

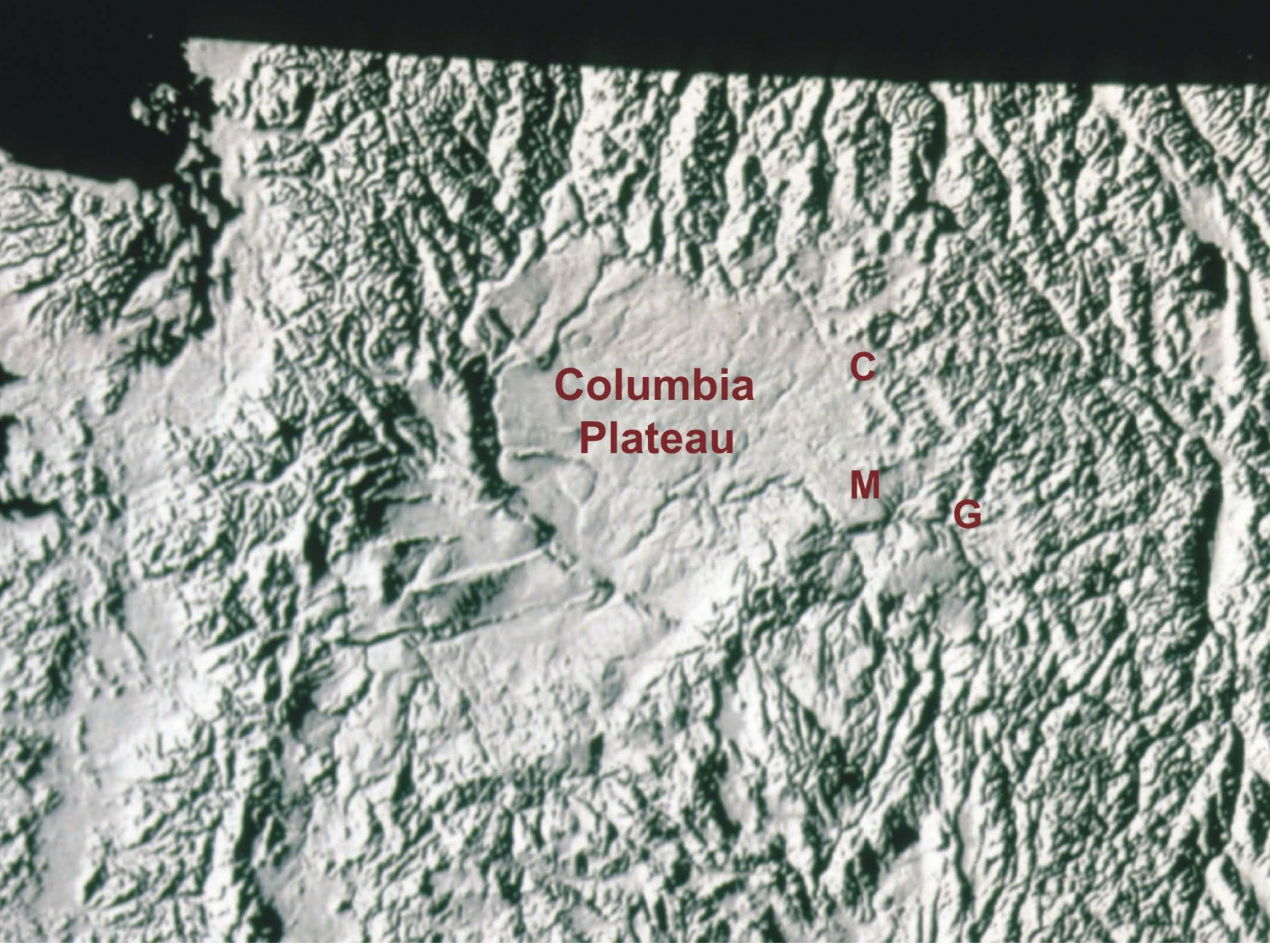
# Deeply Weathered Rock and Ancient Soils in North Idaho

The ground between soil surveys  
and the geology of rocks.

**Kurt Othberg**  
**Idaho Geological Survey**  
**University of Idaho**

# Summary

- **Deeply weathered sediments and rocks, plinthite paleosols, and kaolinitic clays are found in remnants of an ancient landscape bordering the eastern edge of the Columbia Plateau.**
- **Columbia River Basalt flows disrupted ancestral stream drainages, which, in response, deposited sediments that record evidence for the environmental conditions that existed at the time.**
- **The paleosols formed under a soil-forming environment that contrasts with the northwest's current climate, but is similar to that of the southeastern USA today. This interpretation is supported by the Clarkia fossil flora found in the region.**
- **Stable landforms surfaces of the basalt flows and the old rocks of the Northern Rocky Mountains show the deep weathering effects of the ancient warm-wet climate. Geologists call these non-transported deposits "saprolites."**
- **The 14.5 m.y. radiometric date of the Priest Rapids basalt provides an approximate age for the fossil flora, plinthite paleosol, and the time of warm/wet climate conditions in this region.**
- **Surficial geologic maps show and describe these ancient sediments, saprolites, and soils.**

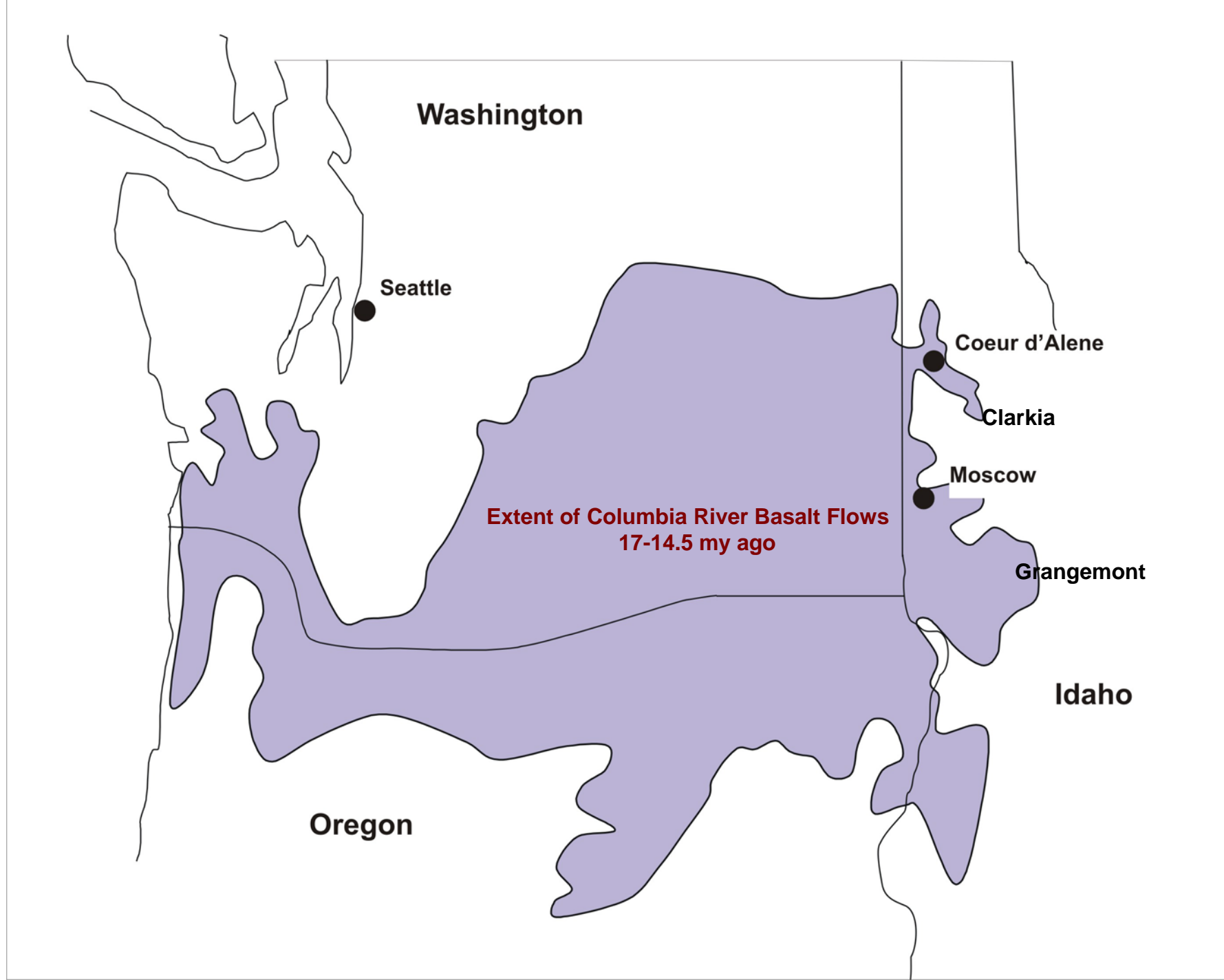


**Columbia  
Plateau**

**C**

**M**

**G**



**Leaf fossils from  
Clarkia lake sediments**



## Examples of Clarkia Fossil Flora

(approx. 15 my ago)

