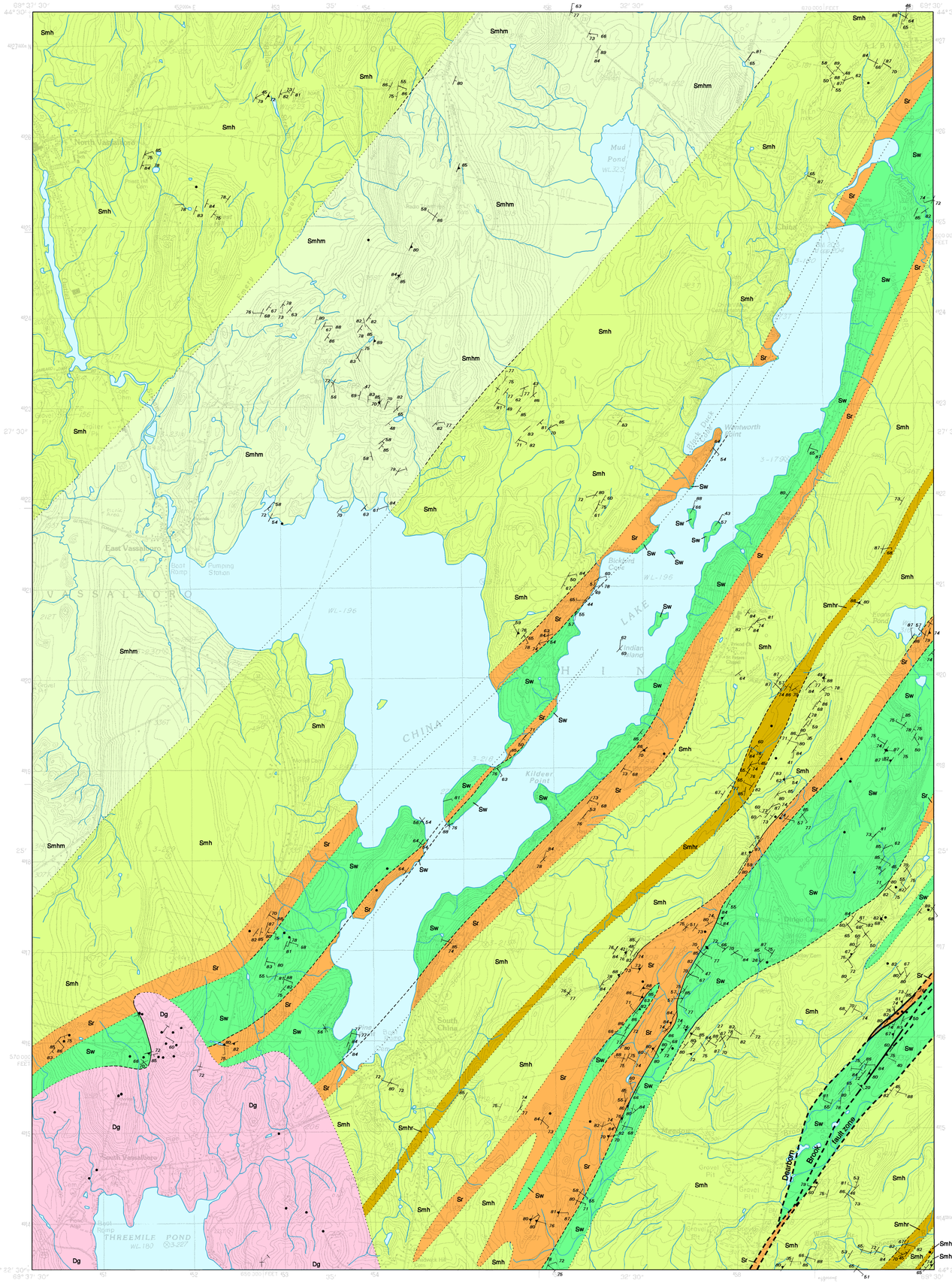

EXPLANATION OF UNITS

INTRUSIVE ROCKS

Devonian

Dg — **Threemile Pond pluton.** Light gray, fine-grained to coarse-grained biotite granodiorite to biotite granite. A U-Pb zircon age of 381 ± 1 Ma is reported by Tucker and others (2001). Several dikes 3 to 4 meters wide (not shown) of light gray, fine-grained biotite granodiorite like that of the Threemile Pond pluton are localized near the pluton in the vicinity of China Lake.

