Surficial Geologic Map of the Hayden Quadrangle, Kootenai County, Idaho

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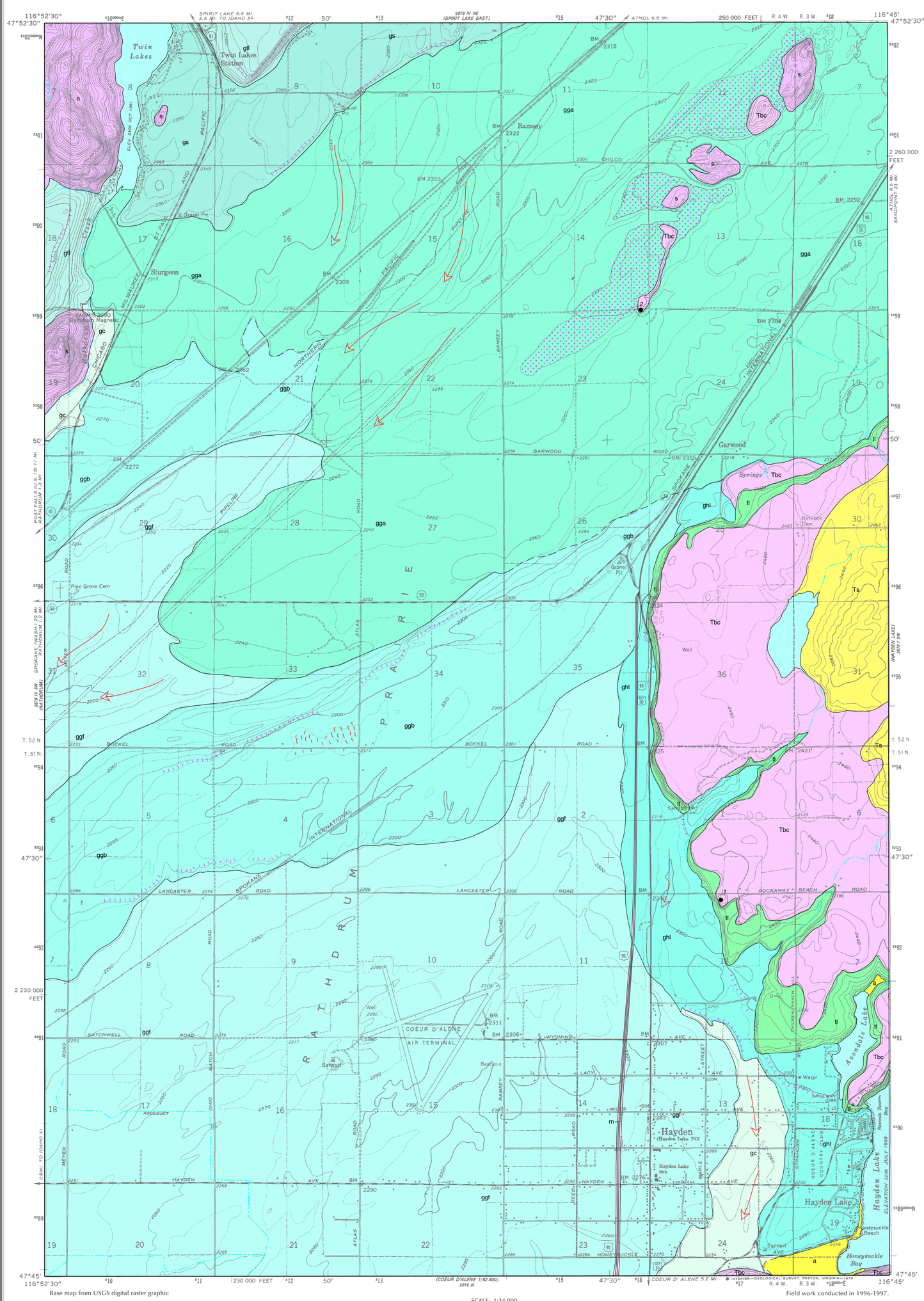
1999

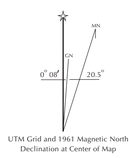


Base map from USGS digital raster graphic

Topography by photogrammetric methods from aerial photographs taken 1958 and planetable surveys 1961

Projection and 10,000-foot grid ticks: Idaho coordinate system, west zone (transverse Mercator)

1000-meter Universal Transverse Mercator grid, zone 11, 1927 North American Datum



UTM Grid and 1961 Magnetic North Declination at Center of Map

SCALE: 1:24,000

1 1/2 0 1 MILE

1 0.5 0 1 KILOMETER

Contour Interval 20 Feet

Dotted Lines Represent 10-Foot Contours

Quadrangle Location

Field work conducted in 1996-1997.

