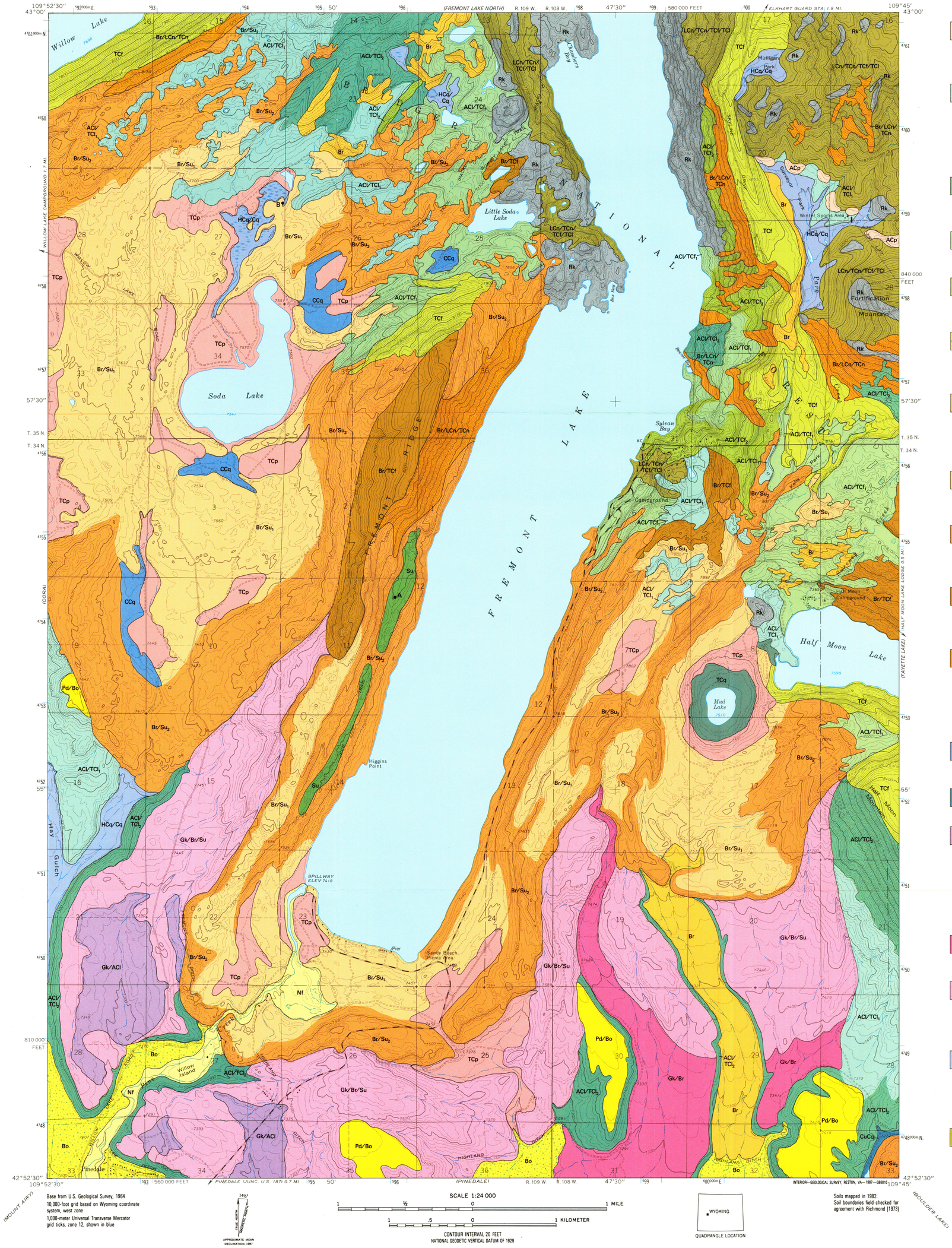
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I–1800



Base from U.S. Geological Survey, 1964
10,000-foot grid based on Wyoming coordinate system, west zone
1,000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

APPROXIMATE MEAN DECLINATION, 1987

SCALE 1:24 000
1 MILE
1 KILOMETER
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

