DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Base from U.S. Geological Survey, 1968

SCALE 1:24000

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

Geology mapped in 1976. Faults from M. R. Mudge, U.S. Geological Survey, unpub. data.

PRELIMINARY MAP SHOWING SURFICIAL DEPOSITS IN THE SOUTH HALF OF THE COOPERS LAKE QUADRANGLE, POWELL COUNTY, MONTANA

By
Irving J. Witkind

1977

CORRELATION OF MAP UNITS

Qal, Qf, Qe	Holocene	QUATERNARY
Qay, Qoy, Qty	Pleistocene	QUATERNARY
UNCONFORMITY		
Tm	Miocene(?)	TERTIARY
UNCONFORMITY		
pCb		PRECAMBRIAN

Introduction

U.S. Geological Survey personnel, in conjunction with Mark Weber, Geologic Consultant to Missoula and Powell Counties, are studying the water and earth resources of an area that extends from the Big Fork quadrangle on the north to the Avon quadrangle on the south (see index map). This map represents a product of that study, and is intended for the use of environmental and land-use planners. Maps of quadrangles, or parts of quadrangles, south of Highway 200 have been prepared by Weber.

The distribution of the alluvium was plotted in the office from aerial photographs. The areal distribution of all other geologic units was determined in the field.

Surficial deposits

Surficial deposits in the northern part of the Big Fork-Avon area were formed primarily during the latter stages of the last ice age--the Pinedale glaciation of the Pleistocene. Glacial deposits mantle the lower flanks of the mountains and form the valley floors; they have been dissected somewhat by streams, but most still appear much as when they were formed.

For ease of discussion, and to avoid the complexities of glacial nomenclature, these deposits have been grouped into two categories, older and younger. The "older" deposits were likely formed during early or middle Pinedale time, and the "younger" deposits during late Pinedale time. In some localities deposits of more than one ice advance may have been included in one or the other category.

No "older" deposits are in this quadrangle; all glacial deposits mapped were formed during the younger glaciation. These "younger" deposits are identified on the map by the letter "y" added to the symbol: thus "Qay" is "outwash of younger glaciation."

DESCRIPTION OF MAP UNITS

Qal ALLUVIUM (HOLOCENE)--Stream-deposited, unconsolidated silt, sand, and gravel. Forms the floor of the North Fork Blackfoot River. Locally includes small deposits of colluvium and other mass-wasting debris. Overlies and masks outwash sand and gravel deposited by meltwaters of wasting ice

Qf ALLUVIAL FAN (HOLOCENE)--Broad, fan-shaped, gently sloping, even-surfaced deposit of moderately well sorted silt, sand, and gravel

Qe EARTHFLOW (HOLOCENE AND PLEISTOCENE)--Lobate, hummocky deposit of partly consolidated, unsorted gravel, cobbles, and boulders in silty to clayey matrix

PINEDALE GLACIATION (PLEISTOCENE)

Qoy Outwash of younger glaciation--The outwash that floors Kleinschmidt Flat has formed an unusually even surface disrupted in places by a few shallow depressions and by sparse scattered ice-rafted boulders. Outwash is light gray, unconsolidated, and consists of well-bedded and well-sorted silt, sand, gravel, and cobbles with a few interspersed small boulders 25-26 cm (10-14 in.) in diameter. The clasts range in shape from subangular to well rounded; most are well rounded. In general, the average size of the material varies throughout the deposit. Near the margins of the map units the materials are smaller and better sorted than near the apex of deposit at the mouth of the valley of the North Fork Blackfoot River. About 75 percent of the unit is composed of clasts that range in size from about 5 mm to about 76 mm (1/4-3 in) in diameter; about 24 percent consists of fine to coarse sand with included small pebbles as much as 5 mm; and the remaining 1 percent is fine silt and clay. Near the northeast corner of Kleinschmidt Flat the outwash is well bedded, fine to very coarse sand with interspersed thin gravel layers. The sand is dark gray, unconsolidated, and consists chiefly of dark-blue angular to rounded grains of limestone. Gravel lenses are 1-2 m (3-7 ft) thick and as much as 6 m (20 ft) long; the lenses consist chiefly of subrounded to well-rounded limestone and argillite clasts that range from 6 to 20 cm (1/4-3/4 in.) in diameter. A few boulders 0.5-1 m (2-3 ft) in diameter are scattered through the sand. About 80 percent of the clasts in the outwash are green and gray argillite and dark-blue limestone; about 20 percent are sandstone, and about 20 percent are purple argillite. Gray diorite fragments are common. A few subrounded to rounded boulders 1-2 m (4-8 ft) in diameter are scattered on the surface.
The outwash was deposited by meltwaters that flowed southward in the valleys of North Fork Blackfoot River and McDermott Creek from a wasting piedmont glacier

