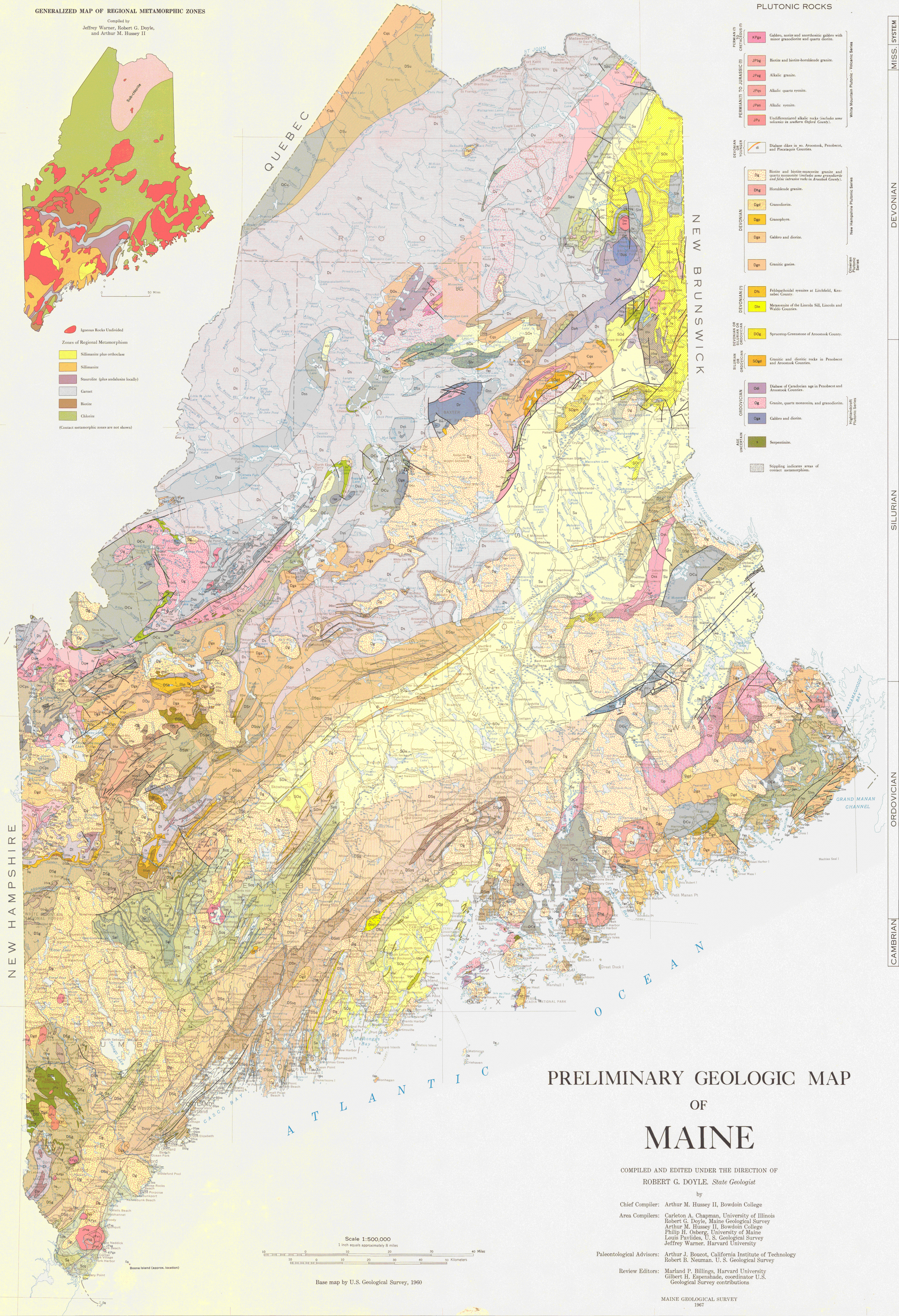


Base map by U.S. Geological Survey, 1960

PLUTONIC ROCKS

PERMIAN (?) OR CRETACEOUS (?)

