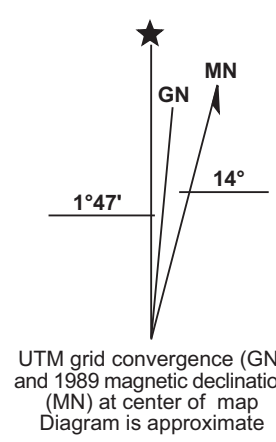
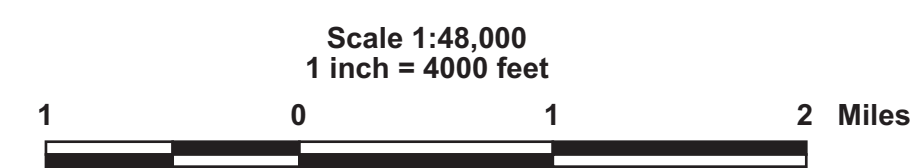


Base from USGS 7 1/2' quadrangles: Billings East, Billings West, Yegen, and Soda Springs NW

Data interpreted from Lopez, 2002.



MBMG Geologic Map 61-B
**Areas of Potential Landslide Hazard
 in the Billings Area,
 Yellowstone County, Montana**

by David A. Lopez and Marianne Sims¹

¹Marianne Sims, former Rocky Mountain College senior thesis student, supervised by D.A. Lopez, 2000-2001.

EXPLANATION

Areas of high landslide potential
 Hazards occur in areas of over-steepened shale slopes below rimrocks of Eagle Sandstone and Judith River Formation and along outbanks of the Yellowstone River and Pryor Creek. Numerous landslides are present in these areas. Potential for movement is high if slopes are undercut, watered heavily, receive higher than normal precipitation, or are artificially loaded by housing and other developments.

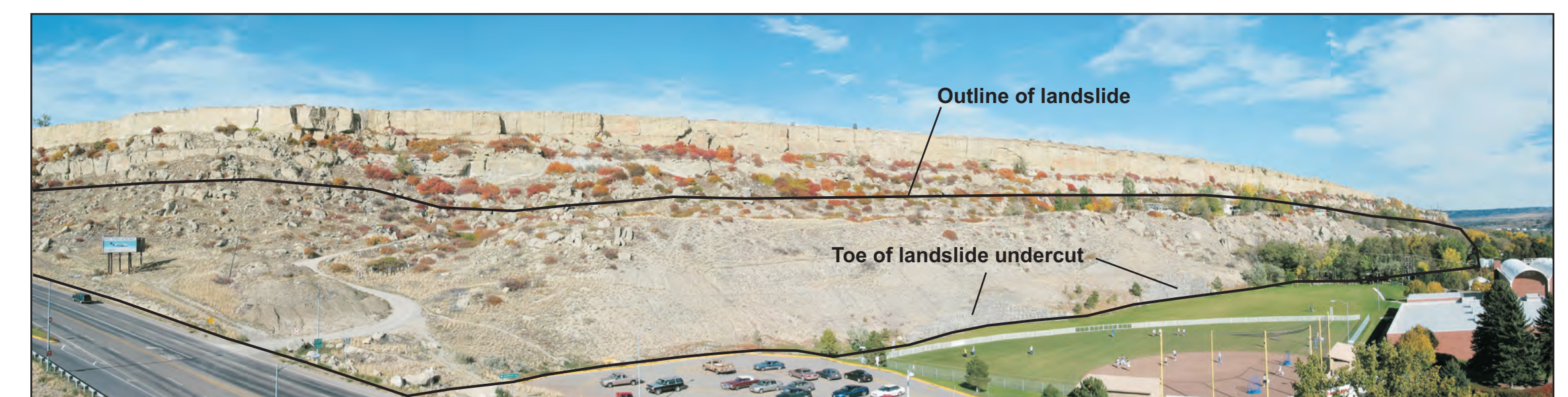
This part of Montana is not a high earthquake risk area, but a large-magnitude earthquake in southwestern or western Montana could produce enough shaking here to trigger movement. It is not implied that all areas shown will definitely move, but that the risk of new landslides forming and old landslides being re-activated is much higher than elsewhere in the map area. Development in these areas should be avoided.