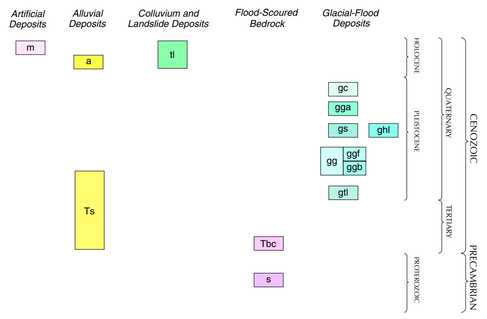
Field work and map preparation funded in part by the U.S. Geological Survey's STATEMAP program.

Reviewed by Wendy J. Gerstel, Washington State Division of Geology and Earth Resources.

Digital cartography by Jane S. Freed and Alan K. Schlerf.

Idaho Geological Survey Digital Mapping and GIS

CORRELATION OF MAP UNITS



INTRODUCTION

This map product addresses the increasing demand for geologic information in urban areas. The area covered by the map is experiencing the most rapid growth in Idaho. The geologic mapping was funded in part by STATEMAP, a national cooperative program of the U.S. Geological Survey with the state geological surveys.

The map represents the geology of the materials and soils exposed near the earth's surface. The thickness of these deposits varies from a few feet in the upland areas to hundreds of feet in the Rathdrum Valley. The map is useful for determining the type and characteristics of the geologic materials found at the surface and in the shallow subsurface by agricultural activities, building excavations, construction material excavations, ditches, and well holes. The information can be used by government, industry, and the public for planning, development, and resource characterization. The map provides new information about the Rathdrum Aquifer, the sole source water supply for over 400,000 people in Idaho and Washington. The map can be used as a guide for site locations but is not intended as a substitute for a detailed, site-specific geotechnical evaluation. This is particularly true in the more urbanized areas where access and exposures are limited and human activity has concealed the geology.

Most users of geologic maps are familiar with traditional lithologic descriptions of bedrock units. Surficial maps show units with more diverse characteristics than rock type or lithology. Most surficial deposits are geologically young, Quaternary in age, and unconsolidated. The Quaternary units are subdivided on the basis of their physical characteristics and the boundaries between them (allostratigraphy). In many places, the boundaries between these units are manifested by morphologic features.

DESCRIPTION OF MAP UNITS

ARTIFICIAL DEPOSITS

m **Made ground (historical)**—Manmade deposits include disturbed, transported, and emplaced construction materials derived from various local sources. Includes the following areas and activities: land along U.S. 95 and major interchanges where earthmoving has changed the landscape morphology; and industrial sites along the waterfront and beachfront that have been bermed or filled. Many smaller areas of made ground are common in urban sites but are not mapped.

ALLUVIAL DEPOSITS

a **Alluvium and lacustrine sediments** (Holocene)–Silt and sand deposits in Honeysuckle Bay and the outlet of Hayden Lake. The deposits are located within the high-water zone of Hayden Lake.

Ts **Relict alluvium** (Tertiary)—Cobbly and pebbly sands derived from Precambrian Belt Supergroup rocks and Mesozoic-Tertiary intrusives. Matrix of weathered saprolite and clay (plinthite) paleosols of the Mokins series (Weisel, 1981). Exposed on a flat upland surface that is about 2,450 feet in elevation underlain by Priest Rapids Basalt. The deposits are probably graded to the blockages caused by the Miocene plateau basalts. The unit is finer grained but equivalent to the Tertiary gravels, *Tg*, mapped on the Coeur d'Alene quadrangle to the south. Generally the deposit is thin, 1 to 5 feet.

