Landslides in Vermont

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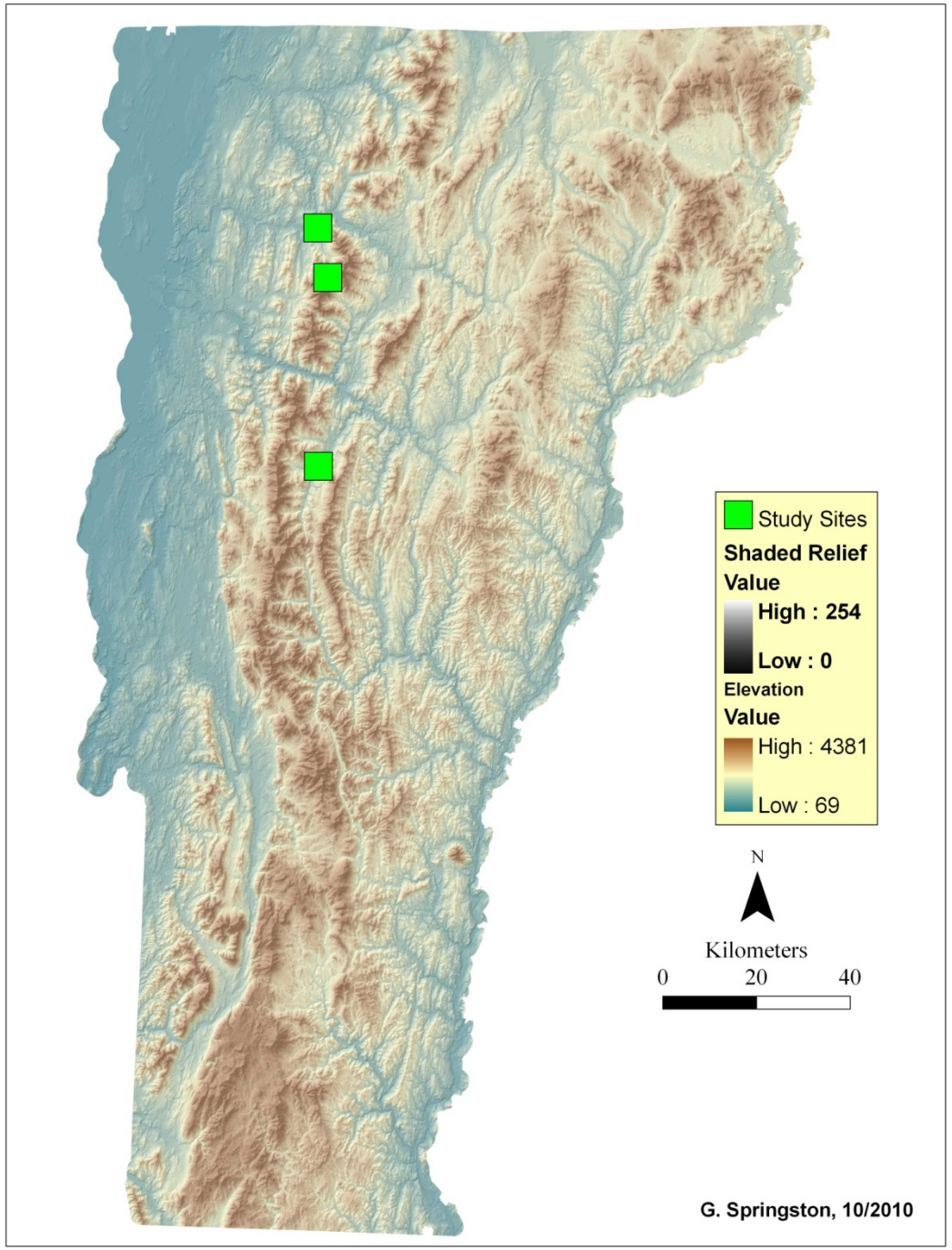
Northfield, VT, October, 2010

Outline

- Definitions
- Mad River
- Vermont Highway Rockfall Hazards
- Smugglers Notch
- Jeffersonville