Areas of moderate landslide potential
 Hazards occur on steep slopes of unstable shales, mostly in Niobrara, Carlile, and Belle Fourche shales. Some landslides are present in these areas. Potential for movement is low to moderate if slopes are undercut, watered heavily, receive higher than normal precipitation, or are artificially loaded by housing and other developments.

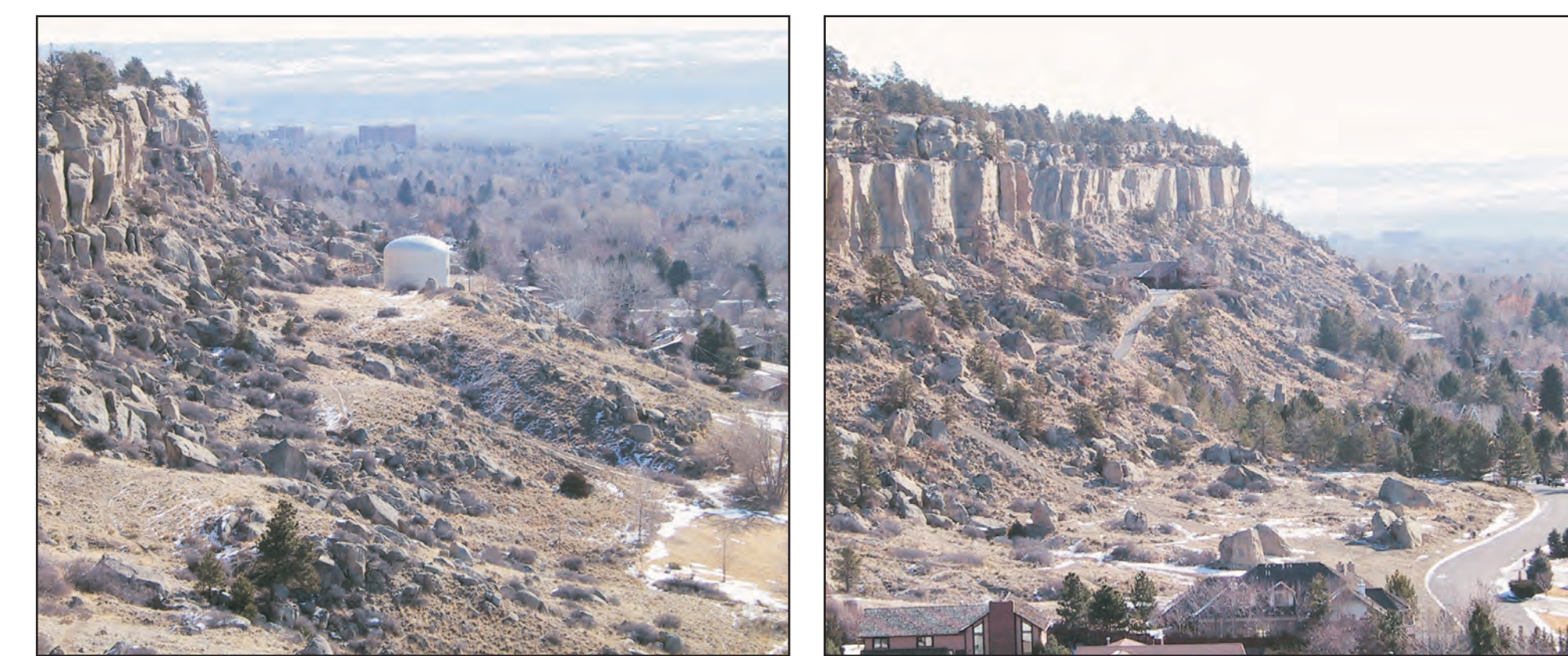
This part of Montana is not a high earthquake risk area, but a large-magnitude earthquake in southwestern or western Montana could produce enough shaking here to trigger movement. It is not implied that all areas shown will definitely move, but that the risk of new landslides forming and old landslides being re-activated is much higher than elsewhere in the map area. Development in these areas must be done with care not to increase the risk by increasing slopes, adding load to steep slopes, or by excessive irrigation. Natural landscaping with plants that can survive on natural precipitation is recommended. Off-site transfer of roof and driveway runoff is also helpful in minimizing landslide hazard.

