U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

SCIENTIFIC INVESTIGATIONS MAP 2877
Pamphlet accompanies map

This map and accompanying digital files represent part of a systematic effort to release geologic map data for the United States in a uniform manner. All geologic data in this series will be published as parts of the U.S. Geological Survey Data Series. The geologic data in this series have been compiled from a wide variety of sources, ranging from state and regional geologic maps to large-scale field mapping. The data are presented for use at a nominal scale of 1:500,000, although more detailed information may be available for use at smaller scales. The accompanying pamphlet with each volume will provide more detailed information on sources and appropriate scales for use. Associated metadata distributed accompany the spatial database of the geologic and are uniformly structured for ease in developing regional- and national-scale maps.

Base from U.S. Geological Survey 1:250,000-scale Gulkana, 1959 (minor revision 1985); Nabesna, 1960 (limited revision 1982); Valdez, 1960 (limited revisions 1981); McCarthy, 1960 (limited revisions 1981); Cordova, 1959 (limited revisions 1982); Bering Glacier, 1959 (limited revisions 1983); Mt. St. Elias, 1959 (limited revisions 1983); Icy Bay, 1961 (limited revision 1985); Yakutat, 1959 (limited revisions 1982)

Topographic contours from a compilation of multiple 15 minute U.S. Geological Survey 45.8-meter Digital Elevation Models (DEMs)

Alaska Albers Equal Area Conic projection; 1927 North American Datum

MAP LOCATION

APPROXIMATE MEAN DECLINATION, 2006

SCALE 1:350 000

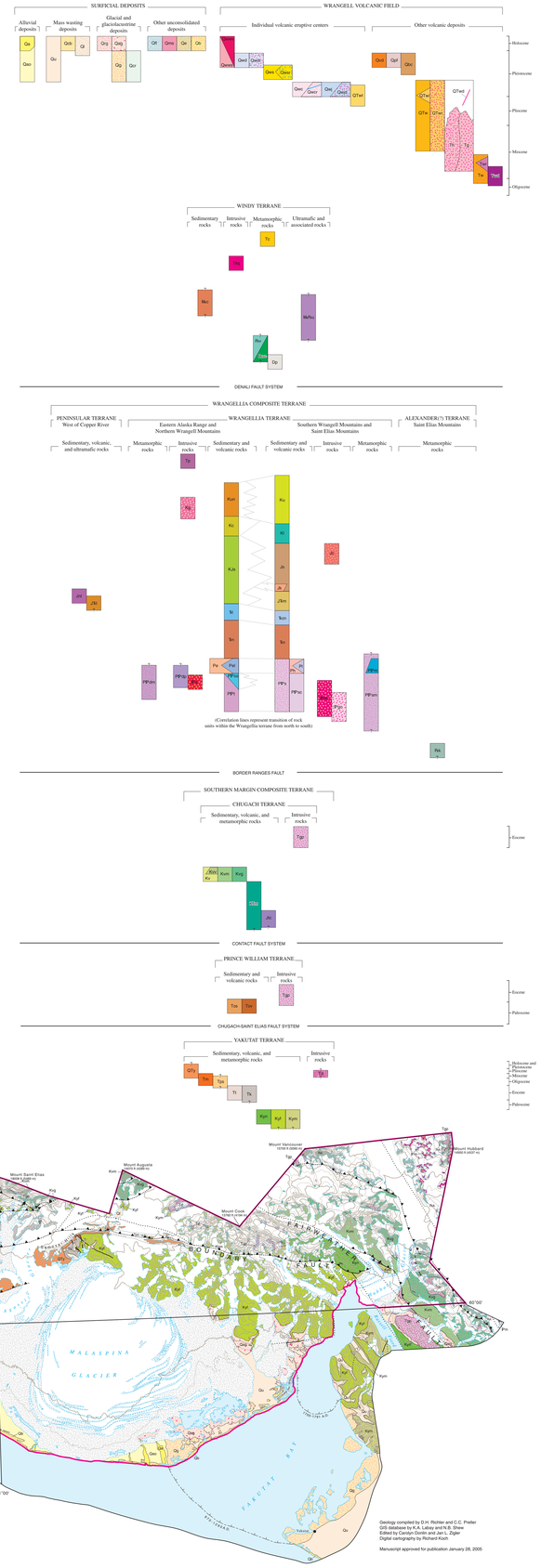
CONTOUR INTERVAL 500 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geologic Map of the Wrangell-Saint Elias National Park and Preserve, Alaska

