GEOLOGIC MAP OF THE TALACHE QUADRANGLE, BONNER COUNTY, IDAHO

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2006

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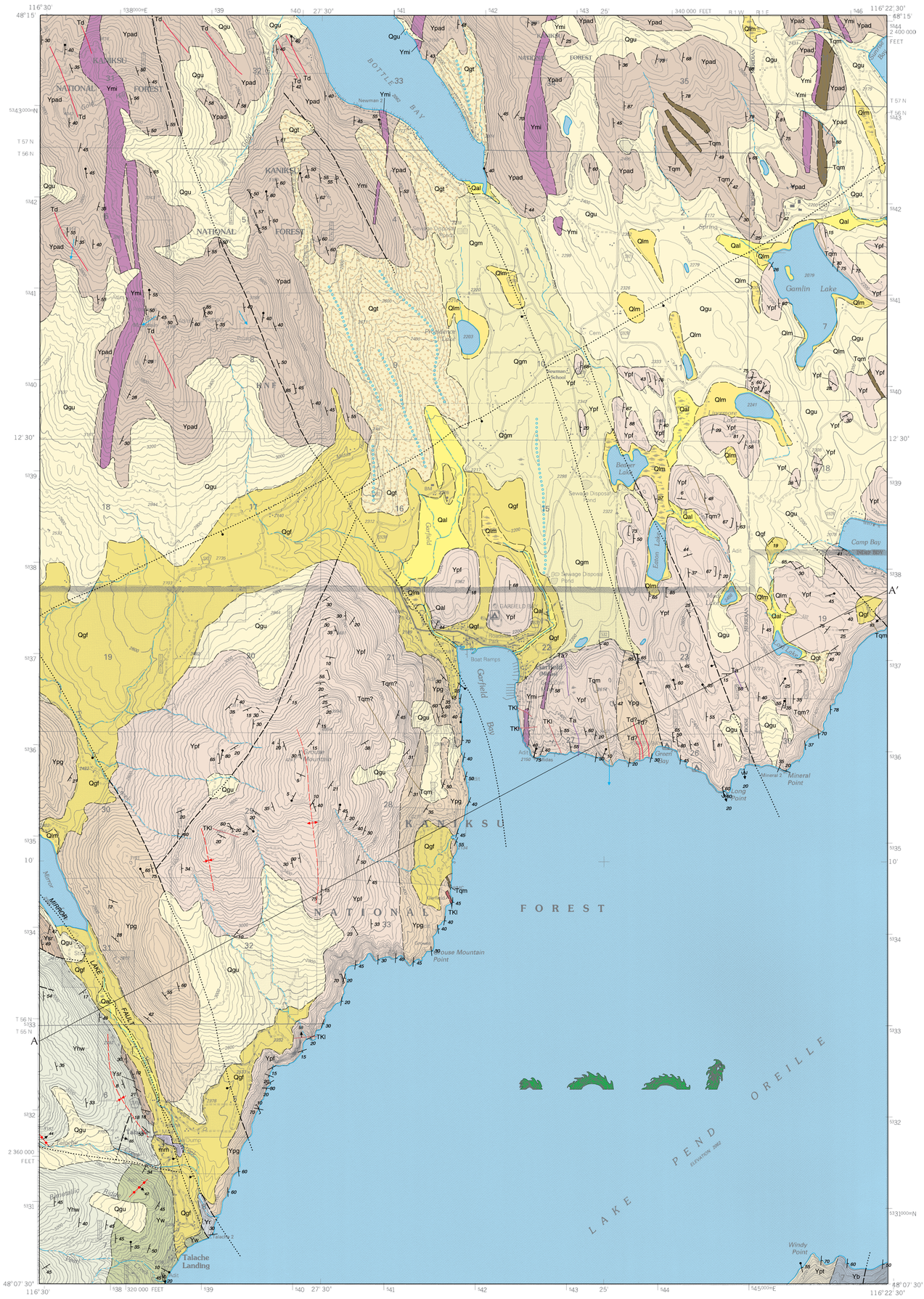


Base map scanned from USGS film-positive base, 1989.
Revised by US Forest Service 1996.
Topography compiled 1982. Planimetry derived from imagery taken 1992.
Public Land Survey System and survey control current as of 1996.
Transverse Mercator. 1927 North American Datum.
10,000-foot grid ticks based on Idaho coordinate system, west zone.
1000-meter Universal Transverse Mercator grid ticks, zone 11.