**Avocado**

**Bald Cypress**

**Birch**

**Chestnut**

**Magnolia**

**Maple**

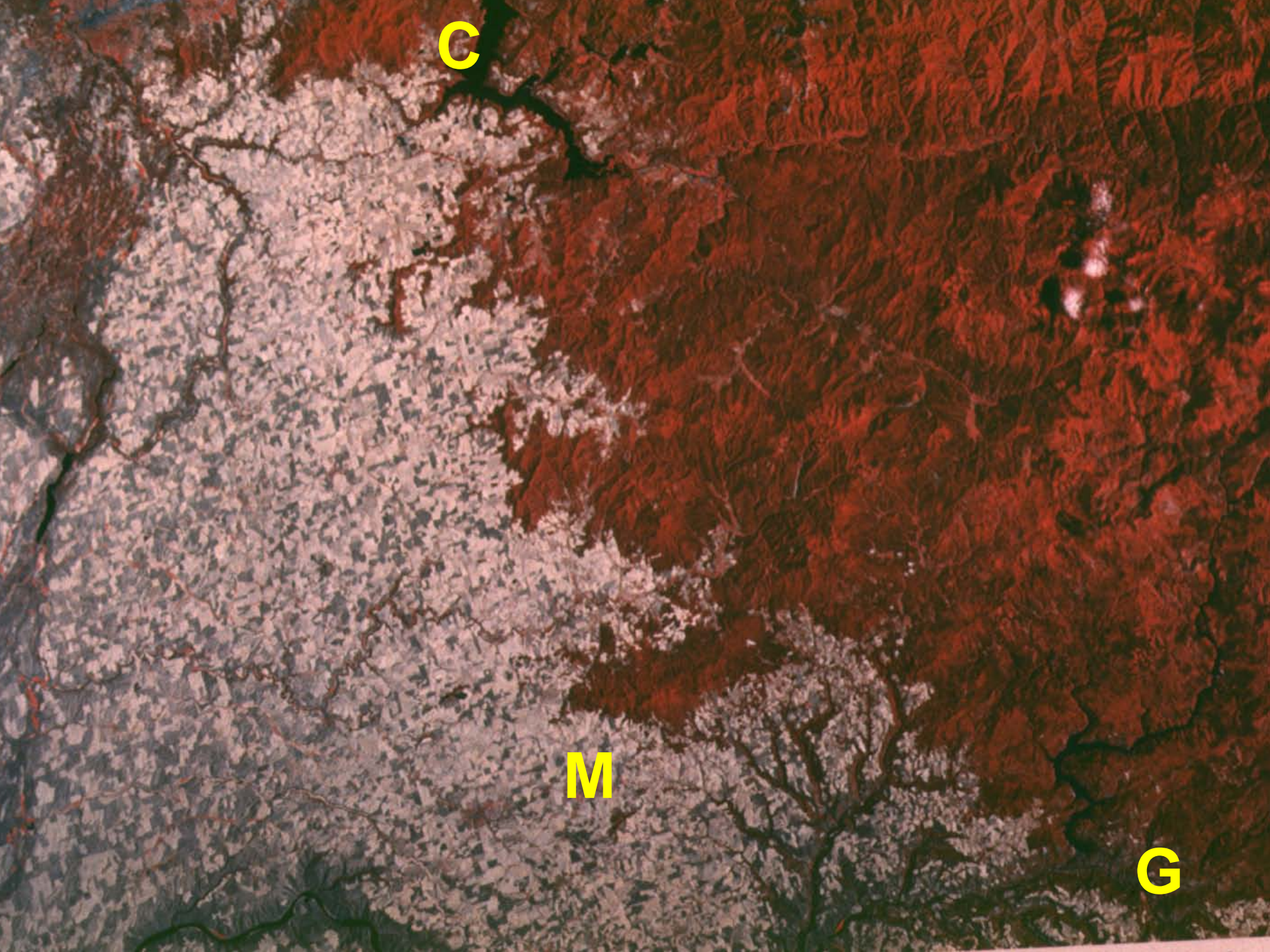
**Oak**

**Sweet Gum**

**Sycamore**

**Tulip Tree**

**Tupelo**



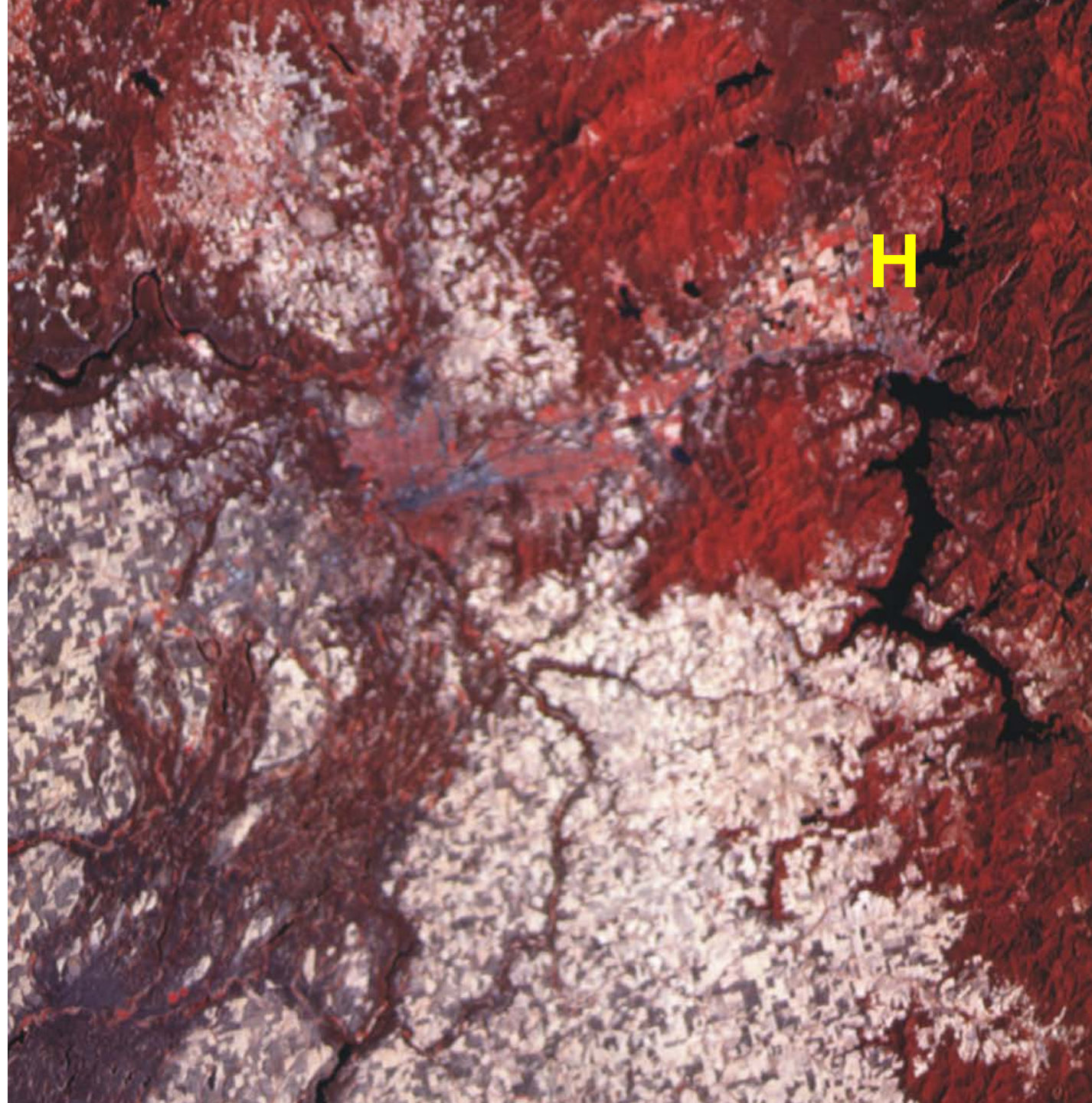
C

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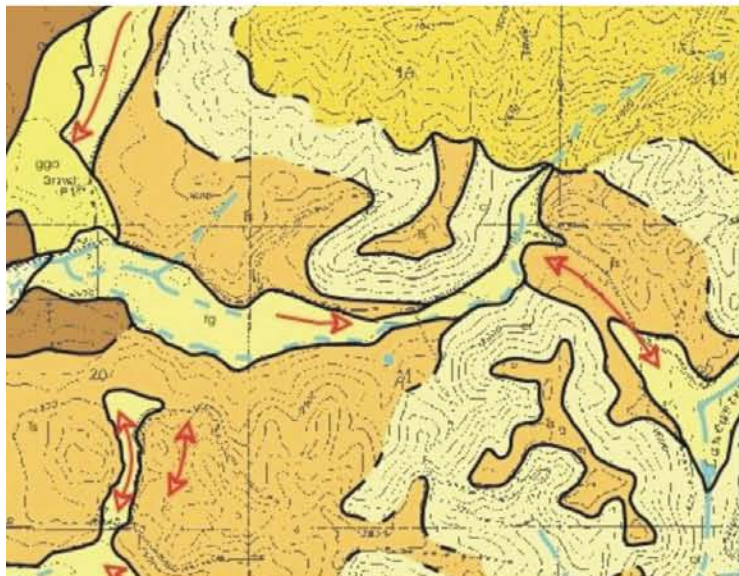