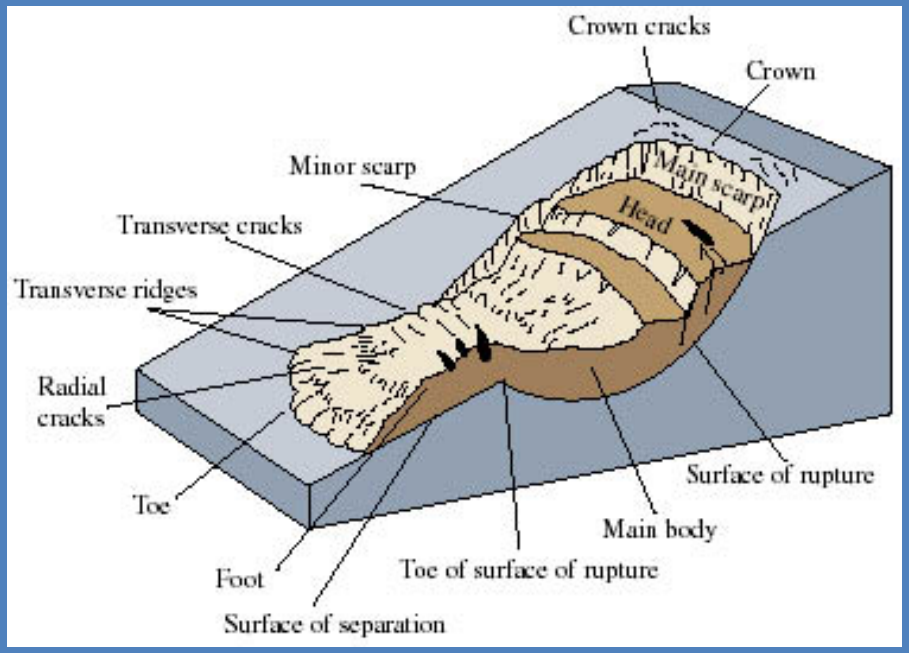
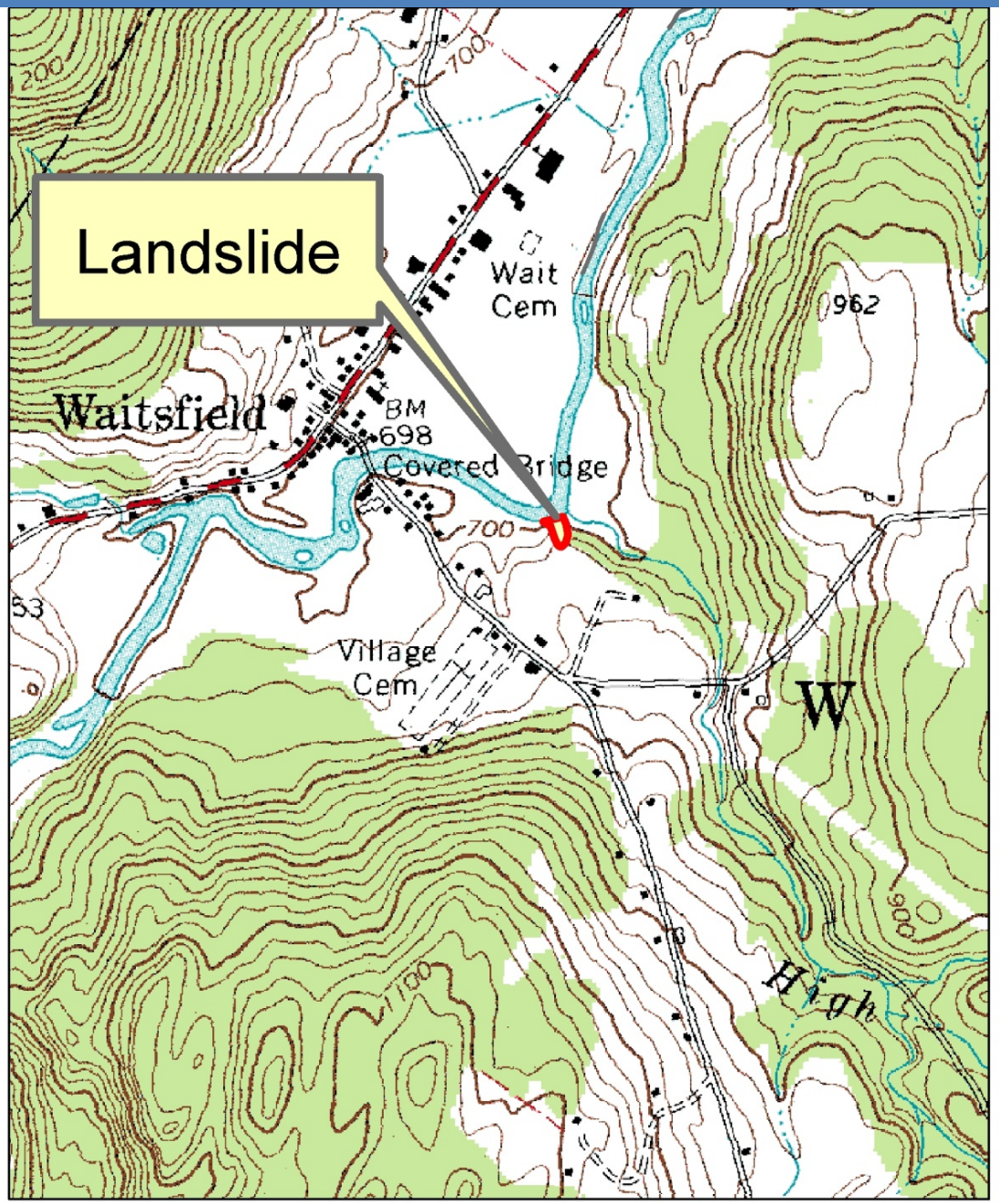
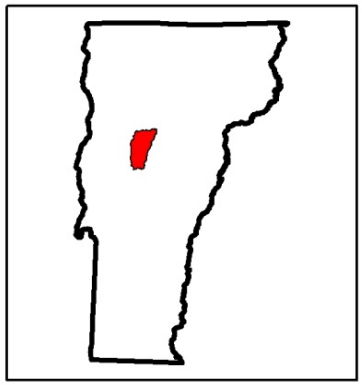