UTM Grid and 1996 Magnetic North Declination at Center of Map

SCALE 1:24,000

1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER

Contour interval 40 feet.

IDAHO
QUADRANGLE LOCATION

Field work conducted 1988-1989 and 2004-2005.

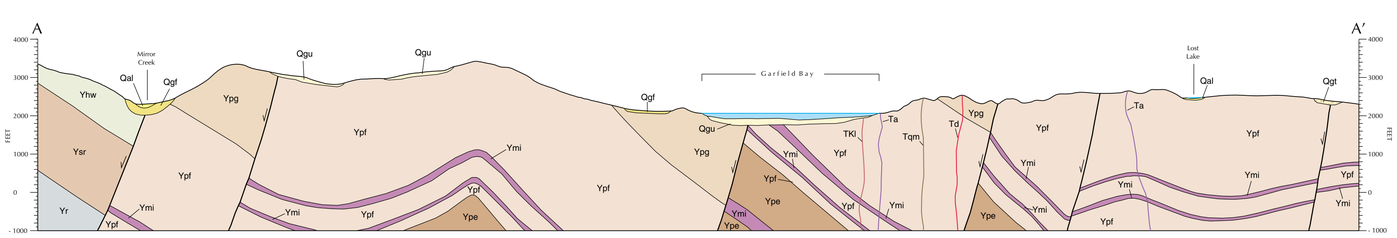
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.

Digital cartography by Jane S. Freed at the Idaho Geological Survey's Digital Mapping Lab.

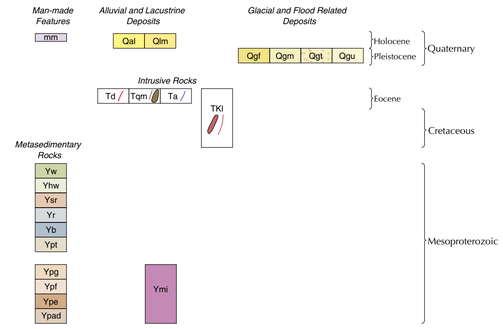
Note on printing: The map is reproduced at a high resolution of 600 dots per inch. The inks are resistant to run and fading but will deteriorate with long-term exposure to light.

PDF map (Acrobat Reader) may be viewed at www.idahogeology.org.

Map version 11-2-2006.



CORRELATION OF MAP UNITS



INTRODUCTION

Geology depicted on this 1:24,000-scale Talache quadrangle is based partly on previous 15' mapping by Harrison and Jobin (1965) and mapping in the Talache mine area by Green (1976). Quaternary deposits were mapped in 1988-1989 and 2004-2005 by R.M. Breckenridge. Bedrock was remapped during five weeks of field work in 2005 by R.F. Burmester, M.D. McFaddan, and R.S. Lewis, to apply some different unit definitions and contact placements for consistency with more current mapping. We also made additional subdivisions within the Prichard Formation based on recent Idaho Geological Survey mapping to the northeast in the Hope, Clark Fork, Scotchman and Trout Peak 7.5' quadrangles (Burmester and others, 2004 a-c; Lewis and others, 2006). See Harrison and Jobin (1963) for the history of naming Belt-Purcell Supergroup units in the area; departures from their naming scheme are explained below within descriptions of affected units.

The most abundant rocks in the Talache quadrangle are low metamorphic grade metasedimentary rocks of the Belt-Purcell Supergroup, Precambrian in age. Some igneous rocks also date from deposition of the Belt-Purcell Supergroup, but most hypabyssal rocks are Eocene in age. Sediments in the area date from Pleistocene glaciation and catastrophic floods from Glacial Lake Missoula, or are Recent.

The quadrangle is in the Talache Uplands geomorphic subdivision (Savage, 1967). During Pleistocene glaciation the uplands were repeatedly scoured by a lobe of the Cordilleran ice sheet that advanced southward along the Purcell Trench from Canada. Tributary valley glaciers from the Selkirk and Cabinet Ranges contributed to the ice stream that scoured the Pend Oreille Lake basin and blocked the Clark Fork valley forming Glacial Lake Missoula. Ice flowed across the Talache Uplands between Cocolalla Valley and the lake basin and mostly protected the glacial deposits from erosion by the Lake Missoula flood outbursts that mainly passed through the lake basin. The floods ended about 15,000 years ago with the retreat of the ice lobe. Late glacial lateral moraines mark the ice position along Gold Mountain, and ground moraine and small lakes occupy the valley between Bottle Bay and Garfield Bay. Post glacial Holocene alluvium and lacustrine sediments occupy the streams and ice depressions.