# SURFICIAL GEOLOGIC MAP OF THE HAYDEN LAKE QUADRANGLE, KOOTENAI COUNTY, IDAHO

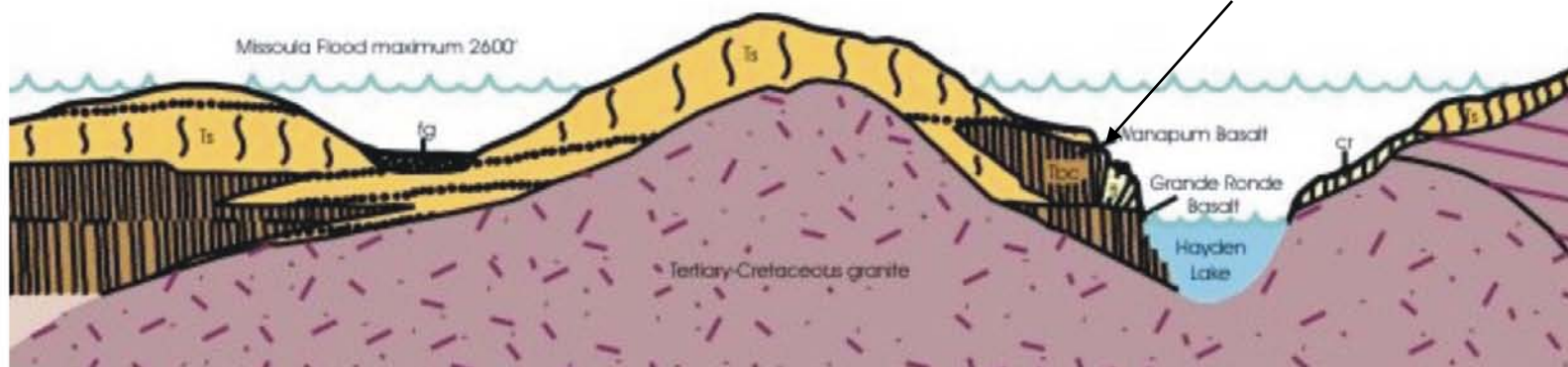
Roy M. Breckenridge and Kurt L. Othberg

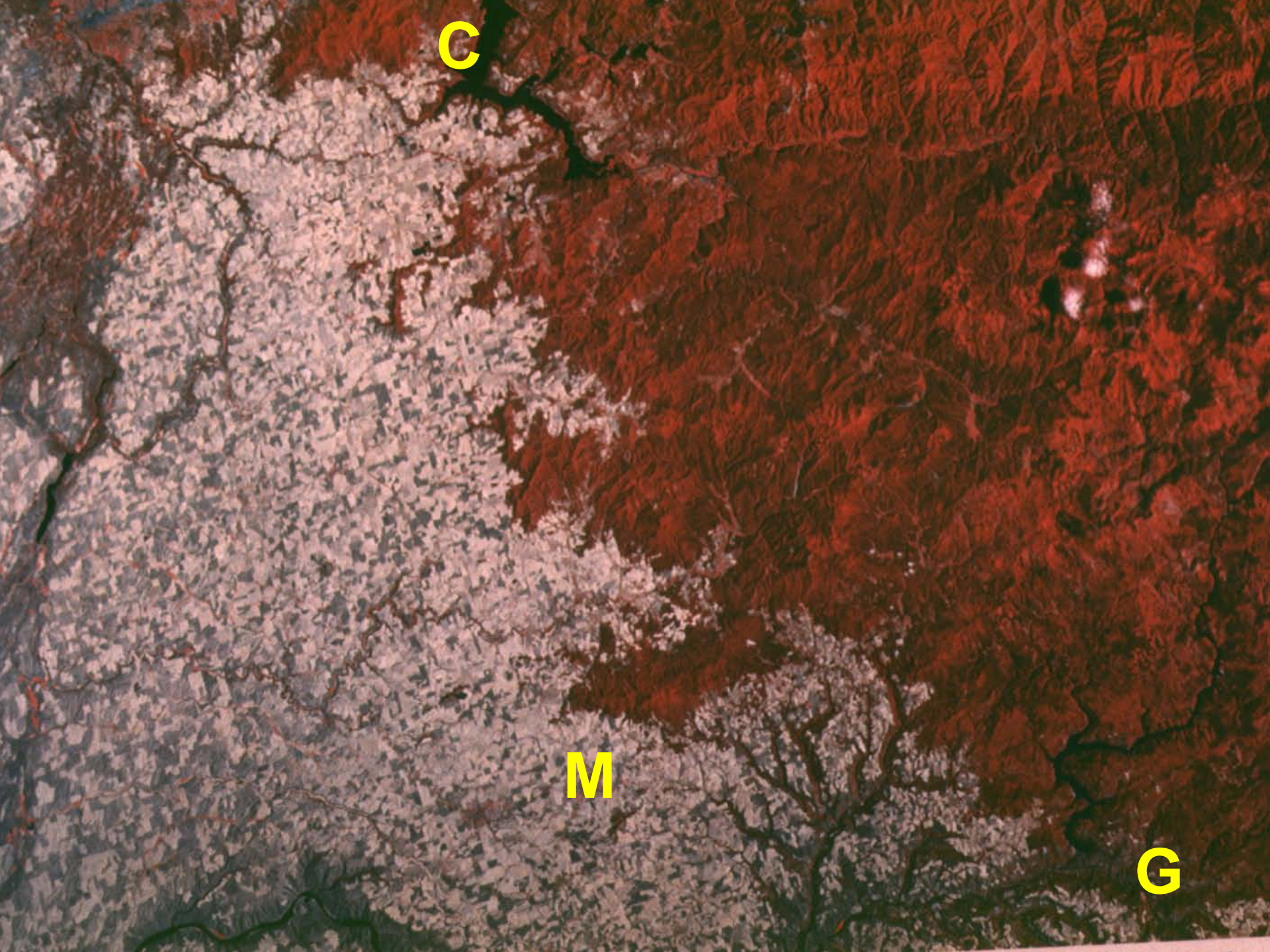
2000



**Ts** **Relict alluvium (Tertiary)**—Cobbly and pebbly sand and silt derived from Precambrian Belt Supergroup rocks and Mesozoic-Tertiary intrusive rocks. Matrix composed of weathered saprolite and clay (plinthite) paleosols (McDaniel and others, 1998a, 1998b, 1998c) of the Mokins series (Weisel, 1981). In the western part of the map, the unit forms a flat to gently sloping upland surface, 2,400-2,600 feet in elevation, that is underlain by basalt of the Priest Rapids Member of the Wanapum Basalt. Eastward, the unit grades into a thick weathered mantle overlying pre-Tertiary rocks. Some relict surfaces are as high as 2,800 feet in elevation. The alluvial deposits are probably graded to high base levels formed when the Miocene plateau basalts blocked and diverted stream drainages (Othberg and Breckenridge, 1998). The unit is finer grained but correlated to the Tertiary gravels (g) mapped on the adjacent Coeur d'Alene (Breckenridge and Othberg, 1999) and Fernan quadrangles. Generally the deposit is thin, from 1 to 7 feet, and in the western part of the map shows morphology modified by repeated Lake Missoula floods.