Soils mapped in 1982.
Soil boundaries field checked for agreement with Richmond (1973)

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.—1987—G86010

DESCRIPTION OF MAPPED SOIL UNITS

ACp — **Alfic Cryochrept (0–20 percent slopes)**—Formed in old till, probably of pre-Bull Lake age, and commonly buried. Exposed in roadcuts along Skyline Drive and in small isolated bodies north and east of Surveyor Park. In a typical profile, A horizon is very dark gray silt loam, 2 in. thick. B horizons are dark-reddish-brown and yellowish-red sandy loam, 20 in. thick. Parent material is light olive brown with reddish-yellow mottles, and consists of gravelly sand several feet thick

ACl/TCl$_1$ — **Argic Cryoboroll-Typic Cryoboroll complex (0–20 percent slopes)**—Formed in till of Pinedale age and in materials weathered from conglomerate of Miocene(?) age. Both parent materials occur widely throughout quadrangle and produce similar soils. In a typical Argic Cryoboroll profile, A horizon is very dark grayish brown gravelly sandy loam, 6 in. thick. B horizon is dark-brown and light-olive-brown sandy clay, 10 in. thick. Parent material is gray bouldery, gravelly sand several feet thick. In areas of aspen, a similar soil with an O horizon of black, partially decomposed organic matter 1–2 in. thick is included in the complex. Typic Cryoborolls are similar to Argic Cryoborolls except for lack of an argillic horizon

ACl/TCl$_2$ — **Argic Cryoboroll-Typic Cryoboroll complex (20–60 percent slopes)**—Formed in till of Pinedale age underlying steep forested moraine slopes, in till of Bull Lake age underlying steep slopes along outer margins of moraines that are covered by sage and grasses, and in conglomerate of probable Miocene age with a cover of sage and grasses. Typical profile is described in unit ACl/TCl$_1$

ACl/TCf$_1$ — **Argic Cryoboroll-Typic Cryoboralf complex (0–20 percent slopes)**—Formed in till of Pinedale age under deciduous and coniferous vegetation and confined to the northern half of quadrangle. Soils do not correspond to a specific topographic position. Typical Argic Cryoboroll profile described in unit ACl/TCl$_1$ and typical Typic Cryoboralf described in unit TCf

ACl/TCf$_2$ — **Argic Cryoboroll-Typic Cryoboralf complex (20–60 percent slopes)**—Formed in till of Pinedale age on north- and west-facing slopes. Vegetative cover is mixed deciduous and coniferous forest; soils are eroded in areas where vegetation has been disturbed. Typical Argic Cryoboroll profile described in unit ACl/TCl$_1$ and typical Typic Cryoboralf profile described in unit TCf

Bo — **Boulder gravelly sandy loam (Argiudic Cryoboroll) (0–20 percent slopes)**—Formed in alluvial-terrace deposits of Holocene and Pinedale age. Developed along Pine Creek and in outwash deposits along the southern margin of quadrangle. In a typical profile, A horizon is very dark gray to gray fine sandy loam, 10 in. thick. B horizon is light-gray fine sandy loam, 6 in. thick. Parent material is light-gray extremely gravelly loamy sand several feet thick

Br — **Burnt Lake stony sandy loam (Typic Cryoboroll) (0–40 percent slopes)**—Formed in till and outwash of Pinedale and Bull Lake age. Present on a variety of geomorphic surfaces, supports a variety of vegetative communities, and is the most prevalent soil in quadrangle. Individual occurrences tend to be small and intermixed with other soils; therefore this unit is typically mapped with other soils in a soil complex. In a typical profile, A horizon is very dark grayish brown and grayish-brown stony or gravelly sandy loam, less than 16 in. thick. Parent material is light-yellowish-brown stony sandy loam several feet thick

Br/Su$_1$ — **Burnt Lake-Sublette complex (Typic Cryoboroll-Argic Pachic Cryoboroll) (0–20 percent slopes)**—Formed in till, loess, and colluvium on the gentle slopes of moraines and depressions in moraines of Pinedale and Bull Lake age. Highly variable topography makes delineation of individual soils difficult; widespread on Pinedale moraines. Typical Burnt Lake soil is described in unit Br; a typical Sublette soil is described in unit Su