DESCRIPTION OF MAP UNITS

Intrusive rocks are classified according to IUGS nomenclature using normalized values of modal quartz (Q), alkali feldspar (A) and plagioclase (P) on a ternary diagram (Streckeisen, 1976). Mineral modifiers are listed in order of increasing abundance for igneous metamorphic rocks. Grain size classification of unconsolidated and consolidated sediment is based on the Wentworth scale (Lane, 1947). Bedding thicknesses and lamination type are after McKee and Weir (1963), and Winston (1986). Thicknesses and distances are given in abbreviation of metric units (e.g., dm=decimeter). Multiple lithologies within a rock unit description are listed in order of decreasing abundance. Soil series are from Weisel and others (1982).

MAN-MADE DEPOSITS

mm **Made land (historical)**—Mine dumps at the Talache mine.

ALLUVIAL AND LACUSTRINE DEPOSITS

Qal **Alluvium (Holocene)–**Varied silt, sand, and gravel deposits in modern stream drainages of Mirror, Garfield, and other creeks and small lakes. Moderately sorted to well-sorted silt, sand, and pebble and cobble gravels. Mostly reworked glacial deposits. Typical soils are silt loam to sandy and gravelly loam. Soil series of Hoodoo and Wrencoe. Thickness is up to several meters.

Qlm **Lake, pond and bog deposits (Holocene)–**Consists of soft clayey silt, mud, and peat; at depth is locally underlain by late glacial outwash or till. Interbedded volcanic ash from volcanoes in the Cascade Range is common. Soils include Pywell Muck, Cape Horn and Hoodoo series. Thickness 1-10 m.

GLACIAL AND FLOOD-RELATED DEPOSITS

Qgu **Glacial deposits, undivided (Pleistocene)–**Gravel, sand, and silt deposits of till and associated proglacial outwash and glacial sediments. Unstratified to poorly bedded, unsorted to moderately sorted. Mostly isolated remnants of till and kame terraces preserved on slopes along valley sides and in smaller tributaries. May include some interbedded lake sediments and outburst flood gravels from Glacial Lake Missoula. On steep unstable slopes may take the form of mass movement deposits. Soils mainly silt loam of the Pend Oreille series. Thickness varies from several to tens of meters.

Qgt **Till deposits (Pleistocene)–**Dense clayey pebble and cobble till with local boulders deposited by the Purcell Trench Lobe of the Cordilleran Ice sheet. Poorly stratified compact basal till includes ground moraine and some interbedded proglacial deposits. Forms lateral moraines on the east side of Gold Mountain. Soils include silt loams and gravelly silt loams of the Pend Oreille and Vay-Ardtoo series. Thickness varies; may exceed 50 m (160 feet).

Qgm **Deposits of ground moraine (Pleistocene)–**Silty to sandy boulder till of poorly stratified compact lodgment till includes ground moraine and some interbedded proglacial deposits. Present in most of the lowland between Bottle Bay and Garfield Bay. Forms drumlin-like features of molded till probably cored by bedrock. Soils include silt loams and gravelly silt loams of the Pend Oreille and Vay-Ardtoo series. Thickness varies; may exceed 50 m (160 feet).

Qgf **Glaciofluvial deposits (Pleistocene)–**Coarse silt, sand, and gravel deposits of glacial outwash. Mostly stratified sands and rounded gravels and occasional boulders. Often occurs in channels within and interbedded with till. Thickness a meter to over tens of meters.

INTRUSIVE ROCKS

Td **Dacite dikes (Eocene)–**Biotite dacite dikes, commonly porphyritic with blocky phenocrysts of feldspar up to 3 cm and biotite phenocrysts to 5 mm. Commonly light gray, resistant, and form cliffs and talus slopes. Dikes are a few meters wide; rarely 50. Some appear to continue for 100 to 1000 m but most are not exposed continuously enough to demonstrate their extent. Concentrated in the northwest part of the map area. Most may be related to the Wrencoe pluton to the northwest, in the northwestern part of the Sagle and southwestern part of the Sandpoint 7.5' quadrangles. A sample of the pluton from near Wrencoe (19 km west of Talache), was dated by U-Pb zircon at 50.1 ± 6.3 Ma (Whitehouse and others, 1992).

Ta **Andesite dikes (Eocene)–**Aphanitic with small hornblende and plagioclase phenocrysts. Small dikes east of Garfield Bay. May be related to *Tqm* dikes.