**Priest Rapids basalt is 14.5 my old**





C

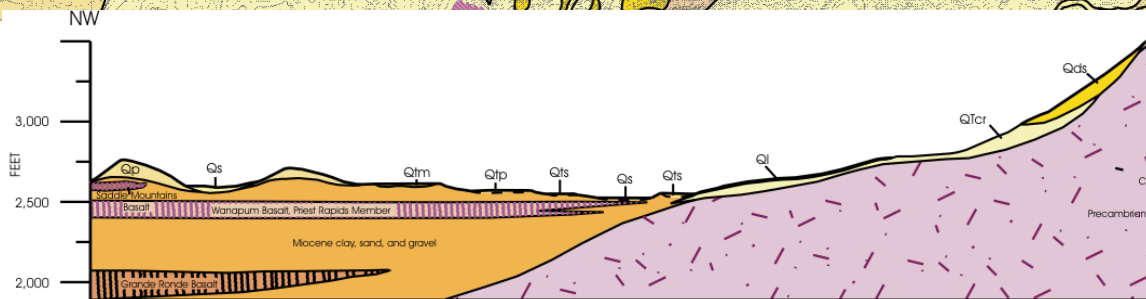
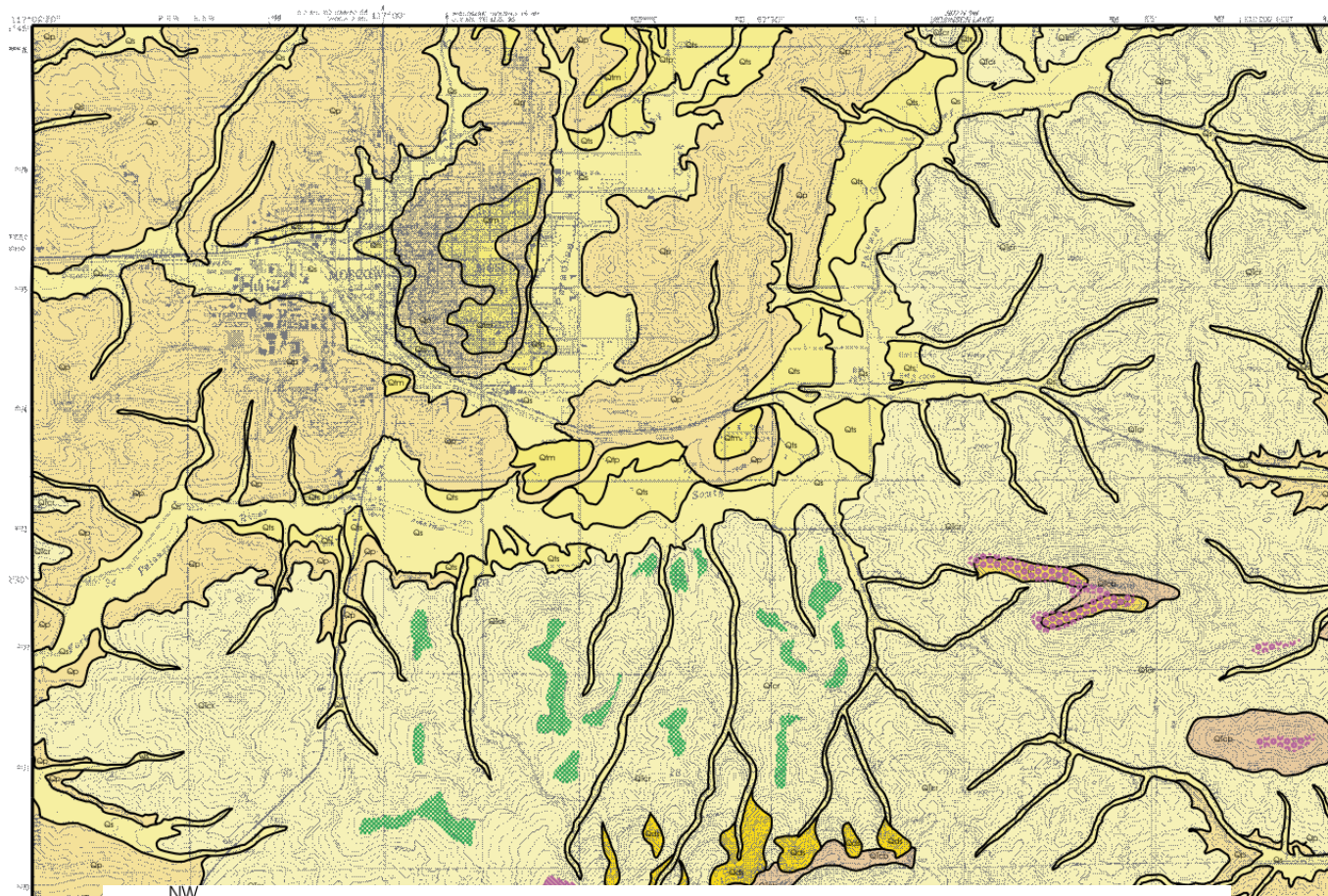
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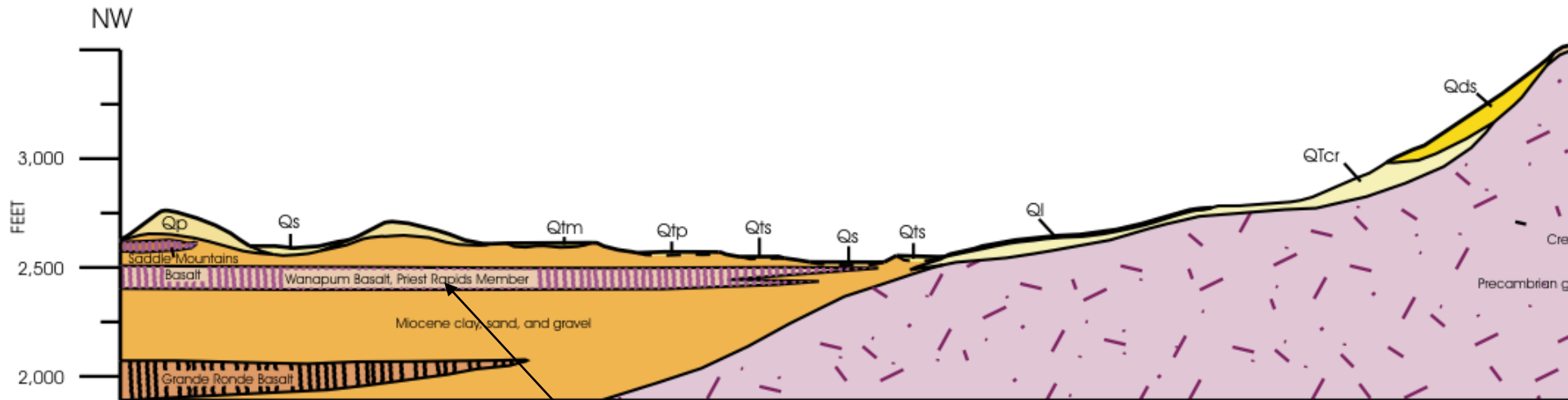
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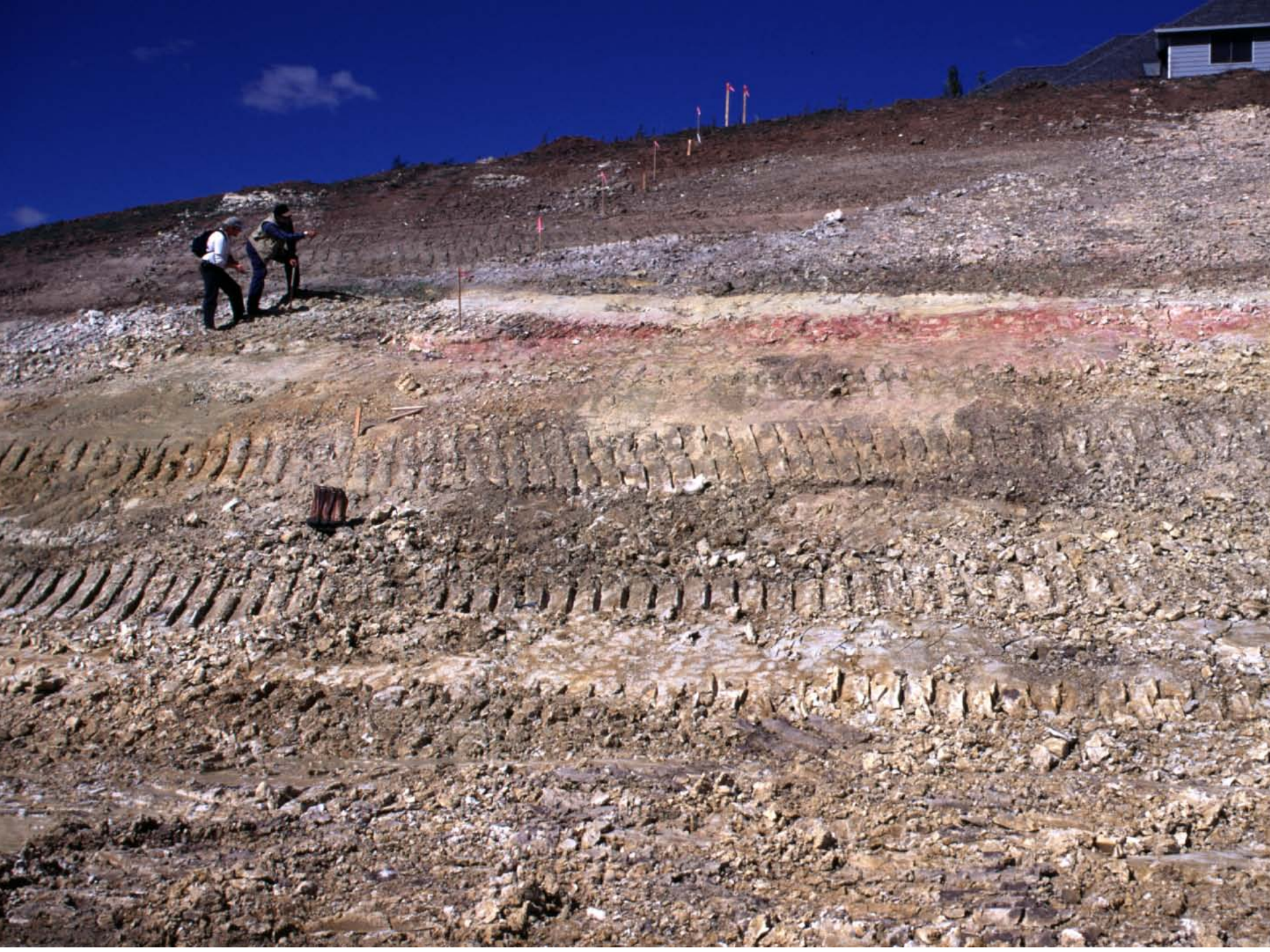
# SURFICIAL GEOLOGIC MAP OF THE MOSCOW EAST QUADRANGLE AND LATAH COUNTY, IDAHO