- KPga — Gabbro, norite and anorthositic gabbro with minor granodiorite and quartz diorite.

PERMIAN (?) TO JURASSIC (?)

- JPbg — Biotite and biotite-hornblende granite.
- JPag — Alkalic granite.
- JPqs — Alkalic quartz syenite.
- JPas — Alkalic syenite.
- JPu — Undifferentiated alkalic rocks (*includes some volcanics in southern Oxford County*).

White Mountain Plutonic - Volcanic Series

DEVONIAN OR YOUNGER

- di — Diabase dikes in so. Aroostook, Penobscot, and Piscataquis Counties.

DEVONIAN

- Dg — Biotite and biotite-muscovite granite and quartz monzonite (*includes some granodiorite and felsic intrusive rocks in Aroostook County*).
- Dhg — Hornblende granite.
- Dgd — Granodiorite.
- Dgp — Granophyre.
- Dga — Gabbro and diorite.

New Hampshire Plutonic Series

- Dgn — Granitic gneiss.

Oliverian Plutonic Series

DEVONIAN (?)

- Dfs — Feldspathoidal syenites at Litchfield, Kennebec County.
- Dln — Metasyenite of the Lincoln Sill, Lincoln and Waldo Counties.

DEVONIAN OR SILURIAN OR ORDOVICIAN

- DOg — Sprucetop Greenstone of Aroostook County.

SILURIAN OR ORDOVICIAN

- SOgd — Granitic and dioritic rocks in Penobscot and Aroostook Counties.

ORDOVICIAN

- Odi — Diabase of Caradocian age in Penobscot and Aroostook Counties.
- Og — Granite, quartz monzonite, and granodiorite.
- Oga — Gabbro and diorite.

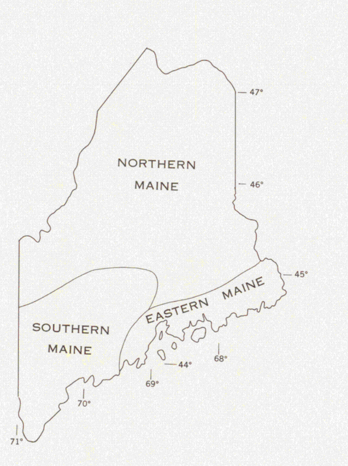
Highlandcroft Plutonic Series

AGE UNCERTAIN

- s — Serpentinite.

Stippling indicates areas of contact metamorphism.

STRATIFIED ROCKS



SYSTEM		AMERICAN STANDARD SERIES [1]	EUROPEAN STANDARD SERIES	
MISS.				
DEVONIAN	UPPER DEVONIAN	SENECAN	UPPER DEVONIAN	
	MIDDLE DEVONIAN	ERIAN	MIDDLE DEVONIAN	Givetian
				Eifelian
	LOWER DEVONIAN	ULSTERIAN	LOWER DEVONIAN	Upper Emsian
				Lower Emsian
				L. Emsian-Siegenian or both
		HELDERBERGIAN		Siegenian
				U. Gedinnian
				L. Gedinnian
SILURIAN	UPPER SILURIAN	CAYUGAN	UPPER SILURIAN	U. Ludlow
				L. Ludlow
	MIDDLE SILURIAN	NIAGARAN		Wenlock
	LOWER SILURIAN	MEDINAN	LOWER SILURIAN	U. Llandovery
				M.–L. Llandovery
ORDOVICIAN	UPPER ORDOVICIAN	CINCINN.		Ashgill
	MIDDLE ORDOVICIAN	MOHAWKIAN		Ashgill/Caradoc
				Llanvirn/Llandeilo
	LOWER ORDOVICIAN	CANADIAN		Arenig
				Tremadoc
CAMBRIAN				

NORTHERN MAINE

MD: Red and light gray conglomerate, sandstone, and quartzite; and reddish brown quartzite and siltstone (*unnamed units in Washington, Hancock, and Penobscot Counties*).