Tqm **Quartz monzonite dikes (Eocene or Cretaceous)—**Fine-grained equigranular quartz monzonite dikes. Some contain altered pyroxene(?) phenocrysts up to 4 mm long. All contain interstitial potassium feldspar, strongly zoned plagioclase, acicular hornblende phenocrysts to 5 mm length, and subordinate biotite. Notable for low quartz content (<10 percent). Typically altered, and possibly related to gold mineralization in the region. Similar to *Ta* except entirely phaneritic. Includes rocks mapped as Kd and Kgd by Harrison and Jobin (1965). Single stock of Kd mapped by Harrison and Jobin (1965) in the northeast corner of the map was re-interpreted as three large *Tqm* dikes based on the mode of occurrence of other rocks of this composition.

TKl **Lamprophyre dikes (Eocene or Cretaceous)–**Mafic dikes with biotite phenocrysts. Generally deeply weathered and poorly exposed so probably underrepresented on map.

Ymi **Mafic intrusive rocks, undivided (Mesoproterozoic)**–Medium-grained hornblende gabbro, biotite quartz diorite, biotite-hornblende quartz diorite and fine-grained diorite. Gabbro generally quartz-bearing. Quartz diorite that occurs as middle and upper parts of apparently differentiated mafic sills and as separate sills in the Trout Peak quadrangle to the east is rare here. All may exhibit some granophyric textures. Finer-grained varieties typically in thinner bodies. Probably all are Moyie Sills similar to the sills described by Bishop (1976) from about 60 km north. Most are quartz tholeiites or differentiates from tholeiitic magma intruded into the Prichard Formation. Intrusion of many sills was at shallow levels closely following sedimentation (Cressman, 1989; Sears and others, 1998). Age of sills in *Ype* is probably close to U-Pb dates on zircons from Plains, Montana, about 100 km southeast (1.47 Ga; Sears and others, 1998), or from near Kimberley, British Columbia about 160 km to the north (1.468 Ga; Anderson and Davis, 1995).

BELT-PURCELL SUPERGROUP

Yw **Wallace Formation (Mesoproterozoic)**–Pinch and swell couplets and couples of gray, tan-weathering calcitic to dolomitic, very fine-grained quartzite or siltite and black argillite, and lesser amounts of calcareous and non-calcareous white quartzite and dolomitic siltite. In the pinch and swell sediment type of Winston (1986), scours and loads of quartzite cut or deform subjacent black argillite. Black argillite caps commonly contain ptygmatically folded siltite- or quartzite-filled cracks that taper downward. On bedding plane surfaces, the cracks are generally discontinuous and sinuous, occurring as isolated parallel or three-pointed star "birdsfoot" cracks. Some dolomitic siltite to 30 cm has distinct "molar-tooth" structure in which non-resistant, irregular, vertical calcite ribbons have been removed by weathering. Deformed and poorly exposed in southwest corner of map area, but may contain stromatolites, green dolomitic siltite and argillite and white quartzite that are present in the Clark Fork quadrangle to the east (Burmester and others, 2004b). Top not exposed in area. Zircons from a tuff in the upper Helena about 170 km ENE yielded a U-Pb date of 1.454 Ga (Evans and others, 2000), which may be close to the age of the upper part of the Wallace here. Unit is upper part of the lower calcareous member (Wallace 1) of Harrison and Jobin (1963). Equivalent to the middle member of Wallace as mapped by Harrison and others (1986) and Lewis and others (2002).

Yhw **Helena Formation, western facies (Mesoproterozoic)**–Cyclic couplets and couples of white quartzite to tan-weathering dolomite or dolomitic siltite, with associated massive green siltite and thinly laminated wavy green siltite and argillite couplets containing various amounts of carbonate (dolomite) and calcitic pods. Present in southwestern part of map area and poorly exposed, but in the Clark Fork quadrangle lower part predominately thin, wavy laminae to couplets of green siltite and light green argillite (Burmester and others, 2004b). Upper part dominated by siliciclastic to carbonate cycles. White calcitic quartzite, commonly 10-20 cm in thick, is overlain by tan-weathering, green silty dolostone or dolomitic siltstone. Brown-weathering, gray, conchoidally-fracturing dolostone scattered throughout; gray limestone with characteristic vertical "molar-tooth" structures common. Oblong horizontal carbonate "pods" are common within the silty dolostone higher in unit. Upper contact placed at lowest concentration of pinch and swell couplets with black argillite tops. Thickness based on map pattern on the order of 900 m (3000 feet). Unit corresponds to the lower Helena Formation to the east (Harrison and others, 1992) but has lower carbonate content. Unit is lower part of the lower calcareous member (Wallace 1) of Harrison and Jobin (1963). Equivalent to lower member of Wallace as mapped by Harrison and others (1986) and Lewis and others (2002).

