicated by a stipple pattern. Constraints on the age of these rocks are provided by cross-cutting Eocene granodiorite plutons, and the interpretation that some rocks in this unit have experienced a regional Late Cretaceous and early Tertiary metamorphic event (Forbes and Engels, 1970; Smith and Diggles, 1981). We suspect, however, that most rocks in this unit are Paleocene in age and correlative with rocks in

unit "Tgt." Occurs in the Coast Mountains east and north of Ketchikan (Berg and others, 1978; Elliott and Koch, 1981), east of Petersburg (Brew and others, 1984), east of Admiralty Island (Brew and Grybeck, 1984), and in the Skagway area (Fred Barker and Joe Arth, written commun., 1984).

TKt — TONALITE (PALEOCENE AND LATE CRETACEOUS) — Hornblende-dominant, biotite-bearing tonalite and subordinate quartz diorite in steeply dipping, foliated, and locally lineated sills in the Coast Mountains (Brew and Ford, 1981; Brew and Morrell, 1980). Occurs east and north of Ketchikan (Berg and others, 1978; Elliott and Koch, 1981), east of Petersburg (Brew and others, 1984), east of Admiralty Island (Brew and Grybeck, 1984; Brew and Ford, 1977; Brew and Morrell, 1980), and north of Haines (MacKevett and others, 1974; Redman and others, 1984; Robertson, 1959). Field and preliminary U/Pb (zircon) geochronologic data indicate emplacement in Late Cretaceous and early Tertiary time, during the waning stages of deformation and metamorphism in the Coast Mountains (Gehrels and others, 1985; Brew and Ford, 1981).

Kgt — GRANODIORITE AND TONALITE (LATE CRETACEOUS) — Small plutons to batholiths of granodiorite, tonalite, and subordinate quartz monzonite to quartz diorite and diorite. Most bodies contain biotite and hornblende, many have magmatic epidote and garnet and are plagioclase porphyritic, and some contain pyroxene and (or) muscovite. K-Ar apparent ages of these bodies are generally Late Cretaceous (Smith and Diggles, 1981; Brew and others, 1984). Consists of plutons on Revillagigedo Island and the adjacent mainland (Berg and others, 1978; Eberlein and others, 1983), in the Etolin-Kupreanof Islands area (Brew and others, 1984; Burrell, 1984; Buddington and Chapin, 1929), on the mainland east of Admiralty Island (Buddington and Chapin, 1929; Brew and Grybeck, 1984; Souther and others, 1979), and perhaps in the Haines region (MacKevett and others, 1974; Redman and others, 1984). Plutons that are mineralogically or compositionally different from the main suite of intrusive bodies are queried on the geologic map.

Kum — ULTRAMAFIC ROCKS (EARLY CRETACEOUS AND CRETACEOUS?) — Ultramafic intrusive bodies of magnetite-bearing hornblende clinopyroxenite and subordinate dunite, peridotite, and hornblendite (Taylor, 1967). Several of the complexes are concentrically zoned from a core of dunite to rocks containing progressively less olivine and more hornblende and magnetite. The zoned bodies commonly intrude a two-pyroxene gabbro that may be genetically related (Irvine, 1974) or unrelated (Taylor, 1967) to the ultramafic rocks. Geological and geochemical considerations suggest that rocks in these bodies may be genetically related to Cretaceous and Jurassic volcanic rocks (KJv) (Berg and others, 1972; Irvine, 1973). K-Ar apparent ages of the ultramafic rocks indicate emplacement during Early Cretaceous time (Lanphere and Eberlein, 1966). Bodies belonging to this suite occur on Duke Island (Irvine, 1974), Annette and Revillagigedo Islands (Berg and others, 1978), small islands west of Etolin Island and Kupreanof Island (Brew and others, 1984), and on the mainland near Myers Chuck (Ruckmick and Noble, 1959), Tracy Arm (Brew and Grybeck, 1984), and Klukwan (MacKevett and others, 1974).

Undated ultramafic rocks provisionally assigned to this unit on the basis of similar lithology are queried on the geologic map and consist of: hornblendite and hornblende pyroxenite on Revillagigedo Island (Berg and others, 1978); pyroxenite, gabbro, and hornblendite on east-central Prince of Wales Island (Eberlein and others, 1983); peridotite, dunite, and pyroxenite in the Coast Mountains near Tracy Arm (Brew and Grybeck, 1984; Grybeck and others, 1977); hornblendite and pyroxene- and hornblende-bearing gabbro on eastern Admiralty Island (Lathram and others, 1965); serpentinized peridotite or pyroxenite on north-central Admiralty Island (Lathram and others, 1965); and peridotite and serpentinite on eastern Baranof Island (Loney and others, 1975).