Compiled by
Donald H. Richter, Cindi C. Preller, Keith A. Labay, and Nora B. Shew

2006

CORRELATION OF MAP UNITS



LIST OF MAP UNITS

[Some unit exposures are too small to distinguish for identification. While labeled when possible, all are attributed within the digital database]

SURFICIAL DEPOSITS

Alluvial deposits

- Qa — **Alluvium (Holocene)**
- Qao — **Older alluvium (Holocene and Pleistocene)**

Mass wasting deposits

- Qs — **Slope deposits, undifferentiated (Holocene and Pleistocene)**
- Qdb — **Bluff colluvium (Holocene)**
- Ql — **Landslide deposits (Holocene and Pleistocene)**

Glacial and glaciofluvatine deposits

- Qrg — **Rock glacier deposits (Holocene)**
- Qdg — **Drift of Alaskan glaciation (Holocene)**
- Qg — **Drift of older glaciations (Pleistocene)**
- Qcr — **Copper River deposits (Pleistocene)**

Other unconsolidated deposits

- Qf — **Fine-grained deposits (Holocene)**
- Qms — **Mineral spring deposits (Holocene)**
- Qe — **Eolian deposits (Holocene)**
- Qb — **Beach and delta deposits (Holocene)**

WRANGELL VOLCANIC FIELD

Individual volcanic eruptive centers

Mount Wrangell volcano (Holocene and Pleistocene, 0.65 Ma and younger)

- Qwws — **Shield lavas**
- Qwvf — **Valley-fill lavas**

Mount Drum volcano (Pleistocene, 0.6–0.2 Ma)

- Qwd — **Lava flows**
- Qwdp — **Domes**

Mount Sanford volcano (Pleistocene, 0.9–0.5 Ma)

- Qws — **Lava flows**
- Qwsr — **Rhyolite dome and flow**

Capital Mountain volcano (Pleistocene, 1.0 Ma)

- Qwc — **Shield and intracaldera lavas**
- Qwcy — **Central andesite plug and dike swarm; rhyolite lacccolith and associated dike**

Mount Jarvis volcanoes (Pleistocene, 1.7–1.0 Ma)

- Qwj — **Shield and intracalderra lavas**
- Qwjd — **Domes**

Tanada Peak volcano (Pleistocene and Pliocene, 1.8–0.9 Ma)

- QTwt — **Shield and intracalderra lavas**

Other volcanic deposits

Volcaniclastic deposits (Pleistocene)

- Qvd — **Volcanic debris flows**
- Qvf — **Pyroclastic flows**
- Qvc — **Cinder cones, flows, and tuffs (Pleistocene)**

Older volcanic and sedimentary rocks (Pleistocene, Pliocene, or Miocene)

- QTw — **Lava flows and sedimentary rocks**
- QTwc — **Flows of the Ice Fields Plateau**
- QTwd — **Domes and intrusive rocks**

Hypabyssal and plutonic rocks (Pleistocene, Pliocene, Miocene, or Oligocene)

- QTwd — **Dikes**
- Tb — **Shallow plutons, small stocks, dikes, and sills**
- Tg — **Granodiorite**

Oldest volcanic rocks (Miocene or Oligocene)

- Twl — **Lava flows and lahars**
- Twr — **Rhyolite flow**
- Twd — **Domes**

WINDY TERRANE

Sedimentary rocks

- Mzc — **Conglomerate and sandstone (Early Cretaceous(?) and Late Jurassic(?) or older)**

Intrusive rocks

- Tertiary — **Snag pluton (Tertiary, 50 Ma)**

Metamorphic rocks

- Trp — **Metamorphic complex of Cottonwood Creek of Richter (1976) (Tertiary)**
- **Metamorphic rocks of the Carden Hills (Permian(?), Pennsylvanian, Mississippian, and Devonian(?))**
- Pzpm — **Metavolcanic rocks**
- Pzpq — **Metavolcaniclastic rocks**
- Dp — **Metasedimentary rocks (Devonian)**

Ultramafic and associated rocks

- MPzu — **Alpine-type ultramafic rocks and gabbro (Cretaceous(?), Jurassic(?), Triassic, Permian, and Pennsylvanian(?))**