Ysr **St. Regis Formation (Mesoproterozoic)**–Vivid red to pale purple siltite, argillite and quartzite, and light green siltite and darker green argillite or dark green siltite and light green argillite couplets. Greens more common near top. Couplets typically uneven and mudcracked. Quartzite typically fine grained in very thin (2-5 cm) and rarer thin (10-20 cm) tabular beds with green argillite caps, similar to those of the Revett Formation. Only top exposed in map area.

Yr **Revett Formation (Mesoproterozoic)**–Resistant white quartzite with green siltite and argillite, commonly as mm to cm green argillite caps. Exposed in map area only as small fault slice northeast of Talache landing, but where better exposed in the Clark Fork quadrangle to the east most quartzite is feldspathic and in tabular beds (Burmester and others, 2004b). Quartzite is commonly of the discontinuous sediment type (Winston, 1986). Mudcracks and mudchips common in argillitic tops throughout.

Yb **Burke Formation (Mesoproterozoic)**–Small area on southeast side of Lake Pend Oreille mapped by Harrison and Jobin (1965) and described as principally dark gray siltite and gray-green silty argillite. The one exposure we visited contained interlayered cm-scale argillite and dm-scale green siltite along with dm-thick beds of greenish quartzite. Top not exposed in the quadrangle.

Prichard Formation (Mesoproterozoic)–White to gray siltite, white to gray to black argillite and white to gray fine feldspathic to coarser feldspar-poor quartzite. Siltite typically rusty weathering and planar laminated with black argillite tops, some with white argillite tops. Rusty nature comes from abundant sulfides, commonly pyrrhotite. Harrison and Jobin (1965) subdivided the Prichard Formation into three members and Cominco only subdivided the upper part. Unit designations *Ypa-Yph* for the Prichard Formation follow recent Idaho Geological Survey usage in the Trout Peak, (Lewis and others, 2006), Hope (Burmester and others, 2004a), Clark Fork (Burmester and others, 2004b) and Scotchman Peak (Burmester and others, 2004c) 7.5' quadrangles.

Ypt **Prichard Formation, transition member (Mesoproterozoic)**–Small area on southeast side of Lake Pend Oreille mapped as upper member of the Prichard Formation by Harrison and Jobin (1965) and described as layers of laminated black and white or pale green argillite alternating with siltite like that of the overlying Burke Formation. The one exposure we visited contained dm-scale gray siltite and microlaminated black and white argillite and siltite. Base not exposed in the quadrangle.

Ypg **Prichard Formation, member g (Mesoproterozoic)**–Gray to white feldspathic quartzite and dark gray argillite. Fine- to very fine-grained quartzite as decimeter, rarely thicker beds; rare medium size grains occur scattered in the finer-grained matrix low in some beds. Ripple cross lamination and rippled tops present though not abundant, as are load and scour features at bases of quartzite beds. Interlayered with platy, even parallel siltite as well as uneven couplets of light gray to white siltite and black argillite. Top placed below thick interval of flat laminated dark gray siltite and argillite. Thickness approximately 560 m (1850 feet) where both contacts are exposed in the Scotchman Peak quadrangle to the east-northeast (Burmester and others, 2004c).

Ypf **Prichard Formation, member f (Mesoproterozoic)**–Rusty weathering, even parallel laminated, gray siltite and dark gray argillite couplets, laminated light gray and dark gray siltite, and minor lighter quartzite. Lamination and parting typically cm scale, although intervals of mm laminated light gray siltite and dark gray to black argillite are common. Most lamination is planar, although mm to cm scours, cross-laminations, load features, and minor hummocks are present in the light siltite bases of wavy to irregular couplets scattered throughout. Minor, scattered dm very fine-grained quartzite beds tend to be light gray and may have scoured or loaded bases. Brown-weathering, non-resistant magnesium carbonate "pods" ranging from round to flattened shapes up to 10 cm in diameter occur throughout the unit, but are not abundant. Quartzite occurs above sills that are near base of *Ypf* in the Clark Fork quadrangle to the east (Burmester and others, 2004b). Rocks east of Garfield Bay assigned to this unit because of quartzite beds above a sill and generally planar nature of lamination in dominantly fine-grained rocks. Upper contact west of Garfield Bay placed below concentration of feldspathic quartzite beds of *Ypg*. Thickness unknown locally; but approximately 1200 m (4000 feet) to the east in the Clark Fork quadrangle.