Dm: Red conglomerate, sandstone, and shale, with minor green sandstone (*Mapleton Sandstone in Aroostook County*).

Dtv: Light gray to black shale, siltstone, sandstone, felsite cobble conglomerate, with minor sideritic sandstone and ironstone (*Trout Valley Formation in Piscataquis County*).

Dto: Metamorphosed dark sandstone, tuffaceous sandstone, shale, and quartzite (*Tomhegan Formation in Somerset and Piscataquis Counties*).

Dr: Felsic volcanic rocks (*includes Kineo Rhyolite in Somerset and Piscataquis Counties, Traveler Rhyolite in Piscataquis and Penobscot Counties, and unnamed units in Piscataquis County*).

Ddg: Felsic and mafic extrusive and intrusive rocks in northern Oxford and Somerset Counties.

Dss: Fine-grained dark gray metasandstone (*includes the Tarratine Formation of Somerset and Piscataquis Counties; Matagamon Sandstone in Penobscot and Piscataquis Counties; Frontenac Formation of Somerset, Franklin, and Oxford Counties; and unnamed units in Piscataquis County*).
Dssm: Mafic volcanic rocks and sills in Oxford, Somerset, and Piscataquis Counties.
Dssf: Felsic volcanic rocks in Oxford County.
Dssq: Misery Quartzite Member of the Tarratine Formation in Somerset and Piscataquis Counties.

Ds: Cyclically bedded dark gray slate and metasandstone (*Seboomook Formation of Franklin, Somerset, Piscataquis, Penobscot, and Aroostook Counties*). [2]
Dsv: Mafic volcanics (*Camera Hill Member of the Seboomook Formation*).

Dav: Volcanic rocks and sills (*includes the Hedgehog Formation and Edmunds Hill Andesite in Aroostook County, Parker Bog Formation of Somerset County, and unnamed units in Piscataquis County*).
Das: Metamorphosed sandstone and conglomerate (*includes Chapman sandstone in Aroostook County, Hobbstown Formation in Somerset County*).
Dah: Shale and slate (*Swanback Formation and unnamed units in Aroostook County*).
Dal: Beck Pond Limestone in Somerset County.

Du: metamorphosed shale, siltstone, sandstone, and conglomerate (*unnamed units in Aroostook County*). [2]
Duc: Thrasher Peak Conglomerate in northern Oxford County.
Duv: Unnamed tuff in Oxford County.

DSw: Metamorphosed red and green slate and conglomerate (*Capens Formation in Somerset and Piscataquis Counties of Early Ludlow age*); quartzite (*Whiskey Quartzite in Somerset and Piscataquis Counties of Late Gedinnian age*).

DSls: Metamorphosed limestone, calcareous siltstone, and calcareous sandstone (*unnamed units in Somerset, Piscataquis, Franklin, Penobscot, and Aroostook Counties*).

DSu: Metamorphosed shale and graywacke, limestone and sandstone in northwestern Aroostook County.
DSs: Metamorphosed shale, siltstone, argillite, sandstone, graywacke, and conglomerate (*upper member of Bell Brook Formation in Aroostook County*).
DScg: Metaconglomerate, metagraywacke and slate (*lower member of Bell Brook Formation in Aroostook County*).

DSbs: Metamorphosed shale, siltstone, and quartzite in Penobscot, Washington, and Aroostook Counties.
DSd: Quartzite and metamorphosed conglomerate, shale, siltstone, and ferruginous slate (*Daggett Ridge Formation in Penobscot, Aroostook, and Washington Counties*).

DOu: Metamorphosed conglomerate, sandstone, siltstone, and shale in Aroostook County; undifferentiated metasedimentary rocks in Franklin County.
DOv: Undifferentiated volcanic rocks in Piscataquis County.
DOl: Metamorphosed calcareous siltstone and limestone in Franklin County.

DCu: Undifferentiated metasedimentary rocks in Piscataquis and Aroostook Counties.