COLLUVIUM AND LANDSLIDE DEPOSITS

tl **Talus and landslide deposits of Columbia River Basalt Group** (Holocene and late Pleistocene)—Poorly sorted and poorly stratified angular cobbles and boulders mixed with silts and clays. Mass-movement slope deposits mainly associated with basalt rimrock and the interbedded sediments. Gradations from talus to landslide deposits are present and difficult to distinguish. Thickness as much as 40 feet.

GLACIAL FLOOD AND PERIGLACIAL DEPOSITS

Gravels of Rathdrum Prairie

The gravel deposits are the result of repeated catastrophic flood releases from Pleistocene glacial Lake Missoula that persisted until about 12,000 years ago. Hayden is about 20 miles downstream from the Pleistocene Clark Fork ice dam and 15 miles from the end of Lake Pend Oreille where most of the flood waters were channeled. Within the Rathdrum Prairie the proximal deposits consist mostly of boulder gravels with interbedded sands emplaced by high flow regimes. Crude bedding and clast-supported boxwork textures are common. Early geologists in the region interpreted the valley gravels as glacial deposits. The actual limits of the Pleistocene advances of the Purcell Trench lobe are unknown due to catastrophic floods sweeping the area. Today's understanding of the repeated ice dam failures has led most researchers to consider the gravels as flood, not glacial, in origin. Tributary valleys along the sides of the Rathdrum Prairie are filled with more finely bedded flood deposits of sand and gravel. Early geologic reports attributed the tributary valley fills and associated lakes to damming by lateral moraines or kame terraces. We now know they are giant eddy bars. These gravels are irregularly mantled with loess, volcanic ash, and a component of silt from glacial Lake Missoula. They are also sporadically cemented with calcium carbonate in varying stages of development from only rinds on the bottom of clasts to a nearly complete filling of the pore space (Breckenridge and others, 1997b).

gc **Channel gravels undivided** (Pleistocene)—Latest Wisconsin flood and outwash gravels and sands deposited in channelways cut into high energy fans and bar features. Moderately sorted and stratified from lower flow regimes. The channels are commonly developed at the margin of the prairie because the larger boulders armor the center of the flood path. Locally includes angular basalt columns derived from the basalt rimrock. Surface soils are gravelly loam of the Kootenai series (Weisel, 1981). Thickness 10 to 40 feet.

gga **Gravel of Garwood** (Pleistocene)—Poorly sorted sandy gravel deposited in a large fan formed downstream from the flood outlet of Lake Pend Oreille. Lobate in form at the southwest margin. Represents one of the last recognizable flood events. Surface soils are gravelly silt loam of the Kootenai series and silt loams of the Bonner series (Weisel, 1981). Thickness 10 to 50 feet.

gs **Gravel of Scarcello Road** (Pleistocene)—Mixed deposits of poorly to moderately sorted, stratified cobbly sands and sandy gravels carried by outburst floods. Forms a well-developed terrace at about 2,360 feet in elevation. Surface soils are gravelly silt loam of the Kootenai series (Weisel, 1981). Thickness 20 to 80 feet.

ghl **Gravel of Hayden Lake** (Pleistocene)–Coarse, poorly sorted gravel forms a terrace at about 2,300 feet along the eastern margin of Rathdrum Prairie. Characteristically contains columns of basalt eroded from the nearby rimrock and large clasts of clay from the Latah Formation. Surface soils are fine, gravelly silt loam of the Avonville series and gravelly silty loam of the Kootenai series (Weisel, 1981). Thickness 40 to 50 feet.

Gravel of Green Ferry (Pleistocene)—Coarse flood gravels. Consists of an extensive sheet of flood deposits in the quadrangle. Characterized by poor sorting and variation in bedding. Probably represents the last episode of major flood events. Thickness in excess of 100 feet.

ggf **Gravel of Green Ferry fan facies** (Pleistocene)—Poorly sorted, sandy flood gravels with channel cut and fill structures. Formed by large coalescing fan complex characterized by scour and fill features and concentrations of lag boulders. Margins characterized by numerous lobe forms. Dissected by waning phases of flooding and smaller, later flood events. Surface soils are fine, gravelly silt loam of the Avonville series (Weisel, 1981). Thickness 10 to 80 feet.

ggb **Gravel of Green Ferry bar facies** (Pleistocene)—Bouldery channel bar facies of flood gravels. Coarse and poorly sorted imbricated gravels, with large-scale foreset bedding. Forms a large channel bar with well-developed current ripples at the surface. Surface soils are coarse, gravelly silt loams of the Avonville series (Weisel, 1981). Thickness up to 30 feet.

gtl **Gravel of Twin Lakes** (Pleistocene)—Coarse, stratified sandy gravel forms the highest preserved remnant flood terrace in the quadrangle at about 2,500 feet in elevation. Forms a large pendant bar in the lee of Round Mountain, a bedrock knob just north of the map. Represents the earliest of the flood deposits recognized in the area. Surface soils are gravelly silt loam of the Kootenai series (Weisel, 1981). Thickness up to 80 feet.