WRANGELLIA COMPOSITE TERRANE

PENINSULAR TERRANE
(West of Copper River)

Sedimentary, volcanic, and ultramafic rocks

- Jm — **Mafic and ultramafic rocks (Middle or Early Jurassic)**
- JTRt — **Talkeetna Formation (Early Jurassic and Late Triassic(?))**

WRANGELLIA TERRANE
(Eastern Alaska Range and Northern Wrangell Mountains)

Metamorphic rocks

- PIPdm — **Diorite complex, metamorphic part (Permian(?) and Pennsylvanian)**

Intrusive rocks

- Tg — **Younger plutons (Tertiary)**
- Kg — **Mid-Cretaceous plutons (Cretaceous)**
- PIPdc — **Diorite complex, plutonic part (Permian(?) and Pennsylvanian)**
- **Ahtell pluton (Pennsylvanian)**

Sedimentary and volcanic rocks

- Kun — **Nonmarine sedimentary rocks (Late Cretaceous)**
- Kc — **Chisana Formation (Early Cretaceous)**
- KJk — **Nutzotin Mountains sequence of Berg and others (1972) (Early Cretaceous and Late Jurassic)**
- Ts — **Triassic limestone (Late Triassic)**
- Ten — **Nikolai Greenstone (Late and/or) Middle Triassic)**
- **Mankomen Group (Early Permian and Pennsylvanian)**
- Pe — **Eagle Creek Formation (Early Permian)**
- Pel — **Limestone of Eagle Creek Formation**
- PIPss — **Slana Spur Formation (Early Permian and Pennsylvanian)**
- PIPt — **Tetelna Volcanics (Early Permian and Pennsylvanian)**

WRANGELLIA TERRANE
(Southern Wrangell Mountains and Saint Elias Mountains)

Sedimentary and volcanic rocks

- Kcg — **Marine sedimentary rocks (Early and Late Cretaceous)**
- Kt — **Shallow marine sedimentary rocks (Early Cretaceous)**
- Js — **Sedimentary rocks (Late, Middle, or Early Jurassic)**
- Jk — **Kotsina Conglomerate**
- JTRm — **McCarthy Formation (Early Jurassic and Late Triassic)**
- Ten — **Chitistone and Nizina Limestones (Late Triassic)**
- Ten — **Nikolai Greenstone (Late and/or) Middle Triassic)**
- PIPs — **Skolai Group, undivided (Early Permian and Pennsylvanian)**
- Ph — **Hasen Creek Formation (Early Permian)**
- Pl — **Limestone of Hasen Creek Formation**
- PIPsc — **Station Creek Formation (Early Permian and Pennsylvanian)**

Intrusive rocks

- Jc — **Chitina Valley batholith (Late Jurassic)**
- PIPm — **Monzonite-granite complex (Pennsylvanian)**
- PIPg — **Gabbro and orthopyroxene (Pennsylvanian)**

Metamorphic rocks

- PIPzm — **Strelna Metamorphics of Plafker and others (1989) (Jurassic(?), Triassic(?), Permian, Early Pennsylvanian, and Late Mississippian(?))**
- PIPzs — **Marble**

ALEXANDER(?) TERRANE
(Saint Elias Mountains)

Metamorphic rocks

- Pzk — **Kaskawulsh Group of Kindle (1953) (Pennsylvanian, Mississippian, Devonian(?), and older)**

SOUTHERN MARGIN COMPOSITE TERRANE

CHUGACH TERRANE

Sedimentary, volcanic, and metamorphic rocks

Valdez Group (Late Cretaceous)

- Kv — **Greywacke-facies flysch**
- Kvs — **Metamorphosed basalt and tuff**
- Kvm — **Amphibolite-facies flysch**
- Kvg — **Gneiss and schist**
- Kfm — **Mélange units (mid-Cretaceous, Jurassic, and Late Triassic(?))**
- Jc — **Schist of Liberty Creek of Winkler and others (1981) (Jurassic(?))**

Intrusive rocks

- Tgp — **Granitic plutons (Eocene, 50 Ma)**

PRINCE WILLIAM TERRANE

Sedimentary and volcanic rocks

Orca Group (early Eocene and late Paleocene)