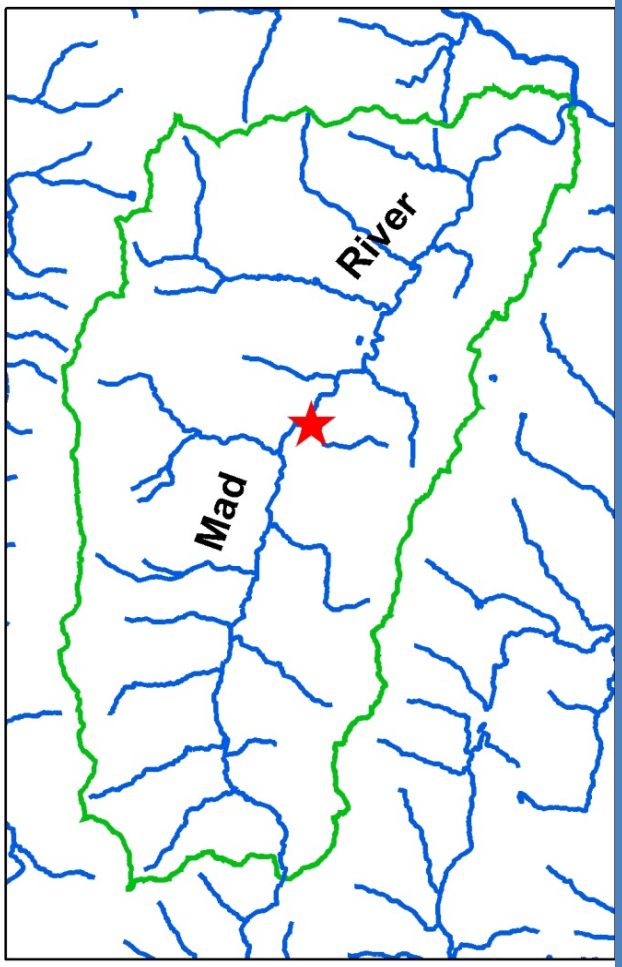
Figure from USGS Fact Sheet 2004-3072 http://pubs.usgs.gov/fs/2004/3072/fs-2004-3072.html

Landslide on Winooski River, Cate Farm, Plainfield, 2009

- "The downslope movement of soil, rock and organic materials under the influence of gravity and also the landform that results from such a movement" (The Landslide Handbook, USGS Circular 1325, p. 4).