Sls: Calcareous metasedimentary rocks (*includes Hardwood Mountain Formation in Somerset and Franklin Counties; Lobster Lake Formation in Piscataquis County; and unnamed units in Oxford, Penobscot, and Somerset Counties*).

Slv: Unnamed metavolcanic and metasedimentary rocks in Aroostook, Penobscot, and Piscataquis Counties.

Spu: Calcareous metasiltstone (*upper member of the Perham Formation in Aroostook County*).

Sch: Calcareous metasiltstone (*Chesuncook Limestone in Piscataquis County, unnamed units in Piscataquis and Somerset Counties*).

Sp: Metamorphosed calcareous siltstone, shale, and limestone containing sedimentary iron manganese deposits (*Perham Formation undivided of Aroostook County*).

Su: Metamorphosed gray and green siltstone, sandstone, shale, graywacke, conglomerate, and sedimentary iron-manganese deposits (*includes Smyrna Mills, Island Falls, and Allsbury Formations of southern Aroostook County and northern Penobscot County; Kellyland Formation of Washington, Penobscot, and Hancock Counties, notably calcareous siltstone and slate*); unnamed metamorphosed limestone, conglomerate, shale, and tuff in Penobscot, Aroostook, and Washington Counties.
Sul: Metamorphosed limestone, calcareous siltstone, and shale within the Island Falls Formation in southern Aroostook County.
Sus: Silicified calcareous metasiltstone and slate in Hancock County.

Ssl: Dominantly calcareous metasedimentary rocks (*unnamed units in Somerset and Franklin Counties*).

Ssc: Conglomerate, sandstone and siltstone (*includes Frenchville Formation in Aroostook and Penobscot Counties, and unnamed units in Penobscot, Franklin, Oxford, and southern Aroostook Counties*).

Sln: Calcareous metasiltstone (*Spragueville Formation in Northern Aroostook County*).

Spl: Metamorphosed calcareous siltstone, shale, and limestone containing sedimentary iron manganese deposits (*Maple Mountain Formation and lower member of the Perham Formation in Aroostook County*).

SOd: Metavolcanic rocks and minor slate and metasandstone (*Dunn Brook Formation in Aroostook County*).

SOv: Felsic and mafic metavolcanics in Piscataquis and Somerset Counties.

Sb: Slate (*Burnt Brook Formation in Aroostook County*).

SOgm: Slate and metagraywacke (*Mattawamkeag Formation in Aroostook County*).

SOc: Metamorphosed limestone, calcareous sandstone, and shale (*Carys Mills Formation in Aroostook County*).
SOcl: Slate, slate and metagraywacke, and metasiltstone in Aroostook County.

SOn: Metamorphosed shale, conglomerate, and volcanic rocks (*Nine Lake Formation in Aroostook County*).

Ocr: Slate and metagraywacke (*Chandler Ridge Formation in Aroostook County*).

Oc: Metamorphosed shale, siltstone, sandstone, and conglomerate (*unnamed units in northern Piscataquis and northern Aroostook Counties*).

Oss: Metamorphosed dark gray and black shale, chert, sandstone, and minor volcanic rocks, silicified in places (*includes Partridge Formation in Oxford County, Dixville Formation in Franklin and Somerset Counties, and unnamed units in Franklin, Piscataquis, Penobscot, and Aroostook Counties*).
Oqw: Conglomeratic quartzose metagraywacke in Franklin, Somerset, Piscataquis, and Oxford Counties.

Ov: Metamorphosed felsic to mafic volcanic rocks with interbedded metasedimentary rocks (*includes Ammonoosuc Volcanics in western Oxford County, unnamed greenstone in Franklin County, and unnamed units at several places in northern Maine*).
Od: Slate and metagraywacke at base, separately mapped in northern Piscataquis County.

Ot: Metamorphosed felsic to intermediate tuff and tuffaceous sandstone (*includes Shin Brook Formation in northern Penobscot and southeastern Aroostook Counties, Grand Pitch Formation in northern Penobscot and southern Aroostook Counties, and Kennebec Formation in east-central Somerset County*).