STRATIFIED ROCKS

Silurian

Smh — **Mayflower Hill Formation.** Thick bedded metasandstone to very fine-grained quartzo-feldspathic schist. Medium dark gray, dark gray and grayish black fine-grained to very fine-grained quartzo-feldspathic metawacke to fine-grained quartz-plagioclase-biotite granofels and very fine-grained quartz-plagioclase-biotite schist. The metasandstone beds range in thickness from 15 cm to approximately 1.5 m. Metasandstone beds may exhibit weak textural grading. No other relict sedimentary structures have been recognized in this unit southeast of China Lake. In the northwestern half of the quadrangle, parallel sedimentary laminations and rare load casts are present.

Metasandstones are interbedded with thin beds and laminae of phyllite and very fine-grained quartz-plagioclase-biotite schist. These metapelite beds are uncommon, but locally metapelite intervals may approach 30 cm in thickness.

Smhm — **Interbedded metasandstone and metapelite.** Metasandstones consist of medium to dark gray, very fine-grained to fine-grained moderately well to very well sorted quartzo-feldspathic metawacke and locally quartz-rich meta-arenite. Metasandstone beds are on average thinner than those in **Smh**. Metasandstone beds range in thickness from approximately 15 to 75 cm. Beds may be separated by metapelite beds ranging in thickness from 2 to 30 ± cm. Sandstone beds may also be stacked without interbedded metapelite. Sedimentary structures vary throughout the unit, but in general are much better developed than in the thickly bedded units. Graded beds are moderately common. Load structures and flame structures are observed locally. Parallel lamination is moderately common and ripple lamination is uncommon. The sedimentary structures and their sequences are all consistent with deposition from turbidity flows. Sedimentary structures are best preserved in the lower metamorphic zones located in the northern portion of the quadrangle.

Metapelites range from very fine-grained siltstone and claystone slate through phyllite to very fine-grained quartz-plagioclase-muscovite schist. The slates and phyllites exhibit minor rusty weathering along cleavage planes. Silt laminations within the finer-grained beds are uncommon. Metapelite beds are characteristically less than 30 cm, but sequences dominated by metapelite may be several meters thick.

Smhr — **Rusty-weathering schist and metasandstone.** Strongly rusty-weathering, dark gray, grayish black, and black very fine-grained to fine-grained quartz-plagioclase-muscovite-pyrite-pyrrhotite ± graphite granofels. Sillimanite is recognized very locally in outcrops near the southernmost edge of the quadrangle. Compositional layering is variable. Locally present are thin layers or beds of dark gray, grayish black or black fine-grained plagioclase quartzite or quartz-plagioclase-pyrite granofels. Mapping of structures demonstrates that the thin belt of this unit between South China and Evans Pond lies within a syncline and is stratigraphically above the adjacent metasandstones. However, it is lithologically identical to the rusty-weathering unit which is stratigraphically between the Waterville and Vassalboro Formations.

Sr — **Rusty-weathering granofels, schist and metasandstone.** Strongly rusty-weathering, dark gray, grayish black, and black, very fine-grained to fine-grained quartz-plagioclase-muscovite-pyrite-pyrrhotite ± graphite granofels. Sillimanite is recognized very locally in muscovite-richer outcrops near the southern edge of the quadrangle. Compositional layering is variable, and where present is commonly less than 20 cm. Locally present are thin layers or beds of dark gray, grayish black or black fine-grained plagioclase quartzite or quartz-plagioclase-pyrite granofels. This thin unit is a stratigraphic marker between the Waterville Formation and the overlying Mayflower Hill Formation. Thin beds of the same rock type are present within the uppermost portions of the Waterville Formation and the lowermost portion of the Mayflower Hill Formation, either as stratigraphic interfingering or as structural repetition near the contact.