N

0 100 200 400 600

Meters

Mad River Landslide
Waitsfield, Vermont

Lori Barg, Spring, 2002

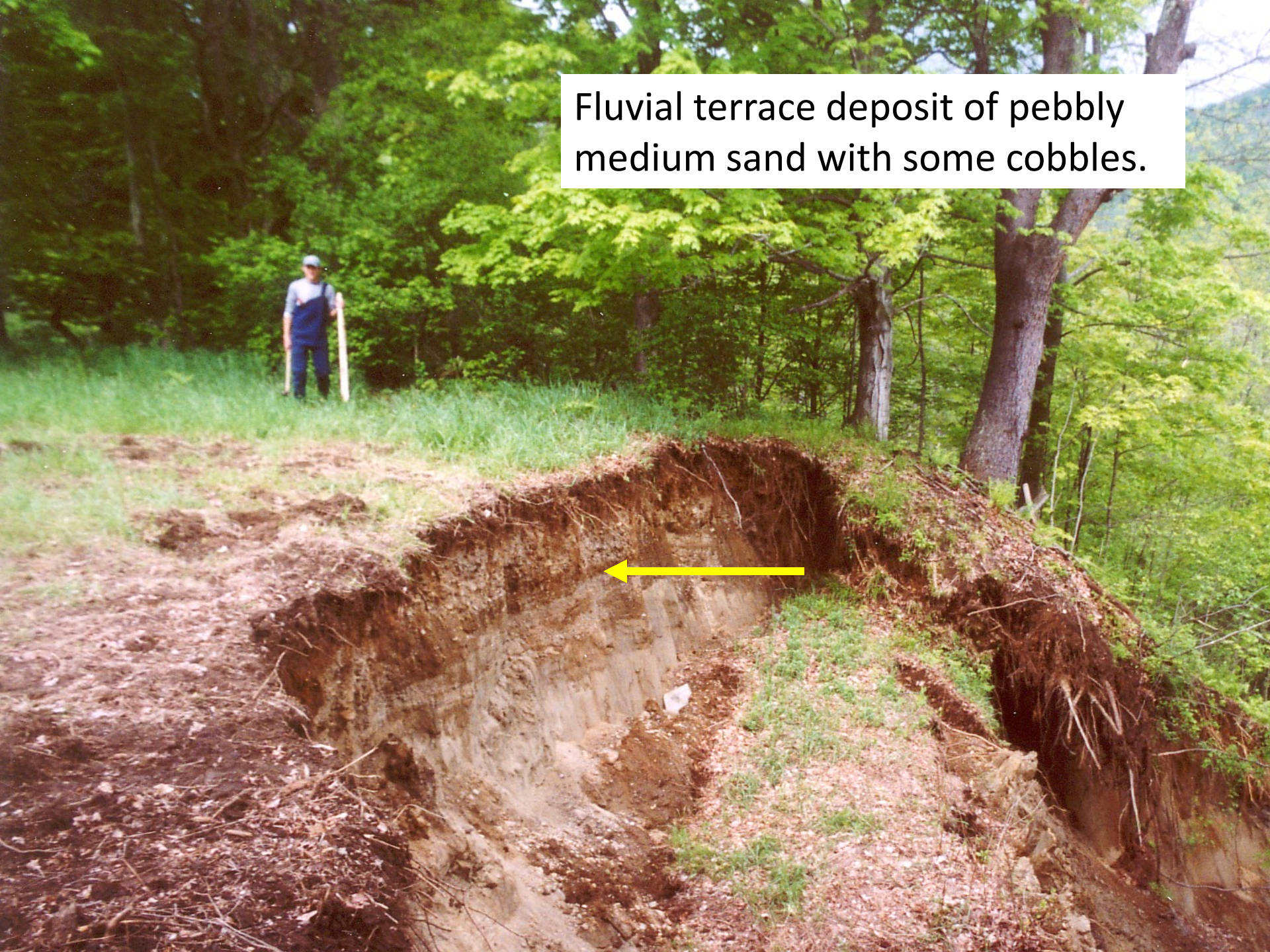

Spring, 2003


6/3/2003


5/28/2003

Stratigraphy

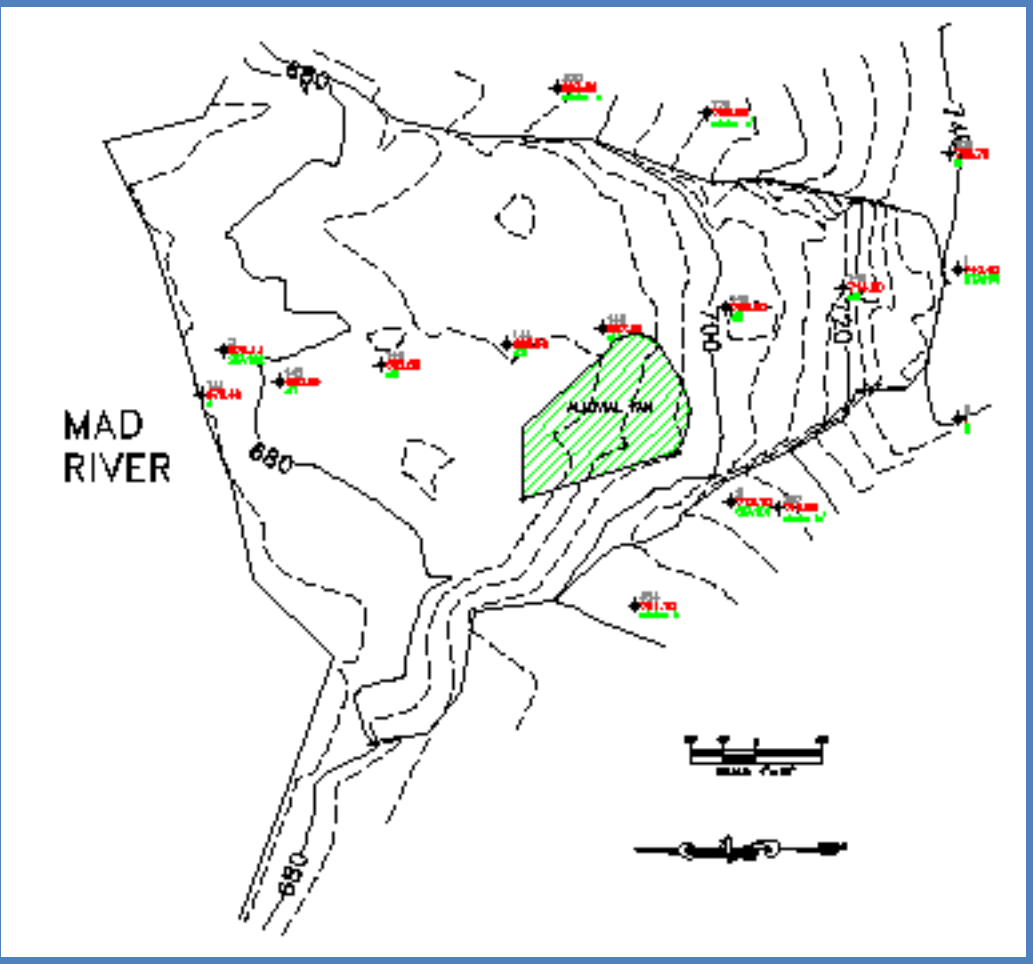
- 0.7 - 1.2 m pebbly medium sand (fluvial).
- 12.2 m fine sand and silty fine sand with layers of massive silty clay (lacustrine).
- 9.1 m varved silt, silty clay and clay with 2-4 cm couplets (lacustrine).


Fluvial terrace deposit of pebbly medium sand with some cobbles.

Below fluvial deposit is fine sand and silty fine sand showing extensive soft-sediment deformation.


Since drainage of glacial Lake Winooski, Mad River has cut down about 22 meters.
Varved clay and silty clay. Two to four cm thick couplets. Winter and summer subequal in thickness.
Spring, 2003