Br/Su$_2$ — **Burnt Lake-Sublette complex (Typic Cryoboroll-Argic Pachic Cryoboroll) (20–60 percent slopes)**—Formed in till, loess, and colluvium on the steep slopes of moraines and depressions in moraines of Pinedale and Bull Lake age. Occurs in arcuate patterns that correspond with end and lateral moraines adjacent to Fremont, Half Moon, and Soda Lakes. Typical Burnt Lake soil is described in unit Br, and a typical Sublette soil is described in unit Su

Br/TCf — **Burnt Lake (Typic Cryoboroll)-Typic Cryoboralf complex (0–40 percent slopes)**—Formed in till. North end of Fremont Ridge is characterized by well-developed Cryoboralfs formed in till of Bull Lake age; currently support sage and grasses. North of Little Soda Lake and Half Moon Lake formed in deposits of Pinedale age; currently support forest cover. Typical Burnt Lake soil is described in unit Br, and typical Typic Cryoboralf is described in unit TCf

Br/LCn/TCn — **Burnt Lake (Typic Cryoboroll)-Lithic Cryorthent-Typic Cryorthent complex (40–90 percent slopes)**—Found on extremely steep slopes in thin tills of both Bull Lake and Pinedale age and in debris weathered from granitic bedrock. Most common in forested northeastern part of quadrangle. Typical Burnt Lake soil is described in unit Br. Typical Lithic Cryorthent has an A horizon that is very dark brown and dark-brown sandy loam, 3 in. thick. Parent materials are dark-yellowish-brown gravelly and stony sand, about 15 in. thick, over gray granite bedrock. Typic Cryorthents are like Lithic Cryorthents except that parent material is thicker in the former

CCq — **Calcic Cryaquoll (0–5 percent slopes)**—Occur in depressions in the area northeast and south of Soda Lake. In a typical profile, A horizon is very dark gray to dark-brown calcareous clay loam, 8 in. thick. Parent material is dark-brown and light-olive-brown calcareous gravelly clayey sand, 16 in. thick, over sandy gravel

CuCq — **Cumulic Cryaquoll (0–5 percent slopes)**—Formed in alluvium of Holocene age along a minor drainage way in the extreme southeastern part of quadrangle. In a typical profile, A horizon is very dark grayish brown clay loam, 36 in. thick. Parent material is bluish-gray sandy clay, 2 ft or more thick

Gk/ACl — **Gelkie (Argic Cryoboroll)-Argic Cryoboroll complex (0–20 percent slopes)**—Formed in till of Bull Lake age and in colluvium derived from that till in the southwestern corner of quadrangle. Confined to those portions of Bull Lake moraines that are irrigated. In a typical profile, A horizon of the Gelkie soil is dark-brown gravelly sandy loam, 8 in. thick. B horizon is brown sandy clay loam, 16 in. thick. Parent material is dark-grayish-brown and grayish-brown calcareous gravelly sandy clay till, several feet thick. A horizon of Argic Cryoboroll is dark-brown gravelly sandy loam, 10 in. thick. B horizon is brown gravelly sandy clay loam, 20 in. thick. Parent materials consist of layers of brown and light-olive-brown gravelly sands that overlie calcareous, olive, gravelly, sandy clay, several feet thick

Gk/Br — **Gelkie-Burnt Lake complex (Argic Cryoboroll-Typic Cryoboroll) (0–6 percent slopes)**—Formed in outwash of Bull Lake age in the southeast corner of quadrangle. Confined to high, nearly level outwash terraces that can be traced to Bull Lake moraines. Typical Gelkie and Burnt Lake soils are described in units Gk/ACl and Br, respectively

Gk/Br/Su — **Gelkie-Burnt Lake-Sublette complex (Argic Cryoboroll-Typic Cryoboroll, Argic Pachic Cryoboroll) (0–20 percent slopes)**—Formed in till of Bull Lake age in the southern part of quadrangle. Gelkie soils are widespread. Burnt Lake soils are confined to steep, exposed and (or) eroded slopes and moraine crests. Sublette soils are found on southeast-facing slopes and in depressions. Typical Gelkie and Burnt Lake soils are described in units Gk/ACl and Br, respectively. A typical Sublette soil is described in unit Su