Kurt L. Othberg and Roy M. Breckenridge  
2001



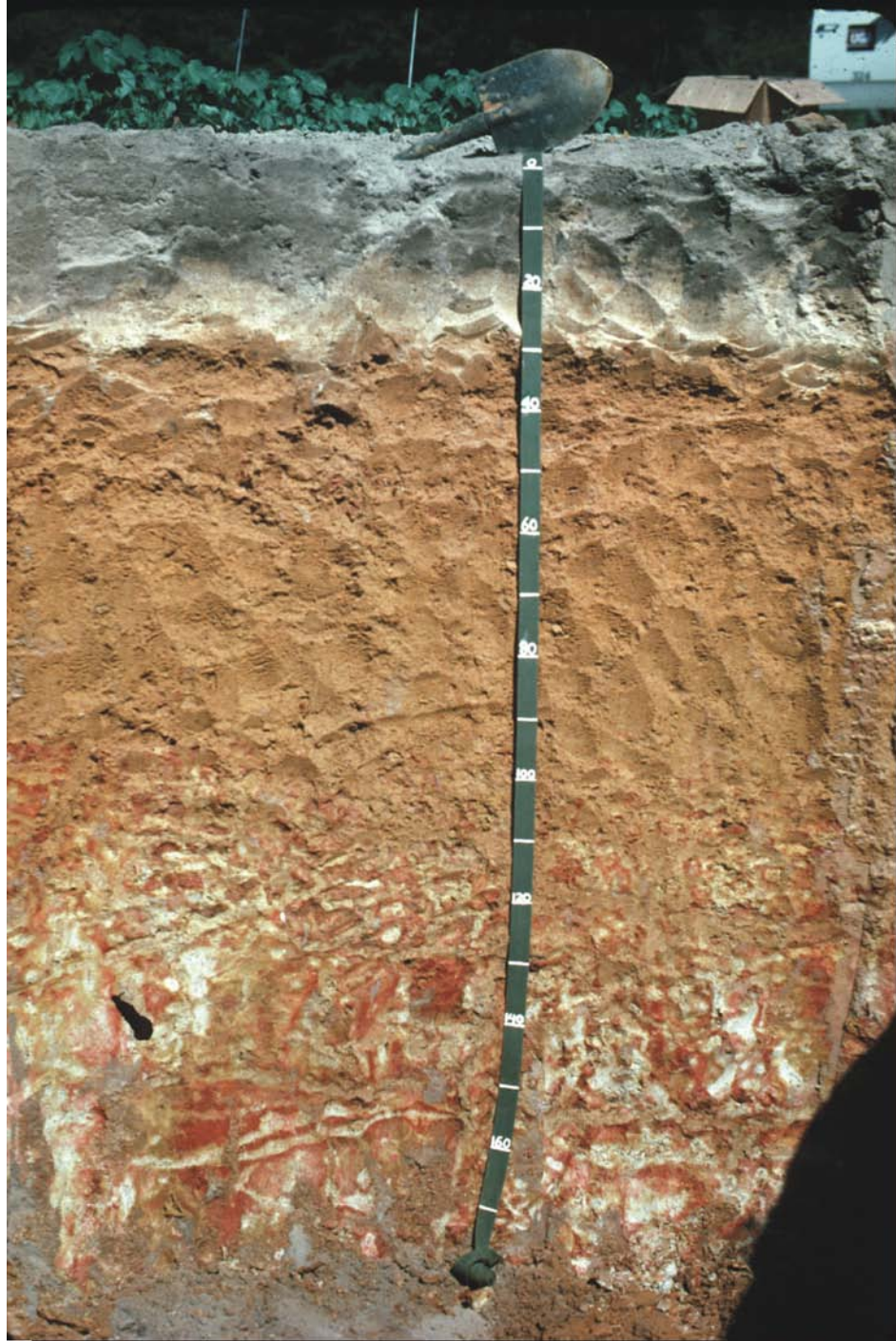


**Priest Rapids basalt is 14.5 my old**

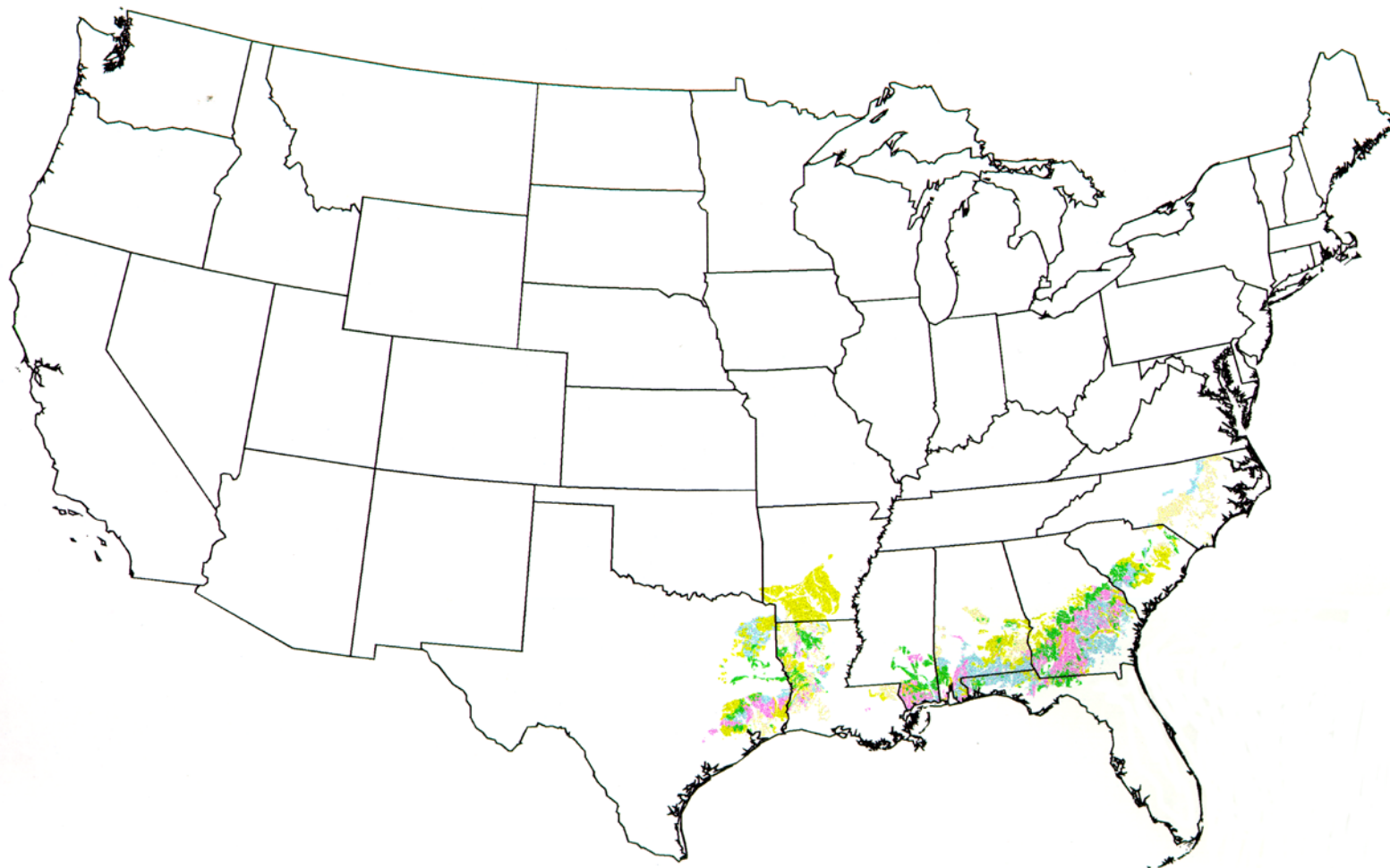


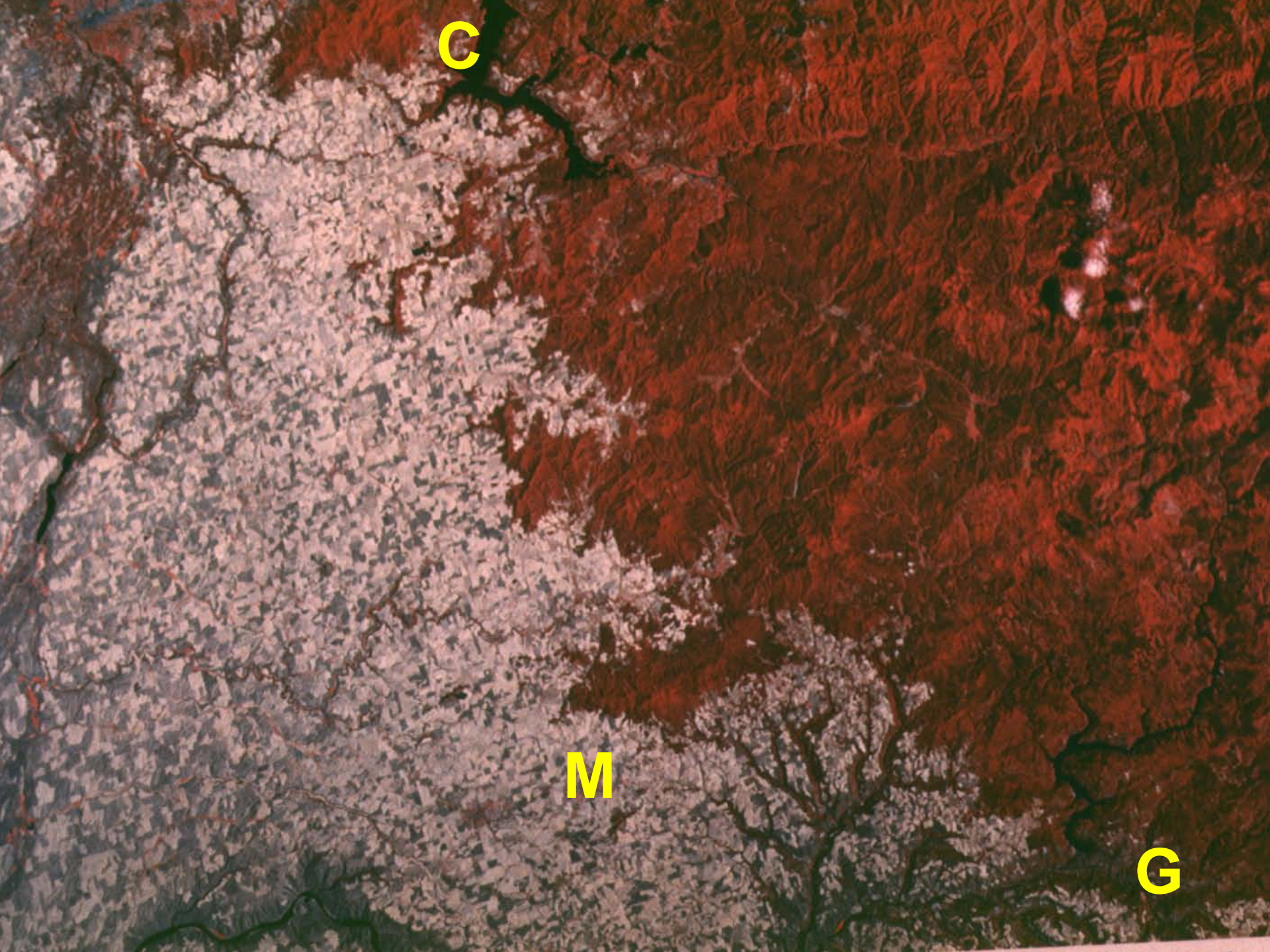






In the US, soils containing plinthite are found mainly in the lower Piedmont and Coastal Plain regions (shaded areas of map). This geomorphic/pedogenic setting provides a valuable model to help