Dimensions

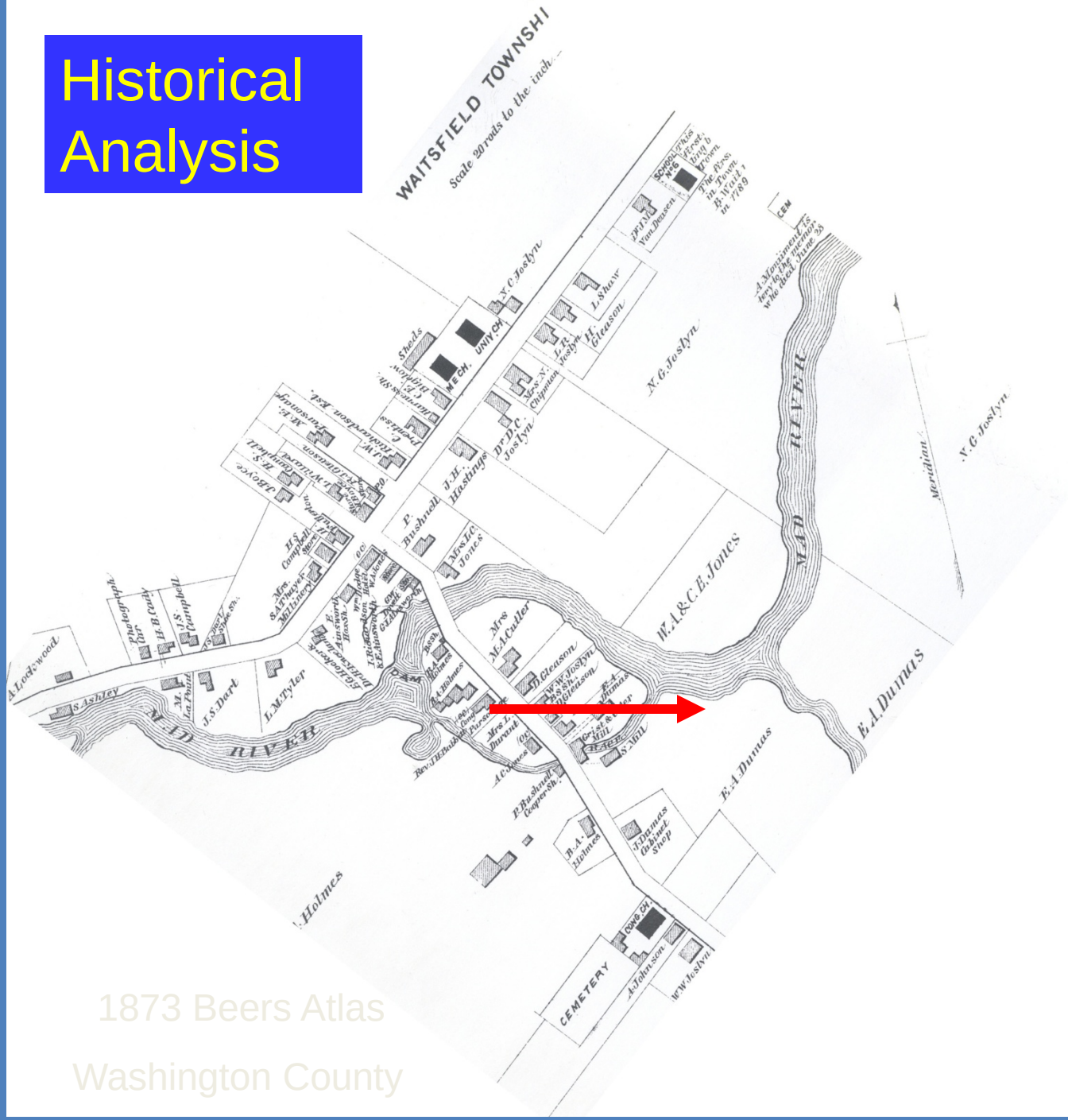


- 43 m (140 ft) wide
- 76 m (248 ft) long (N-S)
- 22 m (70 ft) high
- 15.5º slope overall
- 4000 m³ (5300 yd³) volume of displaced mass

Erosion of Toe

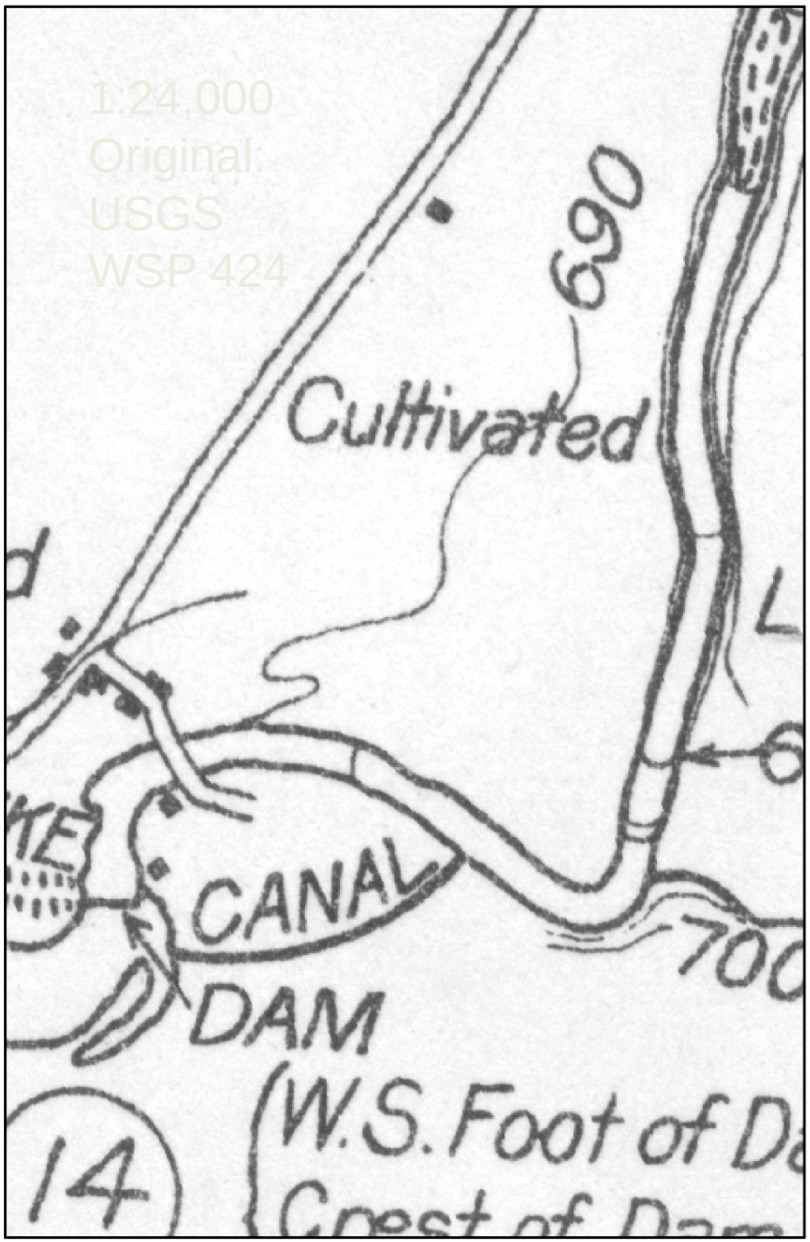
- >10 m (33 ft) eroded since 5/28/03
- >700 m^3 (900 $yards^3$) carried away by river
- Turbidity visible at least to Waterbury -26 km downstream