HCq/Cq — **Histic Cryaquoll-Cryaquoll complex (0–5 percent slopes)**—Formed in topographic lows where the water table is high and supports a wetland vegetation of grasses and sedges. Occur sporadically throughout quadrangle, although the largest bodies are in Hay Gulch and Surveyor Park. In a typical Histic Cryaquoll profile, the O horizon is black to dark-brown peat, 4 in. thick. B horizon is dark-olive silty clay, 3 ft thick. Parent material is bluish-gray sandy silty clay several feet thick. Cryaquolls are similar to the Histic Cryaquolls, except former lacks a surface peat layer

LCn/TCn/TCf/TCl — **Lithic Cryorthent-Typic Cryorthent-Typic Cryoboralf-Typic Cryoboroll complex (0–40 percent slopes)**—Formed in thin colluvium and thin tills of both Bull Lake and Pinedale age over bedrock. Located in the northeastern corner of quadrangle east and west of Fremont Lake. In a typical Lithic Cryorthent profile, A horizon is very dark gray and dark-grayish-brown sandy loam, 3 in. thick. Parent material is dark-yellowish-brown gravelly sand, about 8 in. thick; overlies bedrock. Typical Typic Cryorthent profile is similar to Lithic Cryorthent except that the former is thicker, generally greater than 20 in. thick over bedrock. Typical Typic Cryoboralf and typical Typic Cryoboroll are described in units TCf and ACl/TCl, respectively

Nf — **New Fork gravelly loam (Typic Cryaquoll) (0–5 percent slopes)**—Formed in alluvium of Holocene age along Pine Creek. In a typical profile, A horizon is very dark brown gravelly loam, 8 in. thick. B horizon is dark-grayish-brown fine sandy loam, 8 in. thick. Parent material is brown sandy gravel with yellowish-brown mottles, several feet thick

Pd/Bo — **Pinedale-Boulder complex (Argiudic Cryoboroll-Argiudic Cryoboroll) (0-5 percent slopes)**—Formed in alluvium of pre-Bull Lake age on high terraces mostly in the southern part of quadrangle. In a typical Pinedale profile, A horizon is dark-brown gravelly sandy loam, 6 in. thick. B horizon is brown gravelly sandy clay loam, 16 in. thick. Parent material is yellowish-brown, calcareous, very gravelly sand, several feet thick. Typical Boulder soil is described in unit Bo

Su — **Sublette sandy loam (Argic Pachic Cryoboroll) (0–20 percent slopes)**—Formed in eolian silt and colluvium that overlie till of Pinedale age on lower slopes of moraines and in depressions throughout quadrangle. Few areas are large enough to map separately; those mapped are in swales between high steeply sloping lateral moraines on the west side of Fremont Lake. In a typical profile, A horizon is very dark brown sandy loam, 10 in. thick. B horizon is dark-grayish-brown and dark-brown sandy loam, 20 in. thick. Parent material is grayish-brown sandy loam, 2 ft or more thick

TCq — **Typic Cryaquoll (0–20 percent slopes)**—Formed in lacustrine sediments of Pinedale and probable Holocene age adjacent to Halls Lake. In a typical profile, A horizon is very dark brown silt loam, 4 in. thick. B horizon is black and dark-gray silty clay, 21 in. thick. Parent material is olive-gray clayey silt with yellowish-gray mottles, several feet thick. Lake varves, preserved beneath the soil, have been recovered from cores that penetrated 28 ft beneath the surface

TCf — **Typic Cryoboralf (0–30 percent slopes)**—Formed under coniferous vegetation in tills of Pinedale and Bull Lake age. Occur on the steeply sloping flanks of Pinedale moraines in the northwest part and on till of Bull Lake age in the northeast part of quadrangle. In a typical profile, the O horizon is black partially decomposed organic litter, 2 in. thick, E horizon is grayish-brown gravelly sand, 1–2 in. thick, and B horizon is dark-brown sandy loam, 10–12 in. thick. Parent material is dark-brown and brown bouldery sandy loam several feet thick