- Tos — **Turbidites**
- Tob — **Basalt**

Intrusive rocks

- Tgp — **Granitic plutons (Eocene, 50 Ma)**

YAKUTAT TERRANE

Sedimentary, volcanic, and metamorphic rocks

- QTy — **Yakataga Formation (Holocene(?), Pleistocene, Pliocene, and Miocene)**
- Tmv — **Volcanic and hypabyssal rocks (Miocene and Oligocene)**
- Tps — **Poul Creek Formation (early Miocene(?), Oligocene, and late Eocene(?))**
- Tt — **Tokun Formation (Eocene)**
- Tk — **Kulthieth Formation (Eocene and early Paleocene(?))**
- Kyn — **Schist of Nunatak Fiord (Cretaceous)**
- **Yakutat Group (Cretaceous and Jurassic(?))**
- Kyf — **Flysch**
- Kym — **Mélange**

Intrusive rocks

- Tdr — **Rhyolite porphyry and granite (Pliocene(?) or Miocene(?))**

- **Contact**—Known and approximately located. Dotted where concealed
- **Normal and strike-slip fault**—Known, approximate, and inferred. Dotted where concealed
- **Thrust fault**—Known approximate, and inferred. Dotted where concealed. Teeth on upper plate
- **Dikes**—Andesitic dike swarm, Capital Mountain volcano
- **Dikes**—Chiefly andesite and dacite
- **Caldera wall**—Known and approximate. Dotted where inferred or concealed. Hachures on caldera side
- **White River Ash**—Western and southern limits of readily discernible (thickness approximately greater than 10 cm) White River Ash erupted from Mount Churchill about 1,920 and 1,280 yr B.P. (Lerbekmo and others, 1975; Richter and others, 1995)
- **Glacier ice boundary**—Bounding clean ice from bedrock, supraglacial moraines, and rock glaciers
- **Supraglacial moraine**—Rock debris on existing glacier
- **Submerged end moraine**—Hachures on glacial side
- **Historic ice recession in Icy Bay**—Recession lines are from Post (1988). Year represents historical maximum. Historic recession lines for other glaciers not shown
- **Wrangell-Saint Elias National Park and Preserve boundary**
- **Road**
- **Town**

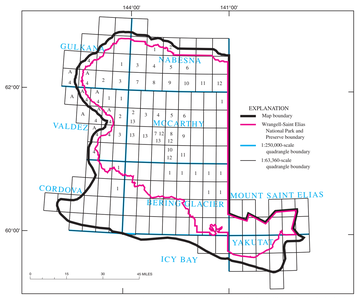


Figure 3. Index map showing sources of information used to compile the geologic map of Wrangell-Saint Elias National Park and Preserve, Alaska. Numbers and letters correlate to 1:63,360-, 1:125,000-, and 1:250,000-scale maps listed in the "Sources of Information" references.

SOURCES OF INFORMATION

[See References section for complete bibliographical information of published sources. Letters and numbers of references are marked on Figure 3]

GULKANA QUADRANGLE

1:250,000-scale

Nokleberg, W.J., Richter, D.H., and Freitsam, O.J., Lange, I.M., Campbell, D.L., Aleinikoff, J.N., Smith, T.E., and Koch, R.D., 1997, written commun.

1:125,000-scale

A. Nichols, D.R., and Yeiltz, L.A., 1960

1:63,360-scale

1. Richter, D.H., Reed, J.C., Schmoll, H.R., Lerman, W.P., Smith, J.G., and Yeiltz, L.A., 1980
2. Richter, D.H., Smith, R.L., Yeiltz, L.A., and Miller, T.P., 1979
3. Richter, D.H., Sellards, W.A., Sawyer, D.A., Reed, J.C., and Schmoll, H.R., 1996
4. Schmoll, H.R., and Yeiltz, L.A., unpub. data, 2002

NABESNA QUADRANGLE

1:250,000-scale

Richter, D.H., 1976

1:63,360-scale

1. Richter, D.H., and Schmoll, H.R., 1973
2. Richter, D.H., Matson, N.A., Jr., and Schmoll, H.R., 1976
3. Richter, D.H., Smith, J.G., Schmoll, H.R., and Smith, R.L., 1993
4. Lowe, P.C., Richter, D.H., Smith R.L., and Schmoll, H.R., 1982
5. Richter, D.H., 1971a
6. Richter, D.H., 1971b
7. Richter, D.H., Moll-Stalcup, E.J., Duffield, W.A., and Shew, Nora, 1997
8. Richter, D.H., and Smith, R.L., 1976
9. Richter, D.H., 1973
10. Richter, D.H., 1973b
11. Richter, D.H., and Jones, D.L., 1973
12. Richter, D.H., Schmoll, H.R., and Matson, N.A., Jr., 1973