Kg — GRANODIORITE (EARLY CRETACEOUS) -- A heterogeneous suite of plutons consisting primarily of biotite, hornblende, magnetite +/- pyroxene +/- garnet granodiorite and subordinate quartz monzonite, tonalite, and quartz diorite. On Chichagof Island these plutons are associated with Early Cretaceous gabbro and diorite. Many intrusive bodies

show a crude zoning from leucocratic rocks in the interior, to progressively more basic rocks toward the margins. K-Ar apparent ages record emplacement primarily during Early Cretaceous time, although similar intrusive bodies northwest of Glacier Bay in Canada have also yielded Late Jurassic K-Ar apparent ages (Chris Dodds, oral commun., 1984). Occurs on Dall Island (G.E. Gehrels, unpub. mapping, 1984), Prince of Wales Island and adjacent smaller islands (Eberlein and others, 1983; Brew and others, 1984), Kuiu Island (Brew and others, 1984), Admiralty Island (Lathram and others, 1965), Chichagof Island (Loney and others, 1975; Johnson and Karl, 1982), north of Cross Sound (Decker and Plafker, 1982; George Plafker, written commun., 1984), in the Glacier Bay area (Brew and others, 1978), and in the Chilkat Range (Lathram and others, 1959; Sonnevil, 1981; MacKevett and others, 1974; Robertson, 1959). Also included is the Moth Bay pluton on southern Revillagigedo Island (Berg and others, 1978), which may alternatively belong to unit "Kgt."

Kd — DIORITE (EARLY CRETACEOUS) — Primarily hornblende +/- biotite +/- clinopyroxene diorite with subordinate quartz diorite and gabbro. Generally occurs with Early Cretaceous granodiorite and gabbro. Occurs on Prince of Wales Island (Eberlein and others, 1983; Gehrels and others, 1983), and on Chichagof Island (Loney and others, 1975; Johnson and Karl, 1982). As described above for unit "Kg," some rocks in this unit may be Late Jurassic in age.

Kgb — GABBRO (EARLY CRETACEOUS) — Primarily clinopyroxene (generally augite) +/- hornblende +/- biotite +/- olivine gabbro, leucogabbro, and subordinate norite, syenite and pyroxenite. Occurs on Prince of Wales Island (Eberlein and others, 1983), Kuiu Island (Brew and others, 1984), and Chichagof Island, where it is associated with Early Cretaceous granodiorite and diorite (Loney and others, 1975; Johnson and Karl, 1982). As described above for unit "Kg," some rocks in this unit may be Late Jurassic in age.

KJd — DIORITE (CRETACEOUS AND JURASSIC?) — Metamorphosed and moderately deformed diorite and subordinate quartz diorite and gabbro on Annette Island, Revillagigedo Island, and the mainland to the northwest (Berg and others, 1978). A small quartz diorite body near northern Annette Island has yielded a Cretaceous K-Ar apparent age; the other bodies are undated. We have assigned a Cretaceous and Jurassic(?) age based on the interpretation that rocks in this unit are genetically related to Cretaceous and Jurassic volcanic rocks in units "KJv" and "KJsv."

KJgb — GABBRO (EARLY CRETACEOUS AND JURASSIC?) — Two-pyroxene gabbro and subordinate hornblende +/- biotite gabbro and diorite. These intrusive rocks generally occur adjacent to the Early Cretaceous zoned ultramafic bodies. Gabbro on Duke Island has yielded a Middle Jurassic K-Ar apparent age on biotite (Smith and Diggles, 1981), although field relations suggest that this gabbro may be in part of Silurian or Ordovician age (G.E. Gehrels, unpub. mapping, 1984). Occurs on Duke Island (Irvine, 1974; Taylor, 1967) and on the mainland near Myers Chuck (Eberlein and others, 1983). We tentatively include the large gabbro and diorite body near Klukwan based on its close association with an Early Cretaceous ultramafic body (MacKevett and others, 1974; Taylor, 1967; Redman and others, 1984).

Jgr — GRANITE (MIDDLE JURASSIC) — Peralkaline aegerine and arfvedsonite granite at Bokan Mountain on southern Prince of Wales Island, which has yielded a Middle Jurassic U/Pb (zircon) apparent age (MacKevett, 1963; Saint-Andre and others, 1983).

Jt — TONALITE (MIDDLE? JURASSIC) — Biotite and hornblende tonalite and quartz diorite on Chichagof Island that has yielded a Middle Jurassic K-Ar apparent age on hornblende (Loney and others, 1975).

