

EXPLANATION OF UNITS

INTRUSIVE ROCKS

Cretaceous-Jurassic (?)

- Kjd** **Diabase.** Large dike on Gerrish Island, mapped to scale. Numerous smaller dikes, some of which are shown by symbols, intrude all rock units.
- Kjeb** **Explosion breccia.** Angular, randomly oriented blocks up to about a meter across, with virtually no matrix between the blocks. Interpreted as explosion breccia which formed in a volcanic vent (Hussey, 1980). Blocks consist of strongly deformed and migmatitic schist and gneiss typical of the Rye Complex, and fragments of mafic and felsic dike rock. Exposed in two areas on Gerrish Island, Kittery. The northern area, north of Sisters Point, includes a 3-meter block of metasediment presumed to be of the Kittery Formation.

Carboniferous-Devonian (?)

- CDg** **Granite and pegmatite.** Biotite-muscovite granite and pegmatite.

METAMORPHOSED INTRUSIVE ROCKS

Devonian (?)

- Dmd** **Metadiorite.** Dark gray, medium-grained, foliated, gneissic metadiorite. Intrudes the Rye Complex.

STRATIFIED ROCKS

Silurian-Ordovician

- SOk** **Kittery Formation.** Variably thin-bedded to thick-bedded, buff-weathering feldspathic and calcareous metawacke. Characterized by well-developed primary sedimentary structures including graded bedding, channel cut-and-fill structure, small scale cross-bedding, flame structure, and flute casts.
- SOe** **Eliot Formation.** Generally thin-bedded, medium gray, calcareous and ankeritic quartz-biotite-chlorite phyllite and metasilstone, and dark gray biotite-chlorite-muscovite phyllite.

Ordovician-Precambrian

- OZr** **Rye Complex.** Heterogeneous unit of variably mylonitic and migmatitic poly metamorphic schists and gneisses. Includes quartz-plagioclase-biotite gneiss, calc-silicate gneiss and biotite gneiss, and quartz-biotite-muscovite-garnet-sillimanite ± staurolite ± andalusite schist and gneiss. These rocks are intruded by various amounts of granite, granodiorite, and pegmatite, generally in concordant or slightly cross-cutting thin sheets. In some places, igneous layers alternate with host gneisses to produce a well layered rock. All rock types are strongly deformed, to produce features such as foliation, porphyroclastic texture, augen gneiss, mylonite, and ultramylonite. Minor amounts of rusty-weathering, dark gray, sulfidic, graphitic schist and impure marble are present on the west shore of Gerrish Island (locality 5).
- OZra** **Amphibolite.** Dark gray amphibolite with calc-silicate laminae.

STRONGLY DEFORMED ROCKS

- um** **Ultramylonite.** Chalky weathering, dark brown, flinty-textured ultramylonite, locally with pseudotachylite veins. Thin, unmapped zones occur within the Rye Complex. Mappable zones occur within the Rye Complex, and along major faults. Ultramylonite along the Portsmouth fault zone has a transitional character attributed to a gradual change from Kittery Formation protolith to the north, to Rye Complex protolith to the south in the zone (Swanson and Carrigan, 1984). Ultramylonite along the Great Common fault zone (Southern Mylonite Zone of Hussey, 1980), involves several protoliths. To the north of this complicated structural zone, the Rye Complex is more migmatitic and at higher metamorphic grade than the Rye Complex to the south of the zone (Hussey and Bothner, 1993). Brittle features, including dextral strike-slip faults and pseudotachylite, of the Fort Foster Brittle Zone are superimposed on the ultramylonites (Swanson, 2006, 2007).

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GEOLOGIC TIME SCALE

Geologic Age	Absolute Age*	
Cenozoic Era	0-65	
Mesozoic Era	Cretaceous Period	65-142
	Jurassic Period	142-200
	Triassic Period	200-253
Paleozoic Era	Permian Period	253-300
	Carboniferous Period	300-360
	Devonian Period	360-418
	Silurian Period	418-443
	Ordovician Period	443-489
	Cambrian Period	489-542
Precambrian time	Older than 542	

* In millions of years before present. (Okulitch, A. V., 2004, Geological time chart, 2004: Geological Survey of Canada, Open File 3040 (National Earth Science Series, Geological Atlas)-REVISION.)

Bedrock Geology of the Kittery Quadrangle, Maine

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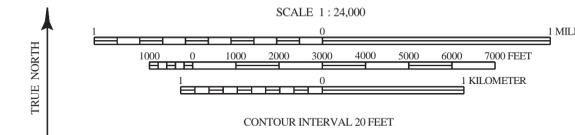
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SOURCES OF INFORMATION

Topographic base from U.S. Geological Survey Kittery, Maine-N.H., quadrangle, scale 1:24,000, using standard U.S. Geological Survey topographic map symbols.

Field work by A. M. Hussey II (1970-2003), and published mapping by Hussey (1980), Rickerich (1983), and Carrigan (1983).

The use of industry, firm, or local government names on this map is for location purposes only and does not impure responsibility for any present or potential effects on the natural resources.

EXPLANATION OF SYMBOLS

Note: Structural symbols are drawn parallel to strike or trend of measured structural feature. Barb or tick indicates direction of dip, if known. Annotation gives dip or plunge angle. For planar features, symbol is centered at observation point. For linear features, tail of symbol is at observation point. Multiple measurements at a site are represented by combined symbols.

- Outcrop of mapped unit (small exposure, large area of exposure)
- ↗ Bedding, tops unknown (inclined, vertical)
- ↗ Bedding, tops known (upright, vertical, overturned)
- ↗ Schistosity (inclined, vertical)
- ↗ Cleavage (inclined)
- ↗ Cleavage, younger than dominant foliation (inclined)
- ✕ Diabase or basalt dike, of Cretaceous-Jurassic(?) age (inclined, vertical, orientation unknown)
- ✕ Rhyolite dike, of Cretaceous-Jurassic(?) age (orientation unknown)
- ↗ Shear zone (inclined)
- ↗ Axis of minor fold (plunging)
- ④ **Notable locality.** 1 = metasediment, Kittery Formation (Stop 4 of Hussey and others, 1984); 2 = thick-bedded, massive metasediment, Kittery Formation (Stop 3 of Hussey and others, 1984); 3 = metasedimentary rocks with variable thickness and sedimentary structures, Kittery Formation (Stop 2 of Hussey and others, 1984); 4 = sheared rocks, Kittery Formation near the Portsmouth fault zone (Stop 6 of Swanson and Carrigan, 1984); 5 = graphitic-sulfidic schist, marble, and amphibolite, Rye Complex (Stop 7A of Swanson and Carrigan, 1984); 6 = brittle features in ultramylonite, Fort Foster Brittle Zone (Stop #2 of Swanson, 2007; Stop 13C of Hussey and Bothner, 1993); 7 = amphibolite with calc-silicate laminae (Stop 7C of Swanson and Carrigan, 1984; Stop 13B of Hussey and Bothner, 1993); 8 = many rock types including biotite gneiss and porphyroclastic augen gneiss, Rye Complex, intruded by dikes of basalt and hornblende lamprophyre (Stop 7F of Swanson and Carrigan, 1984).

EXPLANATION OF LINES

- Contact between rock units (well located, approximately located)
- Ductile fault (well located, approximately located)
- Shear zone