TCp — **Typic Cryochrept (0–20 percent slopes)**—Formed in sandy to gravelly outwash and ice-contact deposits of Pinedale age. Soils occur throughout quadrangle, but are most common beneath sage in the area adjacent to Soda Lake. In a typical profile, A horizon is dark-brown gravelly sandy loam, 8 in. thick. Parent materials are brown and yellow beds of sand and gravel several feet thick

Rk — **Rock outcrop**—Bedrock in which surface slope varies from gentle to steep. Largest areas of exposed bedrock are adjacent to Fremont Lake at the northern end of quadrangle

Contact—Approximately located. Changes in pattern between units not marked by a contact, but shown by scratch boundary, indicate soils are virtually indistinguishable although they were mapped on surfaces with distinct differences in slope

•A **Radiocarbon date sample locality**

DISCUSSION

As in most mountainous regions, where detailed soil mapping has not been done beyond the margin of irrigable land, no comprehensive large-scale soil maps exist for the glacial deposits on the west side of the Wind River Range. Because of the ever-increasing utilization of land, even in sparsely populated regions of the mountainous Western United States, there is a need for soils data, such as are available for Teton County, Wyoming (Young and others, 1982).

This map of the soils in the Fremont Lake South quadrangle, Wyo., was prepared in part to examine the relationship between soils and parent materials. The Fremont Lake South quadrangle was chosen for soil mapping because it contains a variety of deposits of piedmont glaciers, includes the type locality for Pinedale Till, and because a map showing the distribution, age, and description of the tills and other deposits already existed (Richmond, 1973). The map was prepared as part of an experiment to see if detailed geologic maps might aid in the determination of soil boundaries and allow soil mappers to work more quickly in areas where geologic mapping has been done.

Terminology and symbols used on this soil map were selected in accordance with the standards of the U.S. Soil Conservation Service, as set forth by the Soil Survey Staff (1975). The map units include some soil series that have been established by the U.S. Soil Conservation Service, as well as some family units; family units are more general than series units and may include one or more soil series names, as well as series that are as yet unnamed.

The soils in the Fremont Lake South quadrangle were developed mainly in till and in sediments reworked from till of Pinedale, Bull Lake, and earlier ages. In addition, a small proportion of the soils was developed in residuum or in colluvium derived from locally exposed bedrock.

Two radiocarbon dates of soils were recently collected in the quadrangle. The first sample was collected beneath loess and colluvium in a depression between moraines west of Fremont Lake in the NE1/4NE1/4 sec. 11, T. 34 N., R. 109 W. (loc. A). This sample (loc. A) was dated as 6070±100 years B.P. (S.I. 5699) which represents the mean residence time for organic carbon at the base of the A horizon, buried 80–84 in. beneath the surface, in a paleosol. The paleosol appears to represent the onset of a middle Holocene soil-forming interval. The second sample collected from the base of a peat soil, 44 in. thick, located north of Soda Lake in the NE1/4NE1/4 sec. 27, T. 35 N., R. 109 W. (loc. B) was dated as 9305±75 years B.P. (S.I. 5700). The peat formed on glacial outwash in a large, partly filled depression and represents the onset of organic accumulation following a late recessional readvance at the locality. These two dates provide some indication of the ages of many of the younger soils in the quadrangle, and together with field evidence, suggest that erosion from the moraine slopes and sediment accumulation in swales and depressions was common throughout the quadrangle during the middle Holocene.

A boulder conglomerate, formerly considered to be of Pliocene age (Richmond, 1973) is here stated to be of probable Miocene age, as suggested by Richmond (1983), owing to a change in the position and age of the boundary between the Miocene and Pliocene adopted by the U.S. Geological Survey on the basis of papers given at an International Geological Congress Symposium on late Neogene Epoch boundaries (Saito and Burckle, 1975).

Shroba (1977) and Mahaney (1978) contributed the initial soils data which allowed comparison of the morphology and chemical composition of soils on surfaces of differing ages in the quadrangle. However, a systematic mapping effort is needed to help determine whether or not consistently recurring interrelationships among soils and glacial geology can be identified for the map area.

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SOILS MAP OF THE FREMONT LAKE SOUTH QUADRANGLE, SUBLETTE COUNTY, WYOMING

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