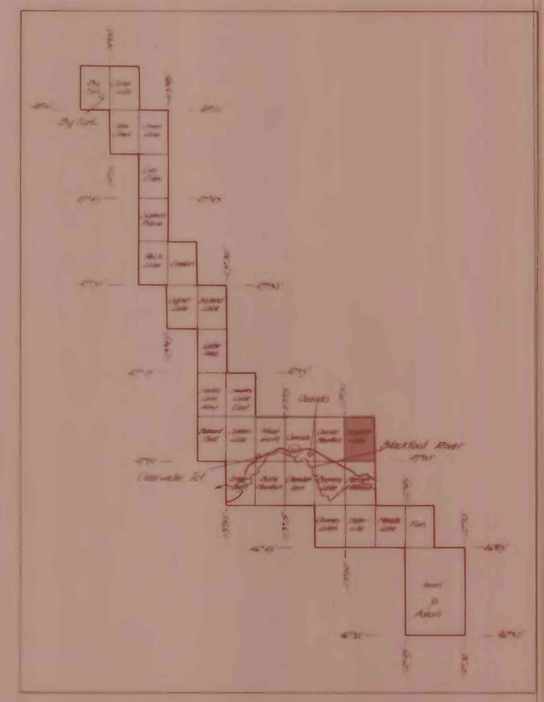
Qty Till of younger glaciation--Characterized by a striking knob-and-kettle topography, and by many small kettle lakes and swamps. Consists of a heterogeneous, partly consolidated mixture of unsorted gravel, cobbles, and boulders in a light- to dark-brown sandy to silty matrix. Clasts range in shape from subangular to rounded; most are subrounded. Sizes range from 0.3 to 4 m (1 ft/8-12 in.); a few subrounded boulders 0.5-1 m (2-3 ft) are scattered through the till. About 50 percent of the clasts in the till are green and gray argillite and dark-blue limestone; about 20 percent are sandstone; about 20 percent are purple argillite; and about 10 percent are diorite fragments and other materials. A few large boulders 2-2.5 m (6-8 ft) are scattered through the till and on the surface

Tm MIOCENE (?) ROCKS--Tan, even- and thin-bedded siltstone and claystone; breaks into angular, tabular fragments; locally contains many plant and insect remains. Commonly wholly or partly concealed beneath till and (or) colluvium. Weathers to form moderate slopes

pCb BEDROCK OF BELT SUPERGROUP, UNDIVIDED (PRECAMBRIAN)--Consists of several units of the Belt Supergroup, chiefly the Empire (argillite and siltite), Helena (limestone and dolomite), Shepard (argillite and dolomite), and Mount Shields (argillite and sandstone) Formations. These are bright units in varying shades of red, purple, green, tan, and gray

——— CONTACT--Approximately located or inferred. In many places wholly or partly concealed by debris or dense foliage

——U/D···· FAULT--Dashed where approximately located or inferred; dotted where concealed. U, upthrown side; D, downthrown side



Index map showing quadrangles in the Big Fork-Avon area. The Coopers Lake quadrangle is shaded. Preliminary surficial geologic maps of the following quadrangles, by I. J. Witkind, are available as U.S. Geological Survey Open-File Reports from the following offices:

Denver Public Inquiries Office
U.S. Geological Survey
1012, Federal Building
1961 Stout Street, Denver, CO 80202

Salt Lake City Public Inquiries Office
U.S. Geological Survey
8105, Federal Office Building
125 South State Street
Salt Lake City, UT 84111

Spokane Public Inquiries Office
U.S. Geological Survey
678, U.S. Courthouse Building
West 920 Riverside Avenue
Spokane, WA 99201

1.	Coopers Lake	77-466
2.	Cygnet Lake	77-198
3.	Holland Lake (W. Half)	77-199
4.	Lake Inez	77-200
5.	Ovando (N. half)	77-196
6.	Ovando Mountain	77-465
7.	Salmon Lake	77-197
8.	Seeley Lake East	77-202
9.	Seeley Lake West	77-201
10.	Woodworth	77-203