REFERENCES CITED

Lopez, D. A., 2002, Geologic map of the Billings area, Yellowstone County, Montana; Montana Bureau of Mines and Geology, Geologic Map GM-61A. Scale 1:48,000.



Large landslide on northern side of Montana State University-Billings gymnasium. Landslide is unstable and continues to move, especially in wet years. Houses on top of the landslide show damage, resulting from continual slow downslope movement. Also note removal of part of the slide toe to accommodate the softball field, which may increase instability.

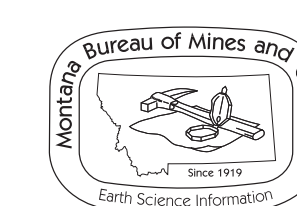
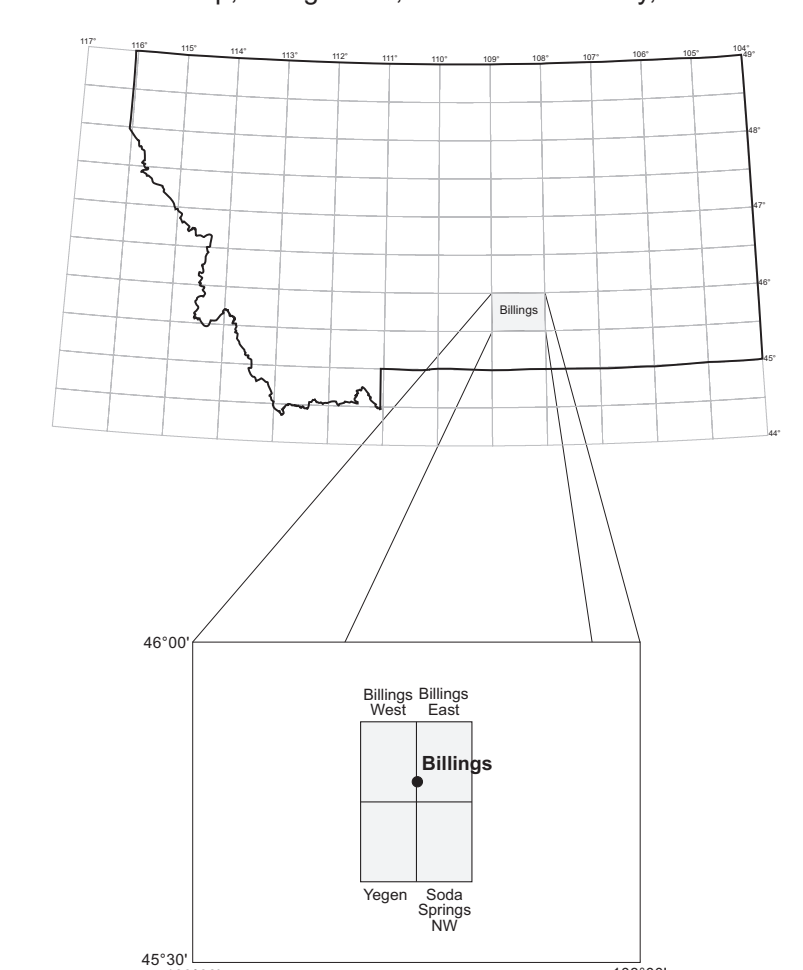


Examples of landslide below the Eagle Sandstone rimrocks



Rotational landslide in Thermopolis Shale on slope over-steepened by erosion along Pryor Creek

Index map, Billings area, Yellowstone County, Montana



Maps may be obtained from:
 Publications Office
 Montana Bureau of Mines and Geology
 1300 West Park Street
 Butte, Montana 59716-8997
 Phone: (406) 496-4167 Fax: (406) 496-4431
 http://www.mbg.mt.edu

or
 MBMG Billings
 1300 North 27th Street
 Billings, Montana 59103
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