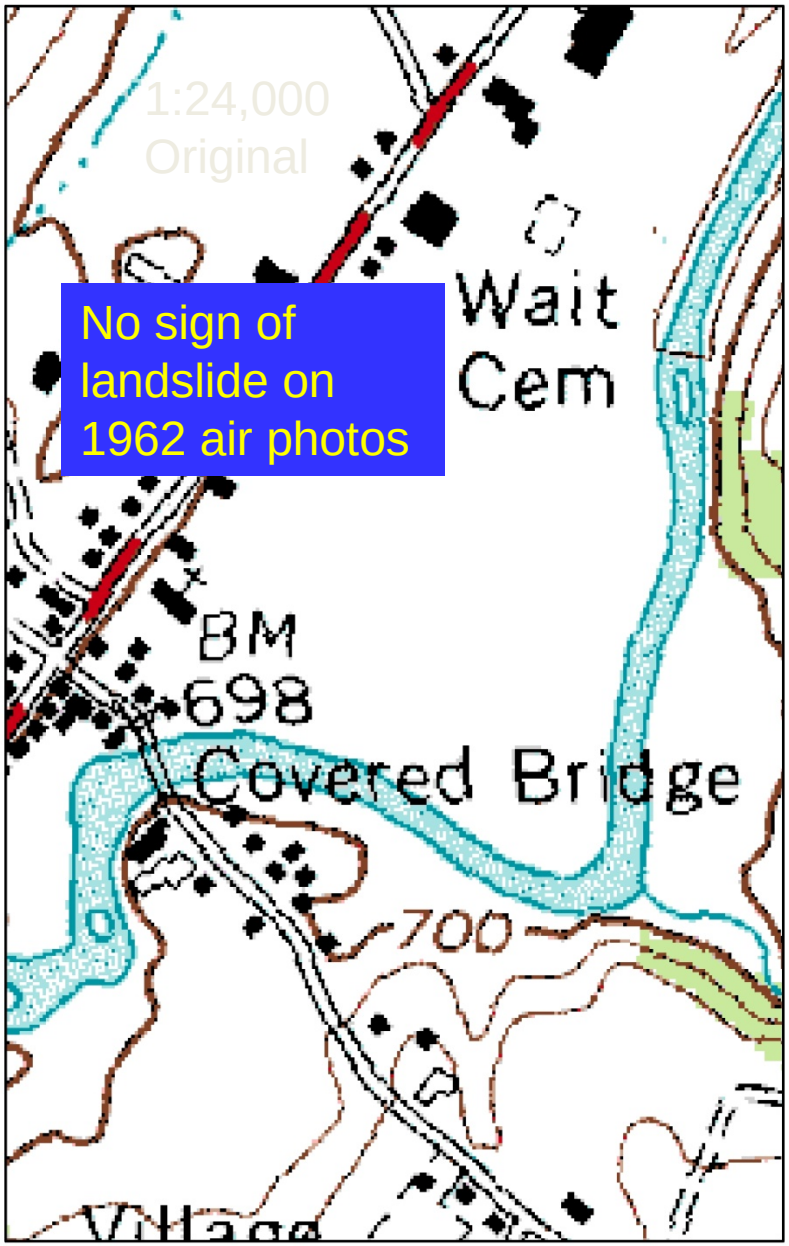
Historical Analysis



1873 Beers Atlas

Washington County





N

1910

1962

0 100 200
Meters

Mad River Landslide
Waitsfield, Vermont

G. Springston
1/2004

N

1974

1995

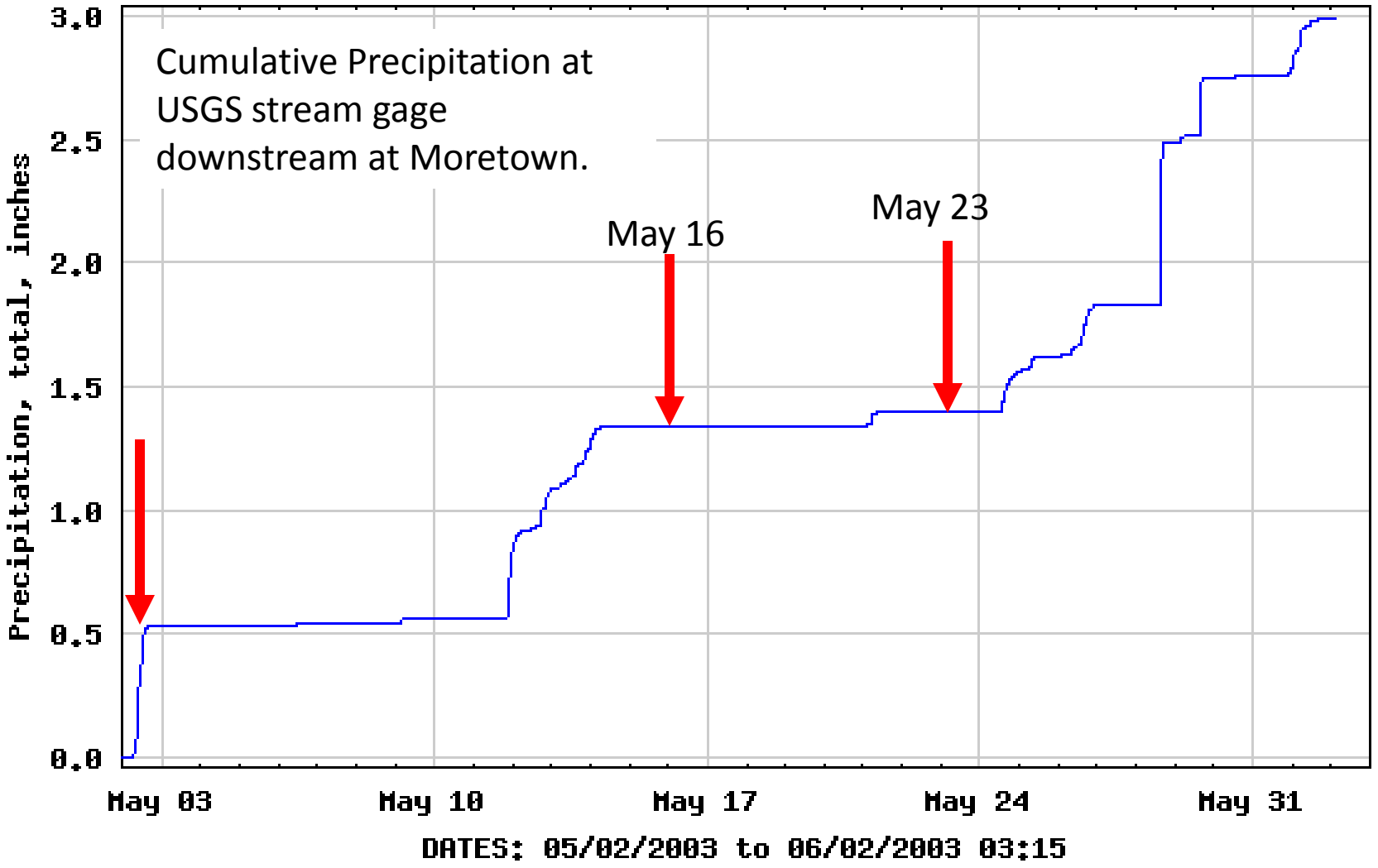
0 100 200
Meters

Mad River Landslide
Waitsfield, Vermont

G. Springston
1/2004

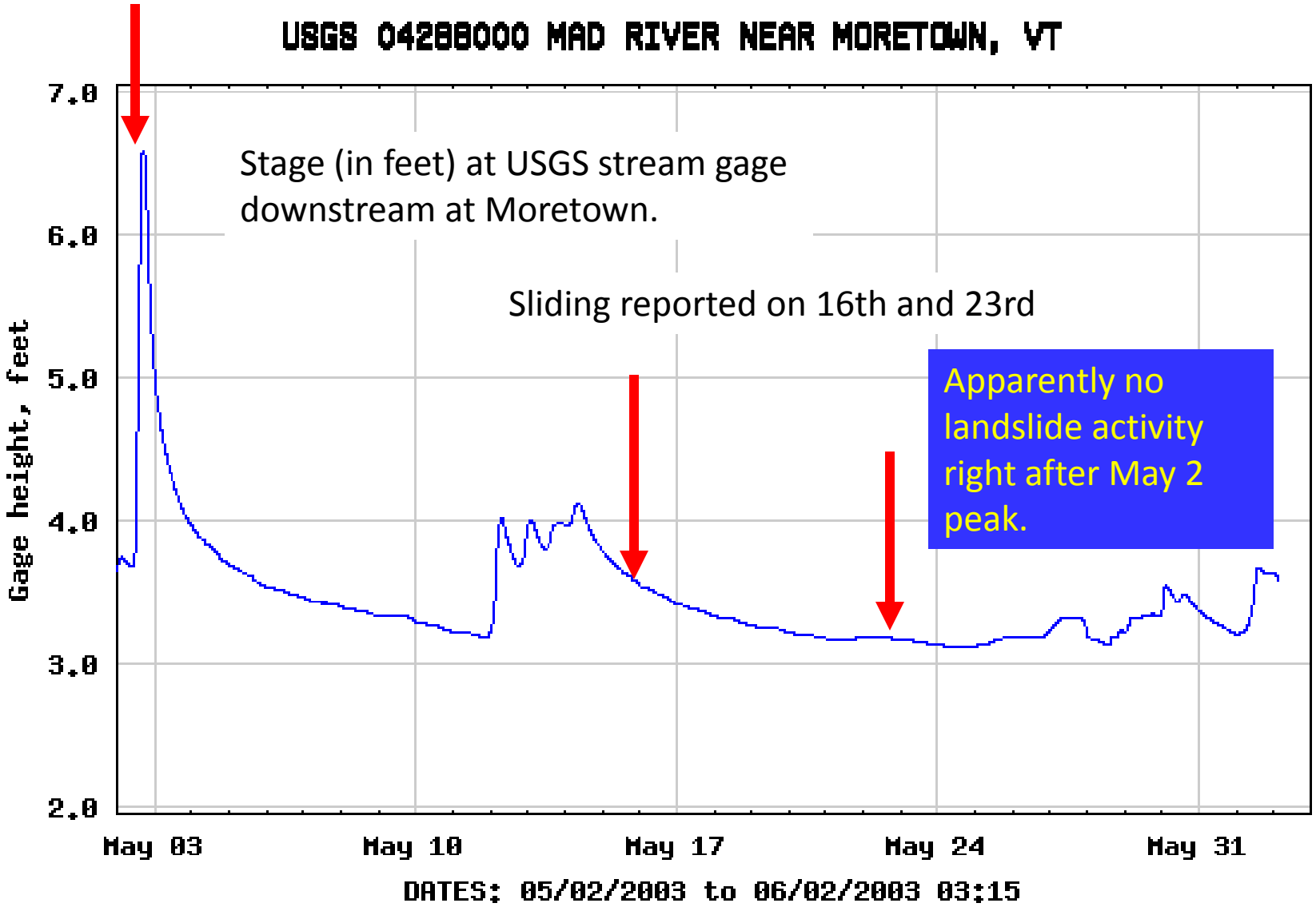
USGS