OCu: Slate, metasandstone, and quartzite, including green and black slate, and some metavolcanic rocks (*includes Beauceville Formation adjacent to Quebec boundary in western Aroostook County, and unnamed units in central Somerset County, in Piscataquis County, and in northern Washington County*). [3]
OCps: Chloritic phyllite and slate containing variable amounts of laminated quartzite (*includes Albee Formation in Oxford County and unnamed units in Franklin and Somerset Counties*).
OCrg: Red and green slate in Oxford, Franklin, and Piscataquis Counties.
OCp: Slate and metasiltstone (*includes Aziscohos Formation and unnamed units in Oxford and Franklin Counties*).
OCr: Sulfidic slate in OCp in Oxford and Franklin Counties.

Cqs: Interbedded quartzite, metasiltstone, and slate, including red and green varieties (*includes Caldwell and Rosaire Groups adjacent to Quebec boundary in western Aroostook County, Grand Pitch Formation in northern Penobscot and southern Aroostook Counties, and unnamed formation with thin limestone beds in northern Piscataquis County*). [3]

SOUTHERN MAINE

Dl: Dark gray slate, schist, and gneiss, in part cyclically bedded (*Littleton Formation above the Boott Member in Oxford County, upper part of Rindgemere Formation in York County, and unnamed unit in Oxford and Franklin Counties*).
Dlr: Sulfidic schist, in part graphitic (*Towow Formation in York County, and unnamed units in Franklin County*).
Dlv: Amphibolite at the base of Dl in west-central Oxford County.

DSbr: Dark gray sulfidic phyllite, schist, and gneiss in Oxford, Franklin, and Somerset Counties.
DSb: Calc-silicate gneiss and granulite (*Boott Member and Howard Pond Member of the Littleton Formation in Oxford County, and unnamed unit in Franklin County*).

DSg: Gray biotite-muscovite gneiss and schist (*includes Shagg Pond Formation, Concord Pond Member of the Littleton Formation and unnamed units in Oxford and Franklin Counties; lower part of the Rindgemere Formation in York and southern Oxford Counties*).
DSrg: Sulfidic gneiss and schist (*includes Billings Hill and Thompson Mountain Formations, and Wilbur Mountain Member of the Littleton Formation in Oxford County, and unnamed units in Oxford, Franklin and York Counties*).
DSl: Calc-silicate gneiss and granulite with minor biotite gneiss and granulite in Oxford, Franklin, and York Counties.
DSsa: Silvery two-mica staurolite schist (*Genie Formation in southern York County*).
DSwb: Cyclically bedded schist and quartzite locally at the top of Dsg in Oxford County.

DSq: Calcareous metasedimentary rocks (*includes Vassalboro Formation in Kennebec, Waldo, Sagadahoc, and Penobscot Counties; Berwick Formation in Cumberland and York Counties; unnamed units in Lincoln, Knox, Waldo, and Hancock Counties; and unnamed unit in Oxford, Franklin, Somerset, and Piscataquis Counties*).
DSql: Calcareous metasiltstone and slate in Franklin, Somerset, and Piscataquis Counties.

Sa: Metamorphosed shale, siltstone, and minor sandstone (*includes Eliot Formation in York and Cumberland Counties; Waterville Formation in Kennebec and Androscoggin Counties; Noyes Mountain and Moody Brook Formations in Oxford and Androscoggin Counties; and unnamed units in Waldo, Knox, and Androscoggin Counties*).
Sal: Metamorphosed limestone and calcareous siltstone (*Patch Mountain and Berry Ledge Formations in Oxford and Androscoggin Counties, and unnamed members in Eliot and Waterville Formations*).

Scq: Metamorphosed calcareous sandstone, siltstone, and graywacke (*Kittery Formation in York County; unnamed units in Franklin, Androscoggin, Somerset, and Piscataquis Counties*).
Scql: Metamorphosed calcareous siltstone and limestone in Franklin, Kennebec, and Androscoggin Counties.

