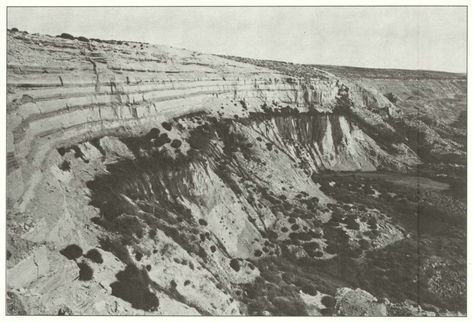
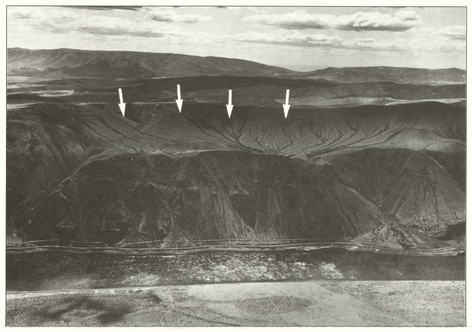


View 3.—Landslide scarp, Locke Island landslide area. Note seepage line at contact between top of Ringold Formation and overlying silts and sands. Scarp here is about 150 ft (45 m) high.

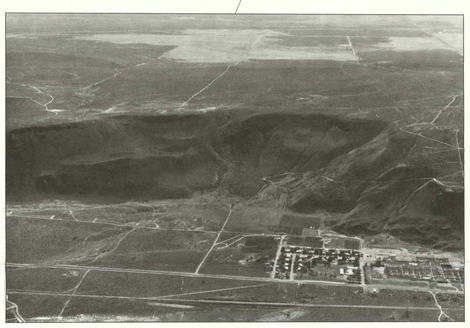
View 4.—Locke Island landslide area, looking down Columbia River toward the southeast. Earth slumps, avalanches, and flows are active here in the Ringold Formation. Active landslide area is about 1.5 mi (2.5 km) long. Maximum height of bluff above river is about 330 ft (100 m). Land mass at right is Locke Island.



View 2.—Mc Coy Canyon landslide area. This slump block in the Yakima Basalt Subgroup of Umtanum Ridge probably was formed during the Pleistocene. Slump block is about 2.0 mi (3.2 km) wide (left to right) and 100 ft (30.5m) high. Arrows indicate head scarp.

View 5.—Savage Island landslide area. These earth slumps, avalanches, and flows in the Ringold Formation have been active since 1973. Note irrigated and plowed fields that are being encroached upon by landslide head scarp. Landslide measures about 0.25 mi (0.4 km) in direction of movement (right to left); its cross dimension (into the photograph) is about 0.75 mi (1.2 km). Maximum height of head scarp is 80 ft (25 m).

View 6.—Active sand dunes along the west bank of the Columbia River. Prevailing winds are from the west (upper left). The longest dimension (transverse to wind) of the largest dunes is about 1,000 ft (305 m).



View 1.—Juniper Springs landslide area. This landslide mass in the Yakima Basalt Subgroup of Umtanum Ridge consists of one large landslide block and many smaller chaotic landslides. It is probably of Pleistocene age. Height of landslide and head scarp is about 750 ft (225 m).

View 7.—Johnson Island landslide area. Note recent landslides in the Ringold Formation that have blocked county road along the east bank of Columbia River. Height of bluff is about 530 ft (160 m).

View 8.—Bluffs along the Columbia River at southern end of Johnson Island landslide area. Note large new tension crack near top of bluffs. This crack, which has a scarp height of as much as 10 ft (3 m), is an indication of possible future slope movement.

EXPLANATION

- la / ls — AREAS SUSCEPTIBLE TO LANDSLIDES—Slopes that may fail if saturated. la, areas of currently active landslides; ls, areas of inactive landslides and steep slopes on Ringold Formation
- EVIDENCES OF TECTONIC STABILITY—Features that suggest an absence of deformation since the times of their formation
- Smooth surfaces formed by floods—Selected surfaces, produced by late Pleistocene floods, that are notably large, smooth, well preserved, and well exposed. Boundary line dashed where boundary is gradational
- RS, RC, RP, C, L — Continuous, undeformed sedimentary strata and lava flows—Parts of bluffs where exposures of layered rocks are good to excellent, and layers appear to be continuous and essentially undeformed. Solid lines indicate no possible stratigraphic offset by faulting or maximum possible offset of 6 ft (2 m) or less. Dotted lines indicate less precise control, and offset, though not evident, could be as much as 6–20 ft (2–6 m). Control based on tracing various strata, stratigraphic surfaces, and lava flows. RS, strata and stratigraphic surfaces in claystone, siltstone, and sandstone of Ringold Formation; RC, top of thick conglomerate layer in Ringold Formation; RP, strata of Ringold Formation traced on aerial photographs (1967–80); C, calcrete capping Ringold Formation; L, lava (basalt) flows. Cross lines indicate points where basis for stratigraphic control changes or terminates. Though evaluations are based on exposures on steep slopes of bluffs, lines are drawn above or below these slopes where necessary to avoid crowding other lines
- SMALL ACTIVE LANDSLIDES—Landslides too small to be mapped at scale 1:100,000

20° TRUE NORTH MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1987

WASHINGTON
MAP LOCATION

SCALE 1:100000
5 0 5 10 15 KILOMETERS
5 0 5 MILES

CONTOUR INTERVAL: NORTHERN PART (PRIEST RAPIDS), 50 METERS, WITH SUPPLEMENTARY CONTOURS AT 10 METERS; SOUTHERN PART (RICHLAND), 20 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Map *B*. Active landslides, landslide-susceptible areas, and evidences of tectonic stability

MAPS SHOWING GROUND-FAILURE HAZARDS IN THE COLUMBIA RIVER VALLEY BETWEEN RICHLAND AND PRIEST RAPIDS DAM, SOUTH-CENTRAL WASHINGTON

By
William H. Hays and Robert L. Schuster

1987

Base from U.S. Geological Survey
Priest Rapids, 1979, and Richland, 1978, 1:100,000

Geology mapped in 1980–82

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1987—G85107