reconstruct the paleogeomorphic evolution of the northern Rocky Mountain/Columbia Plateau margin. This map was generated by Henry Mount of the Natural Resources Conservation Service (NRCS) using the 1:250,000 STATSGO database.





C

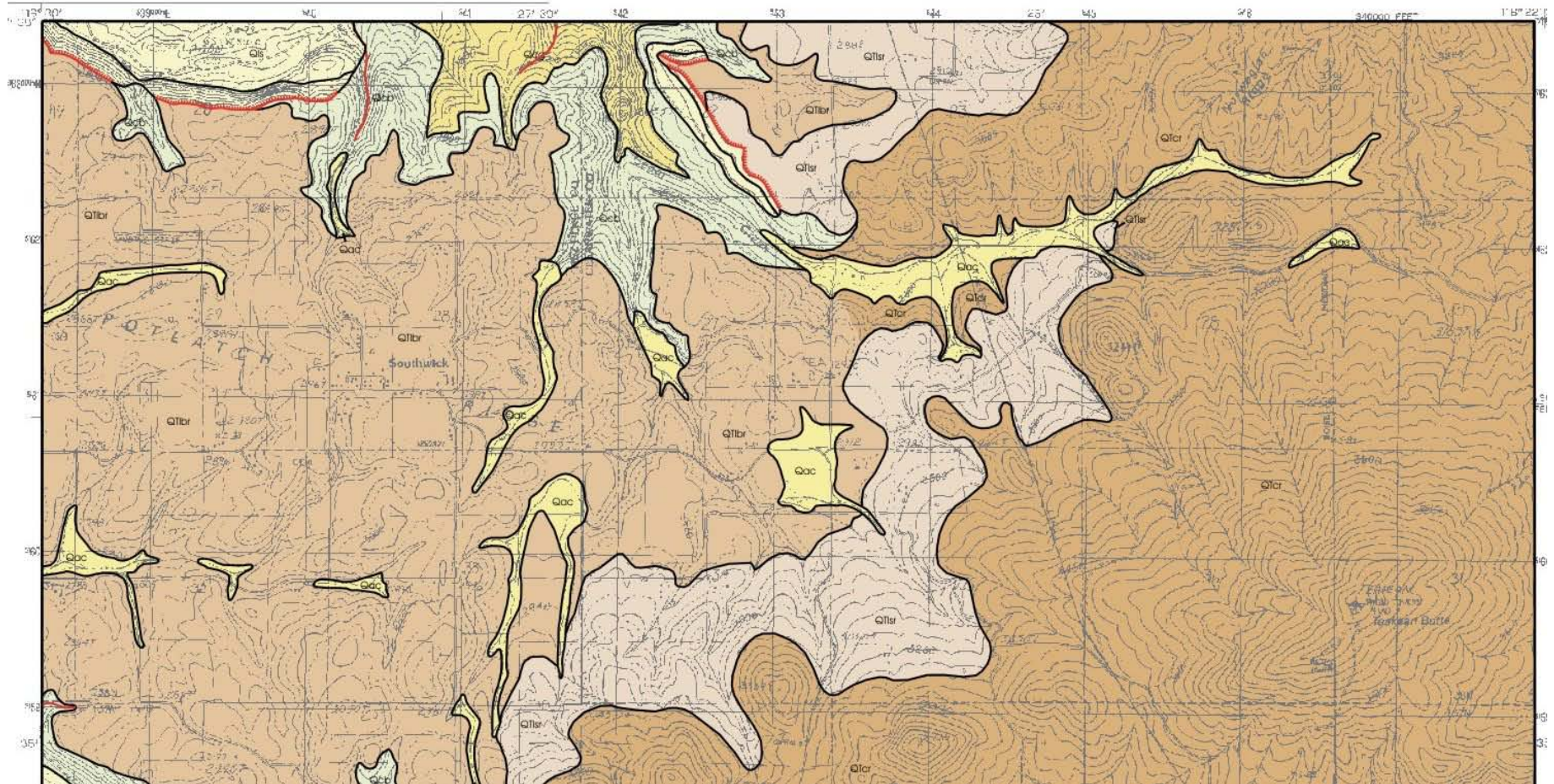
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# SURFICIAL GEOLOGIC MAP OF THE SOUTHWICK QUADRANGLE, CLEARWATER AND NEZ PERCE COUNTIES, IDAHO