SOm: Metamorphosed quartz wacke, conglomerate, siltstone, and shale in Kennebec, Franklin, Androscoggin, and Somerset Counties.
SOml: Limestone or marble with thin slate or schist interbeds in SOm.
SOq: Calcareous quartzite with minor sulfidic quartzite and phyllite in Kennebec and Somerset Counties.
SOql: Limestone or marble with thin slate or schist interbeds in SOq.
SOrv: Metamorphosed felsic tuff with subordinate basic tuff (*metavolcanic member of the Rye Formation in the southern tip of York County*).

DSps: Phyllite and schist in large part sulfidic, with minor micaceous quartzite (*Jewell and Scarboro Formations of the Casco Bay Group in Cumberland and Sagadahoc Counties*).
DSlm: Limestone with slate or phyllite interbeds (*Spurwink Limestone of the Casco Bay Group in Cumberland County*).
DSsg: Metamorphosed mafic volcanic tuffs and flows with subordinate metasedimentary rocks (*Spring Point Greenstone of the Casco Bay Group in Cumberland, York, and Sagadahoc Counties*).
DSsq: Thinly interbedded phyllite or schist and quartzite, and two-mica gneiss (*Cape Elizabeth Formation of the Casco Bay Group in York and Cumberland Counties, Knox Gneiss in Waldo and Hancock Counties, and unnamed unit in Sagadahoc and Lincoln Counties*).
DSlg: Calc-silicate gneiss in Waldo and Hancock Counties.
DSss: Silvery muscovite-biotite schist at base of DSsq in Waldo, Hancock and Penobscot Counties.

DSv: Predominantly felsic metavolcanics and tuffaceous metasandstone, with subordinate amphibolite, lime-silicate gneiss, and biotite-sillimanite gneiss in Cumberland, Knox, Sagadahoc, Lincoln, Kennebec, and Waldo Counties.
DSvr: Sulfidic gneiss and schist in DSv in Cumberland, Lincoln, Sagadahoc, Kennebec, and Waldo Counties.

SOu: Undifferentiated metasedimentary rocks in Somerset, Franklin, Piscataquis, and Penobscot Counties.
SOl: Metamorphosed calcareous siltstone and limestone in Somerset and Franklin Counties.
SOqa: Unnamed quartzite in Franklin, Penobscot, and Piscataquis Counties.
SOr: Unnamed sulfidic metasedimentary rocks in southern Piscataquis and Penobscot Counties.

DSsh: Metamorphosed shale with subordinate sandstone and calcareous rocks in Franklin County.

DScs: Metamorphosed thin-bedded calcareous siltstone and sandstone overlain by thick-bedded calcareous sandstone in Franklin and Oxford Counties.

DScb: Metamorphosed cyclically bedded shale and sandstone in Franklin and Oxford Counties.

DSrp: Dark gray sulfidic phyllite, schist, and gneiss in Oxford and Franklin Counties.

DSp: Metamorphosed shale and sandstone with subordinate quartz-rich polymictic conglomerate, and quartz conglomerate in Franklin and Oxford Counties.
DScr: Metamorphosed sandstone and polymictic conglomerate in Franklin County.

SOgs: Undifferentiated metamorphosed graywacke, sandstone, siltstone, and shale, in part sulfidic, in part conglomeratic, in Franklin County.

Unnamed metasedimentary units in Franklin, Oxford, Somerset, and Piscataquis Counties.
DSsl: Mostly slate.
DSst: Mostly metasiltstone.
DSr: Mostly sulfidic metasiltstone and slate.
DSqu: Mostly quartzite and metagraywacke.
DSc: Mostly metaconglomerate and metasandstone.

EASTERN MAINE

Dp: Coarse red conglomerate and arkose with minor sandy shale (*Perry Formation in Washington County*).
Dpv: Basalt flows and breccia in the Perry Formation, Washington County.

Dev: Rhyolite and andesite flows and tuffs, (*includes Vinalhaven Rhyolite and Thorofare Andesite in Knox County*).