JRd — DIORITE (JURASSIC OR TRIASSIC) — Hornblende and biotite diorite (Jualin Diorite) along the east shore of Lynn Canal (Knopf, 1911; Redman, 1984a). The diorite hornfelses adjacent metasedimentary and metavolcanic rocks that are probably Triassic or Permian

in age, and is overlain unconformably by less metamorphosed strata belonging to unit "KJs" (Redman, 1984a). These relations suggest an emplacement age of Jurassic or Triassic for the Jualin diorite. As discussed above under unit "KPsv," these relations also suggest that some rocks in "KPsv" and associated units were metamorphosed and deformed prior to the deposition of strata of Cretaceous and Jurassic age.

Rg — GRANODIORITE (TRIASSIC) — Hornblende and biotite granodiorite and minor quartz diorite (Texas Creek granodiorite) northeast of Revillagigedo Island (Berg and others, 1978) that has yielded a minimum K-Ar apparent age of Triassic from hornblende (Smith and Diggles, 1981).

PPsy — SYENITE (EARLY PERMIAN AND (OR) LATE PENNSYLVANIAN) — Biotite +/- amphibole +/- aegerine +/- augite syenite on Sukkwan Island that has yielded K-Ar apparent ages of late Pennsylvanian from biotite and Early Permian from hornblende, and an undated but lithically similar body on south-central Prince of Wales Island (Eberlein and others, 1983).

Sst — SYENITE AND TRONDHJEMITE (SILURIAN) — Consists of: leucocratic biotite +/- aegerine +/- arfvedsonite +/- garnet syenite and subordinate diorite on southern Prince of Wales Island (Gehrels and others, 1983); biotite and hornblende trondhjemite on Annette and Gravina Islands and the mainland to the southeast (Gehrels and others, 1983; Berg and others, 1978); and undivided biotite and (or) hornblende syenite and trondhjemite on Chichagof Island (Loney and others, 1975). A Silurian age is indicated by a minimum K-Ar apparent age on Chichagof Island (Lanphere and others, 1965) and preliminary U/Pb (zircon) apparent ages of rocks from Annette, Gravina, and Prince of Wales Islands and the mainland to the southeast (G.E. Gehrels and J.B. Saleeby, unpub. data).

SOum — ULTRAMAFIC ROCKS (SILURIAN AND ORDOVICIAN?) — Pyroxenite, hornblendite, and related ultramafic rocks on southern Prince of Wales Island (MacKevett, 1963; G.E. Gehrels, unpub. mapping) and on southern Dall Island (G.E. Gehrels, unpub. mapping, 1984). Ultramafic rocks on southern Prince of Wales Island are interpreted to be Silurian based on gradational relations with syenitic rocks of Silurian age (Sst), and the intrusive body on Dall Island has yielded a Late Ordovician K-Ar apparent age from hornblende (M.A. Lanphere, written commun., 1984).

SOq — QUARTZ DIORITE (EARLY SILURIAN TO MIDDLE ORDOVICIAN) — Consists of: Late and Middle Ordovician diorite and quartz diorite, and Early Silurian to Late Ordovician biotite-quartz monzonite on Prince of Wales Island (Gehrels and others, 1983; Eberlein and others, 1983; Saleeby and others, 1984; Lanphere and others, 1964; J.B. Saleeby and G.E. Gehrels, unpub. data); diorite and quartz diorite of Early Silurian to Late Ordovician age on Gravina, Annette, and Duke Islands (Gehrels and others, 1984; G.E. Gehrels and J.B. Saleeby, unpub. data); and layered and foliated quartz diorite on southern Dall Island. These rocks are interpreted to be genetically related to Early Silurian and Ordovician volcanic rocks (SOv and SOsv) (Eberlein and others, 1983).

Ogb — GABBRO (MIDDLE? ORDOVICIAN AND ORDOVICIAN?) — Hornblende gabbro and subordinate hornblende pyroxenite and hornblendite on Sukkwan Island that has yielded a Middle Ordovician K-Ar apparent age (Eberlein and others, 1983), and an undated metagabbro on southern Dall Island that is interpreted to be correlative (G.E. Gehrels, unpub. mapping, 1984).

O€dg — DIORITE AND GRANODIORITE (EARLY ORDOVICIAN AND CAMBRIAN) — Foliated and metamorphosed hornblende diorite and biotite +/- hornblende granodiorite on Prince of Wales Island that has yielded preliminary U/Pb (zircon) apparent ages of Early Ordovician and Cambrian (J.B. Saleeby and G.E. Gehrels, unpub. data).

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