Kurt L. Othberg, Daniel W. Weisz, and Roy M. Breckenridge

2002

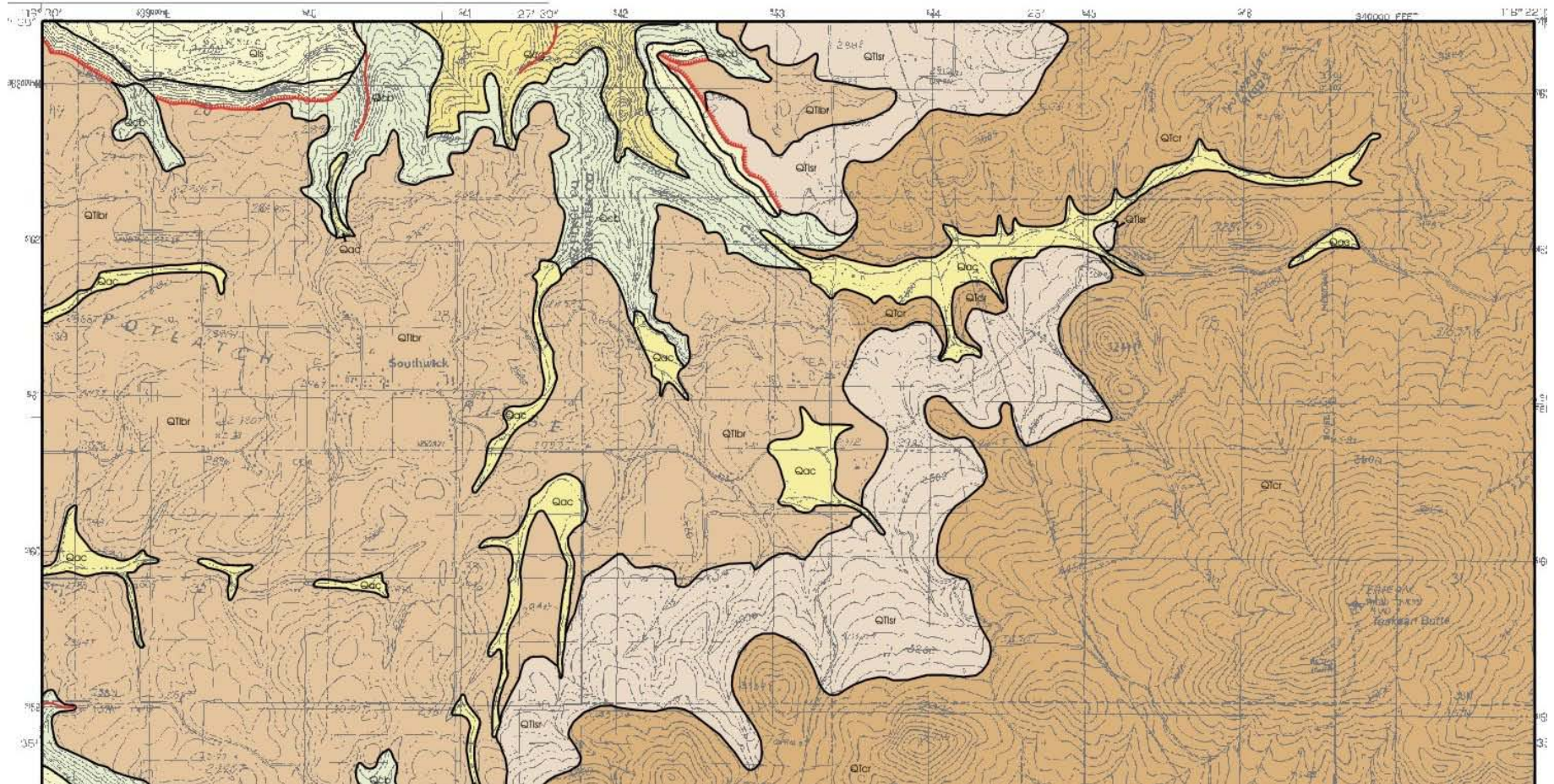




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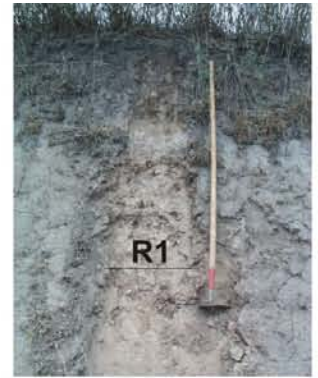