Ype **Prichard Formation, member e (Mesoproterozoic)**–Only depicted in cross section. To the east in the Clark Fork quadrangle, unit consists of light gray to white weathering siltite and quartzite and darker argillite (Burmester and others, 2004b). Decimeter siltite dominates over highly feldspathic quartzite.

Ypad **Prichard Formation, members a, b, c and d (Mesoproterozoic)**–Rusty weathering, dark gray siltite and argillite couplets, siltite, and rare lighter quartzite. All members a through d to the northeast in the Trout Peak quadrangle contain mafic sills as do the rocks assigned to this unit. Couplets typically less than one cm thick and even parallel, although some zones have undulating or uneven bedding, cross lamination and soft sediment disruption. Argillite tops typically darker than siltite but locally are light weathering. Siltite layers are both cm- and dm-scale, typically dark gray, some weathering light gray. Some weathered surfaces of massive dm, rusty-weathering siltites reveal internal mm even laminations. Light gray to white weathering quartzite as isolated dm-scale beds and dm- to rare m-scale beds amalgamated up to several meters thick contain rare medium-grained quartz sand both as basal lags and "floating" grains in a fine-grained matrix. Both load features and scour surfaces on a cm scale are common at the bases of some quartzite beds. Cleavage moderately to poorly developed inconsistently across the area. Hosts Moyie sills that range from tabular with differentiated tops to irregular with no differentiation. Well but discontinuously exposed on steep slopes and ridge tops. Mapped where there were no clear indications that rocks belonged to units higher in the Prichard or where extent of exposures or fault blocks precluded such identification.

STRUCTURE

MIRROR LAKE FAULT

A significant fault zone in the southwestern part of the quadrangle places rocks of the Prichard Formation on the northeast against those of the Revett, St. Regis, Helena and Wallace formations on the southwest. We interpret this to be a southwest dipping normal fault with down-to-the-south motion. This configuration could easily account for the sliver of Revett Formation northeast of Talache Landing. Reverse-slip on a northeast dipping fault would produce the same map pattern but the dip would have to be very steep in order to strand Revett between the east-facing middle Belt rocks on the southwest and complexly folded and faulted middle Prichard rocks on the northeast.

OTHER NW STRIKING FAULTS

The wide expanse of mostly east-dipping Prichard Formation across most of the quadrangle suggests repetition by faulting. Faults are drawn where anomalous development of cleavage, abrupt change in attitude or closely spaced shears suggest concentration of deformation or juxtaposition of different structural blocks. Some are shown as down to the southwest normal faults because such would repeat the east-dipping section economically.

UNNAMED NE FAULT

Apparent lack of southward continuity of sill-bearing strata in the north with the rocks along the lake shore to the south, and absence of folding in the north comparable to that found on Grouse Mountain suggest that there is a fault under the Quaternary deposits in between. This is shown as a down-to-the-southeast normal fault because that would expose higher Prichard strata farther west on the south. Right-lateral strike slip would accomplish the same, and perhaps account for the Grouse Mountain folds if the southern block were buttressed against what is now the Mirror Lake fault. Both motions would accommodate westward-decreasing displacement on the Hope fault to the north. We show this fault terminating against the Mirror Lake fault in the adjacent Sagle quadrangle (Lewis and others, 2006).

MAP SYMBOLS

Contact: line showing the boundary between one map unit and another; dashed where approximate. The location accuracy of contact is 80 feet or more on the ground.

High-angle fault: ball and bar indicates downthrown side of a normal fault; dashed where approximately located; dotted where concealed; arrow indicates dip.

Crest of lateral or end moraine.

Glacial stria.

Fold axis.

Anticline.

Syncline.

14 Strike and dip of bedding.

55 Strike and dip of bedding, ball indicates bedding known to be upright.

40 Strike and dip of bedding that varies at outcrop scale.

19 Strike and dip of overturned bedding.

35 Strike and dip of cleavage.

S 43 Bearing and plunge of asymmetrical small fold showing counterclockwise rotation viewed down plunge.

75 Quartz vein: Arrow indicates dip.

2 50 Bearing and plunge of small fold axis.

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