USGS 04288000 MAD RIVER NEAR MORETOWN, VT



Provisional Data Subject to Revision

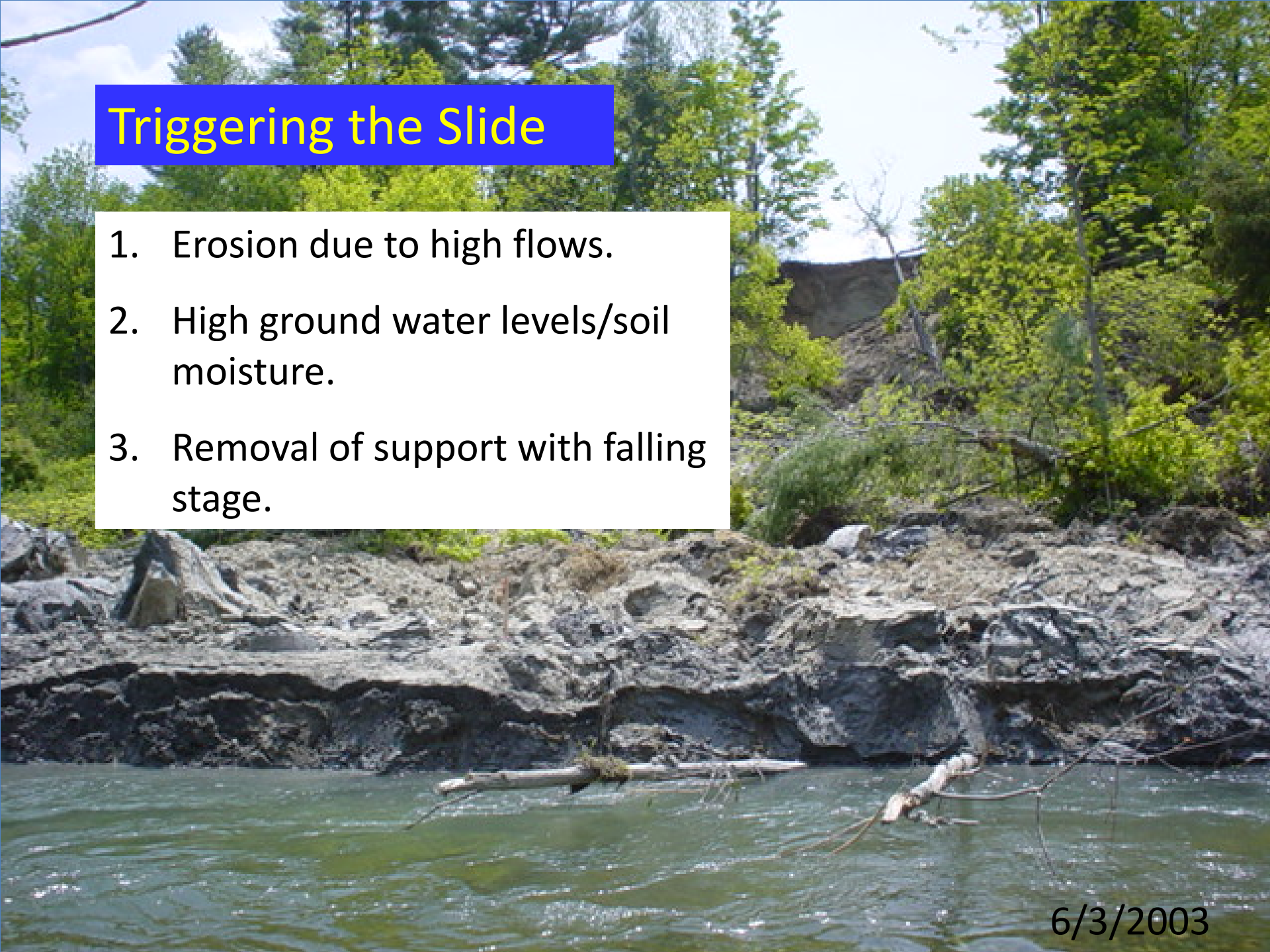
USGS



Provisional Data Subject to Revision

Triggering the Slide

1. Erosion due to high flows.
2. High ground water levels/soil moisture.
3. Removal of support with falling stage.



Rockfall Hazards on Vermont Highways

Vt. Rt. 5A, Westmore

T. Eliassen, Vt. Agency of Transportation


Plane failure: slabs dipping toward road.
Vt. Route 105, Jay
G. Springston, Norwich U. Dept. Geology

I-91 South-bound, Weathersfield

G. Springston,
Norwich U. Dept. Geology

Fracture-bounded Column

Tension Crack

U.S. Rt. 7, Exit 2, Bennington,
G. Springston, Norwich U. Dept. Geology

Rockfall Hazards on Vermont Highways

TOTAL CUTS = 3,647

A (High Rockfall Potential) = 174

Other

RHRS PRELIMINARY RANKING