**Speriodally weathered basalt.**

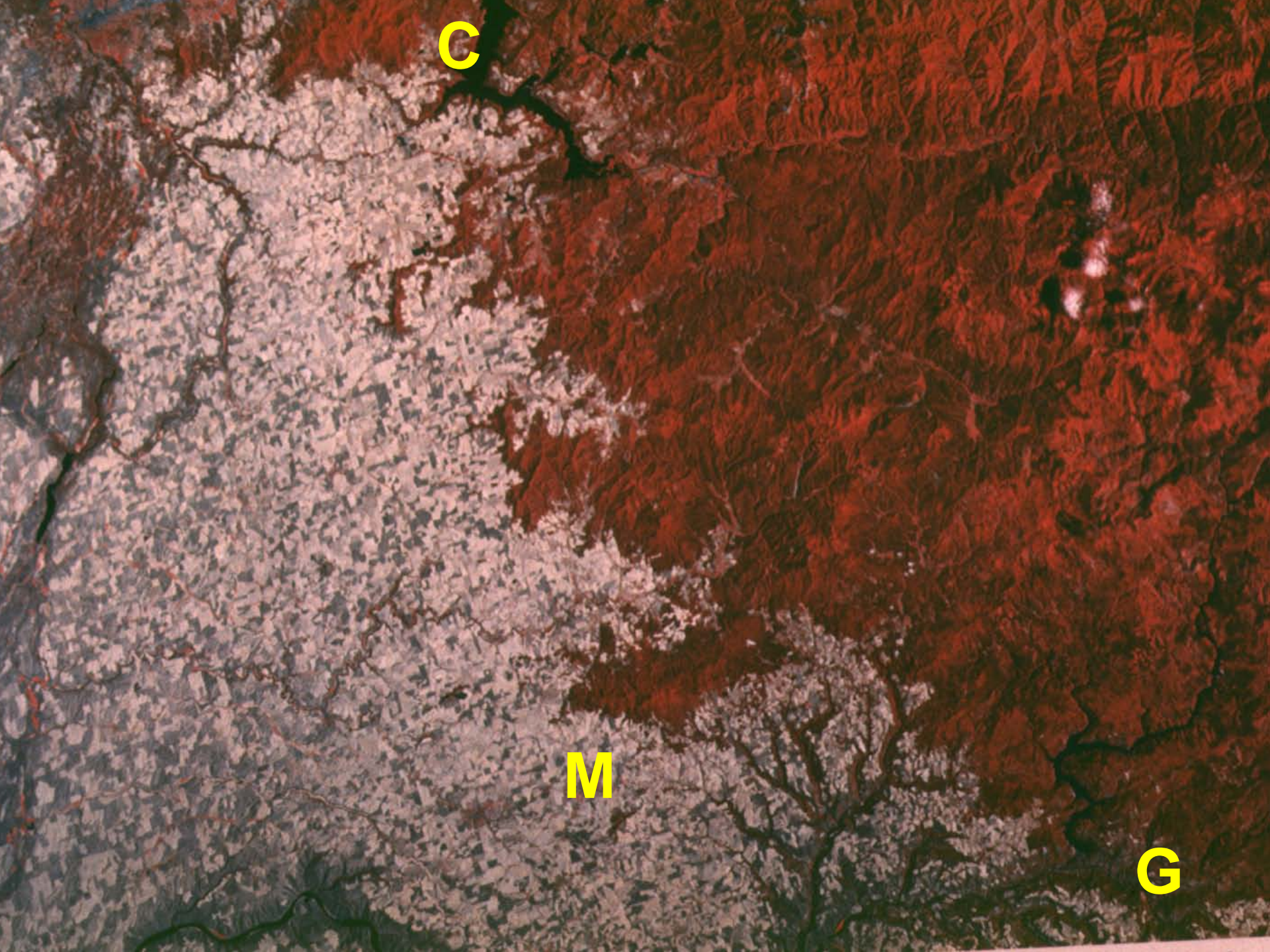


**R2, ~72 in. Deep.  
5 ft. Above basalt spheroid.**



**R1, 48 in. Deep.  
~2 ft. Below E horizon  
~2-3 ft. Above R2.  
~7-8 ft. Above basalt**





C

M

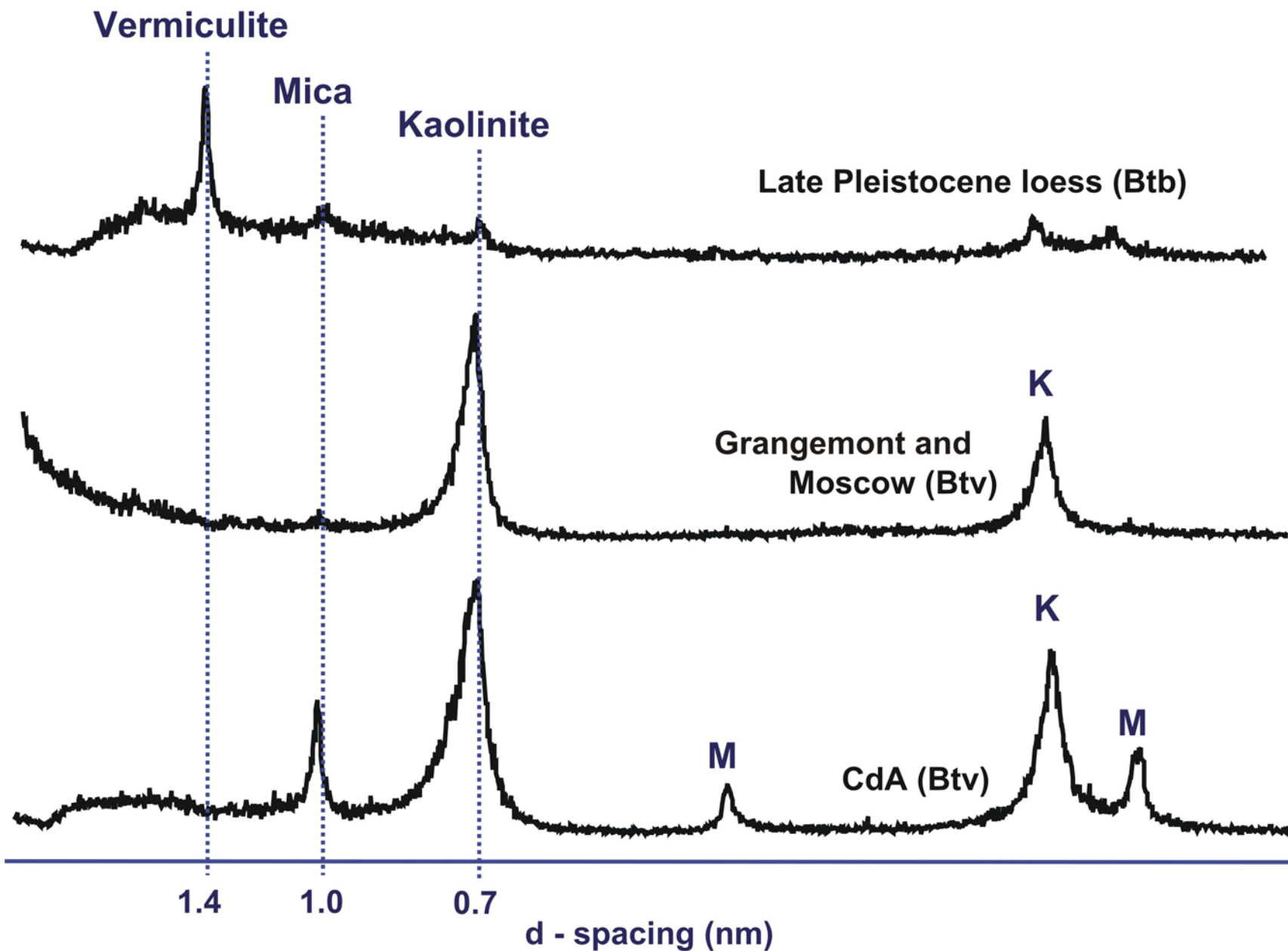
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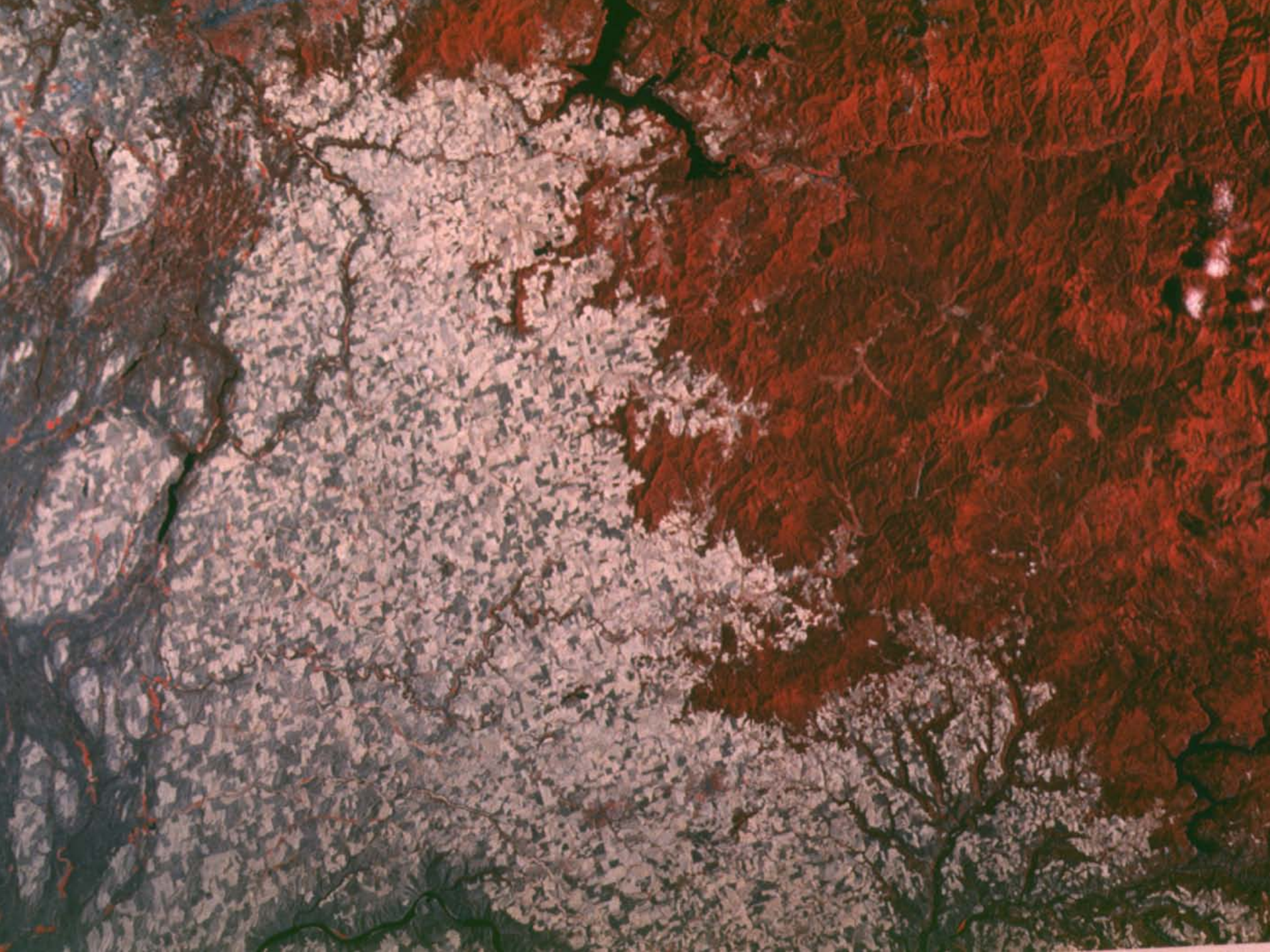






# XRD patterns of <2 μm fractions





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