Sw — **Waterville Formation.** Thinly bedded metapelite and metsandstone. Metapelite, depending upon degree of metamorphism, ranges from mildly rusty-weathering, fine-grained siltstone and claystone slate and phyllite in the northeast to medium-grained quartz-plagioclase-muscovite-biotite (± garnet ± andalusite ± staurolite ± sillimanite) schist in the south. Porphyroblasts of biotite are ubiquitous in the schists. Garnet is locally common, while andalusite and staurolite porphyroblasts and sillimanite grains are uncommon. Metasandstone beds range from moderately well sorted, fine-grained to very fine-grained, non-foliated quartz-plagioclase metawacke through fine-grained to very fine-grained quartz-plagioclase-biotite granofels and fine-grained to very fine-grained quartz-plagioclase-biotite schist. Metamorphic recrystallization of the metasandstones increases from northeast to southwest. Relict sedimentary structures are commonly absent. Interpreted relict sedimentary structures include graded intervals and parallel laminations. Bedding of both metasandstone and metapelite is thin. At the lower metamorphic zones, metasandstones may exhibit minor grading and parallel lamination, but overall relict sedimentary structures are not present or well preserved.

A thin belt of schist about 1.3 miles east of South China is surrounded by the rusty-weathering unit, **Sr**. This belt is interpreted to be Waterville Formation exposed in the core of an anticline. The rocks there consist of medium-grained quartz-plagioclase-muscovite-biotite-garnet-staurolite schist. Porphyroblasts of biotite and garnet are common, while small (less than 0.4 cm) staurolite porphyroblasts are uncommon.

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Funding for the preparation of this map was provided in part by the U.S. Geological Survey STATEMAP Program, Cooperative Agreement No. 07HQAG0079.

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Open-File No. 11-148
2011

SOURCES OF INFORMATION

Field work conducted by S. G. Pollock and W. Bowdoin, 2007, S. G. Pollock, 2011, and T. Grover and L. Fernandes, 2001-2002.

Topographic base from U.S. Geological Survey China Lake quadrangle, scale 1:24,000 using standard U.S. Geological Survey topographic map symbols.

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

EXPLANATION OF SYMBOLS

- **Outcrop, no structural information shown.** Symbols showing bedding, cleavage, and joint orientations also indicate bedrock outcrop locations.

20 — **Strike and dip of bedding, topping direction not determined.** Sedimentary younging direction is inconclusive or not determined. There is an absence of conclusively recognizable current-generated sedimentary structures or unequivocal textural grading. (Inclined, Vertical)

20 — **Strike and dip of slaty cleavage and/or very fine-grained schistosity.** Delineates a representative rock cleavage or foliation orientation for the outcrop shown. Most outcrops at lower metamorphic grade (i.e. chlorite and biotite zones) include fine-grained rocks such as slate or phyllite or very fine-grained biotite-quartz schist. In the upper portions of the biotite zone there is a transition between phyllite and schist. At garnet zone and above, the symbol represents a schistosity controlled by the orientation of muscovite and/or biotite. This symbol is also used for a planar structure in (calcareous) quartz-rich metasandstone. This occurs as a rock cleavage commonly resembling relict sedimentary lamination, which it is not, but is clearly a planar structure produced by the preferred orientation of very fine-grained phyllosilicate minerals. (Inclined, Vertical)

20 — **Strike and dip of joint set.** The most prominent or dominant joint set at the outcrop. (Inclined, Vertical)

Note on combined symbols:

For bedding and cleavage symbols, the center of the strike line is at the point of observation. For joints, the observation point is at the end of the strike line opposite the dip mark. Where two or three measurements were made at the same place, the symbols intersect accordingly.

EXPLANATION OF LINES

Stratigraphic contact between map units.
(Solid = well-located, Dashed = approximately located, Dotted = inferred)

Fault. Dashed where inferred.

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.)