DSa: Interbedded metavolcanic and metasedimentary rocks (*Eastport and Pembroke Formations of Washington County*).
DSve: Undifferentiated volcanic rocks (*includes Castine Formation, Cranberry Island Series, and unnamed units in Hancock and Washington Counties*).
DSvg: Subaqueous slide conglomerate composed of volcanic debris in Washington County.

DSak: Siltstone (*Ames Knob Formation in Knox County*).

Slm: Rhyolite flows and tuff, basalt flows and tuff, with minor shale (*includes Dennys and Edmunds Formations and Quoddy Shale in Washington County*).

SOp: Undifferentiated metasedimentary rocks in Lincoln, Knox, Waldo, Hancock, and southern Penobscot Counties (*includes the Penobscot, Islesboro, and Calderwood Formations, and the Battie Quartzite*).
SOpl: Metamorphosed calcareous siltstone and limestone (*includes the Rockland Formation, Coombs Limestone, and unnamed units in Waldo and Knox Counties*).

Ovn: Metamorphosed basaltic and trachytic flows and tuffs (*North Haven Greenstone in Waldo, Knox, and Hancock Counties*).

Op: Dark gray phyllite and schist with minor quartzite and metabasalt flows and tuffs in Washington and Hancock Counties.

OCe: Muscovite - chlorite - epidote schist with interbedded amphibolite and quartzite (*Ellsworth Formation in Hancock and Washington Counties*).

[1] American standard section adopted from New York State Museum and Science Service, Geological Survey Map and Chart Series, Nos. 1-4: Correlation of the Cambrian, Ordovician, Silurian, and Devonian Rocks in New York State; Albany, New York, 1960-1964.

[2] Plants and spores from some rocks in Aroostook County assigned to Ds and Du suggest a Middle Devonian age (C. McGregor and J. Schopf). Brachiopods from these same units are dated as Early Devonian by A. J. Boucot. For purposes of this map, all these rocks are assigned an Early Devonian age.

[3] Modified after Béland, J. (1956 & 1957) from geology of the Eastern Townships, Quebec.

PRELIMINARY GEOLOGIC MAP
OF
MAINE

COMPILED AND EDITED UNDER THE DIRECTION OF
ROBERT G. DOYLE, *State Geologist*

by

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Gilbert H. Espenshade, coordinator U.S. Geological Survey contributions

MAINE GEOLOGICAL SURVEY
1967

SOURCES OF GEOLOGIC INFORMATION

(Geologic information on this map is based on mapping completed for the most part, prior to 1965.)