VALDEZ QUADRANGLE

1:250,000-scale

Winkler, G.R., Silberman, M.L., Grantz, Arthur, Miller, R.J. and MacKevett, E.M., Jr., 1980

Williams, J.R., and Johnson, K.M., 1980

1:125,000-scale

A. Nichols, D.R., and Yeiltz, L.A., 1960

1:63,360-scale

1. Richter, D.H., Lanphere, M.A., McGimsey, R.G., Moore, B.R., Nye, C.J., Smith, J.G., and Winkler, G.R., unpub. data, Geologic map of the Valdez D-1 and D-2 quadrangles
2. Yeiltz, L.A., 1980
3. Yeiltz, L.A., 1981
4. Schmoll, H.R., and Yeiltz, L.A., unpub. data, 2001

MCCARTHY QUADRANGLE

1:250,000-scale

MacKevett, E.M., Jr., 1978

1:63,360-scale

1. Richter, D.H., Reed, J.C., Lerman, W.P., and Menzies, Martin, 2000
2. MacKevett, E.M., Jr., Richter, D.H., Smith, J.G., and Winkler, G.R., 1978
3. Winkler, G.R., and MacKevett, E.M., Jr., 1981
4. MacKevett, E.M., Jr., 1972
5. MacKevett, E.M., Jr., 1970a
6. MacKevett, E.M., Jr., 1970b
7. MacKevett, E.M., Jr., and Smith, J.G., 1972a
8. MacKevett, E.M., Jr., 1974
9. MacKevett, E.M., Jr., and Smith, J.G., 1972b
10. MacKevett, E.M., Jr., 1973
11. Miller, D.J., and MacColl, R.S., 1964
12. Trop, J.M., Ridgway, K.D., Manuszak, J.D., and Layer, P.W., 2002
13. Yeiltz, L.A., unpub. data, 2001

CORDOVA QUADRANGLE

1:250,000-scale

Winkler, G.R., and Plafker, George, 1993

1:63,360-scale

1. Pavlis, T.L., and Sisson, V. B., written commun., 2002

BERING GLACIER QUADRANGLE

1:250,000-scale

Plafker, George, unpub. data, Geology of Bering Glacier and Icy Bay quadrangles

1:63,360-scale

1. Plafker, George, unpub. data, Geology of NE Bering Glacier quadrangle

MOUNT SAINT ELIAS QUADRANGLE

1:250,000-scale

Plafker, George, unpub. data, Geology of Mount Saint Elias and Yakutat quadrangles

ICY BAY QUADRANGLE

1:250,000-scale

Plafker, George, unpub. data, Geology of Bering Glacier and Icy Bay quadrangles

YAKUTAT QUADRANGLE

1:250,000-scale

Plafker, George, unpub. data, Geology of Mount Saint Elias and Yakutat quadrangles

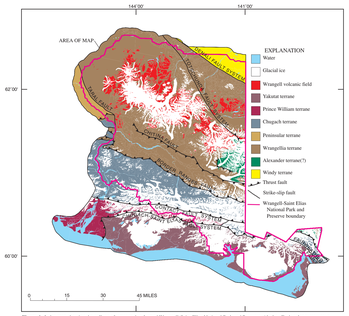


Figure 4. Index map showing the collage of terranes that formed Wrangell-Saint Elias National Park and Preserve, Alaska. Each color represents a unique stratigraphic package, bounded by thrust or strike-slip faults.

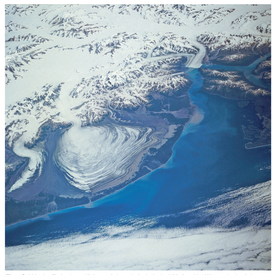


Figure 5. Malaspina Glacier, the world's largest piedmont glacier, is clearly visible from this 1989 space shuttle mission photo. Draining off the Bagley ice field, it covers over 3,000 sq. miles (5000 sq. kilometers). Image courtesy of Earth Sciences and Image Analysis Laboratory, NASA Johnson Space Center, http://eol.jsc.nasa.gov, photo number STS028-97-082.

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