FLOOD-SCOURED BEDROCK

Tbc **Basalt scoured by Missoula Floods** (Miocene)—Columbia River Basalt Group. Forms sporadic rimrock along the margins of Rathdrum Prairie. Mostly eroded by Pleistocene glaciation and repeated Missoula Floods. May be present in the subsurface of Rathdrum Prairie (Breckenridge and others, 1997a). The Priest Rapids Basalt and Grande Ronde Basalt are recognized in the area. The chemical type and paleomagnetic polarity of basalt samples are listed in the table. Shallow surface soils are stoney loam and sandy loam of the McGuire series, and Lacey-Bobbitt association. Locally scattered flood erratics are common. Surface thickness variable, 2 to 15 feet.

s **Precambrian metamorphic rocks of the Belt Supergroup and gneiss and granite scoured by Missoula Floods** (Precambrian)—Mapped by Griggs (1973).

SYMBOLS

Contact: dashed where approximately located.

Abandoned channels of Lake Missoula Floods drainageways; generally erosional pathways during waning flows.

Giant current ripple field; rolling topography from ground level. Crests visible from the air and on aerial photographs.

Slope face of gravel flood bar or erosional scarp.

Stippled areas represent depositional surfaces of remnant flood bars.

2 Location of basalt sample (see table).

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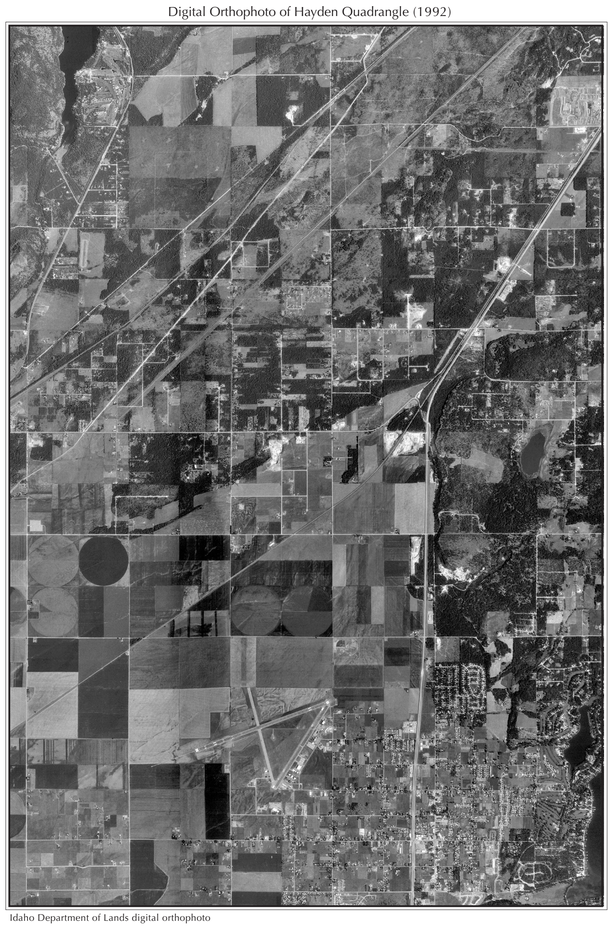
Basalt Analyses

Sample	Location Latitude	Location Longitude	Chemical Type	Magnetic Polarity
1	47°47'14"	116°46'33"	PR	R
2	47°50'45"	116°47'11"	GR	N

PR = Priest Rapids Basalt; GR = Grande Ronde Basalt; R = reversed polarity; N = normal polarity

Digital Orthophoto of Hayden Quadrangle (1992)



Idaho Department of Lands digital orthophoto

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