1. Neuman, R. B. (reconnaissance)
2. Pavlides, Louis (reconnaissance)
3. Mencher, Ely, and Roy, D. C. (reconnaissance)
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11. Hall, Bradford (detailed and reconnaissance)
12. Hansen, Henry W. A. III (reconnaissance)
13. Pavlides, Louis (detailed and reconnaissance)
14. Pavlides, Louis (detailed)
15. Rankin, Douglas (detailed and reconnaissance)
16. Rankin, Douglas (detailed)
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55. Borns, H. W. Jr. (reconnaissance and detailed)
56. Glidden, P. (reconnaissance and detailed)
57. Milton, Daniel (detailed)
58. Forsythe, W. (reconnaissance)
59. Pankiwskyj, K. W. (detailed)
60. Caldwell, D. W. (reconnaissance)
61. Trefethen, J. M. (detailed and reconnaissance)
62. Foss, T. (reconnaissance)
63. McGregor, J. D. (reconnaissance and detailed)
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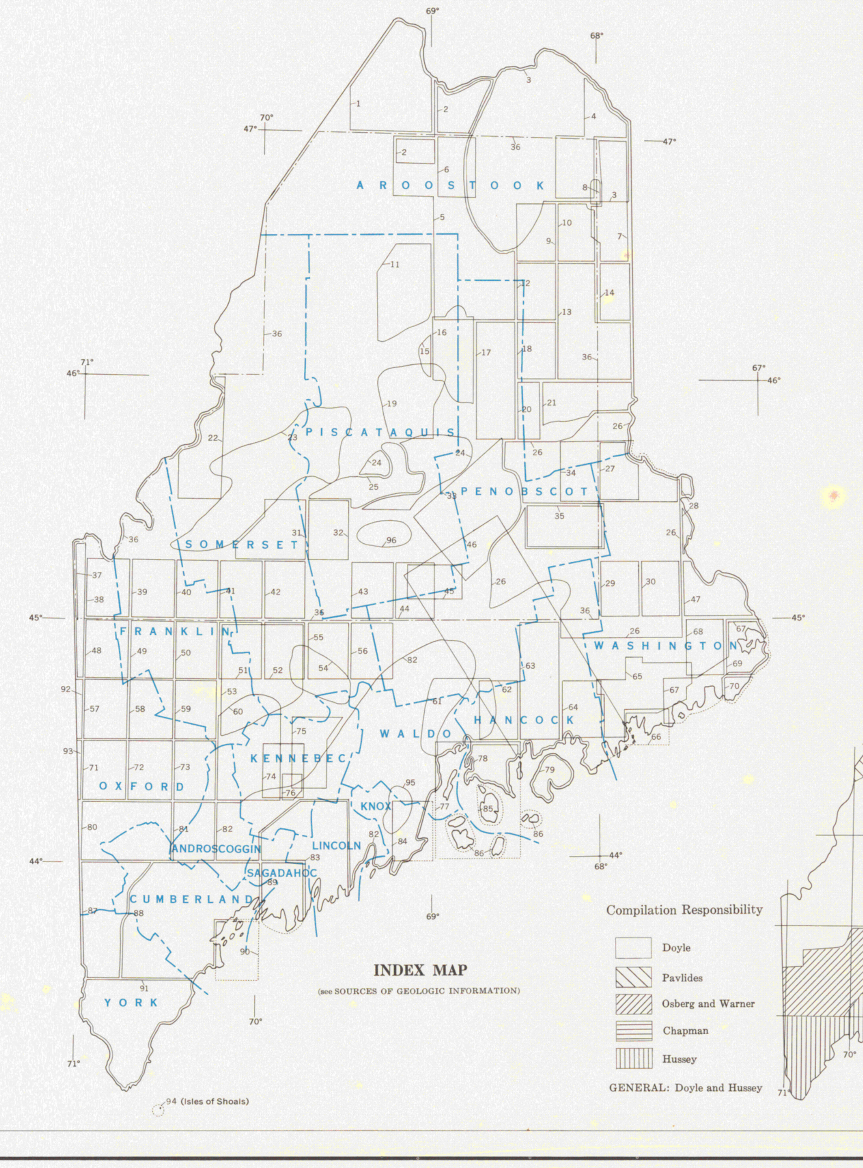

INDEX MAP
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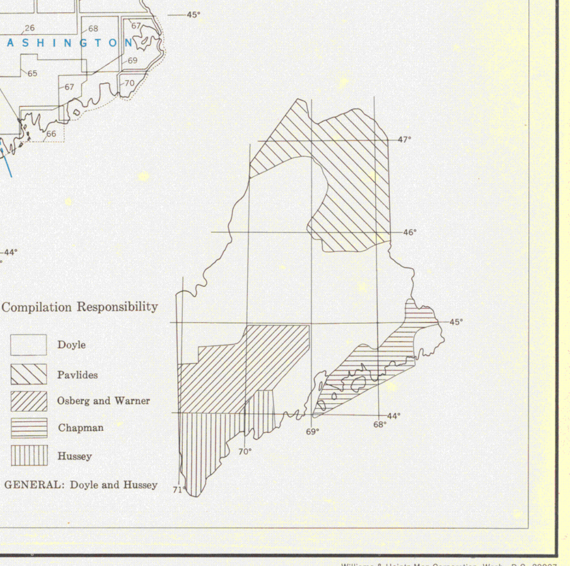

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