

Jones Landslide, Pottsville, Arkansas – 2 ½ years of Monitoring



By
J. Michael Howard

Southern edge of the Russellville East 7.5 minute quad



Galla
Creek
Lake

Pottsville I-40 exit

35 15 08.56,-93 01 28.88

Pottsville

I - 40

Pottsville

Background

- The landslide was recognized by Doug Hanson and the author April 18th of 2005 and was sighted from Interstate 40.
- Discussions with Mr. John Jones, land-owner, resulted in permission to visit the site periodically for monitoring and study.
- The author was assisted during his visits by various AGS staff members, including Doug Hanson, Bill Prior, and Scott Ausbrooks.

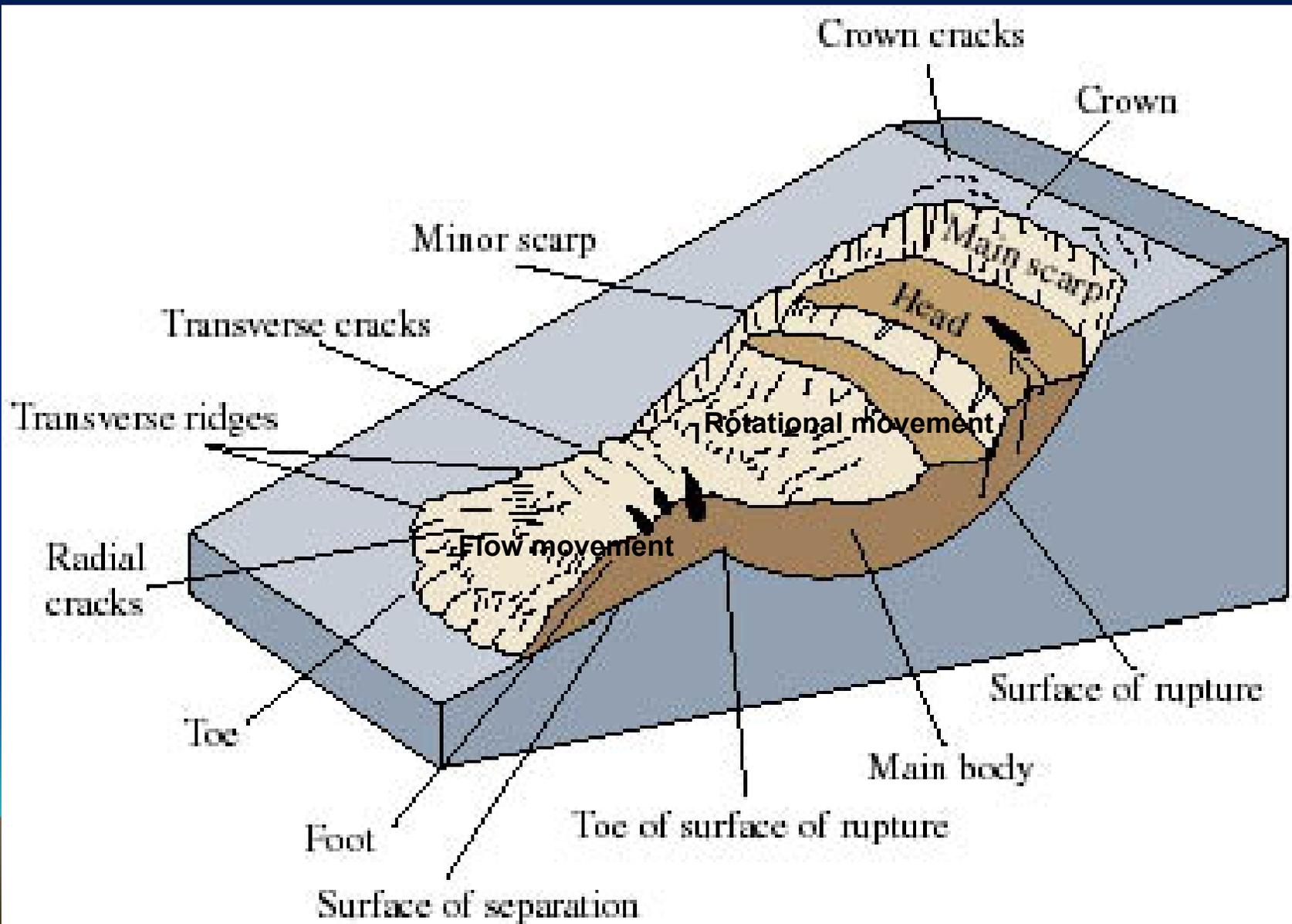


- Mr. Jones stated that the slide occurred soon after heavy rains in October 2004.
- 2004 Weather Notes from NOAA National Climatic Data Center revealed that from August 9th to October 6th the area had no significant rainfall. Then, during the 4 day period from October 7 - 10, there was a total of 4.75 inches of rain. Of that total, 3.53 inches of rain fell on October 8th within 24 hours.
- The October 8th rain event triggered the landslide.



An idealized slump-earth flow showing commonly used nomenclature for labeling the parts of a landslide. Rotational Landslide.

Modified from USGS Fact Sheet 2004-3072.



Existing conditions of site

- The site was clear of vegetation and had been mined for shale fill for the Pottsville overpass and ramp on I-40.
- Average slope for the undisturbed hillside is $\sim 15^\circ$ (3:1).
- Reclamation by contouring the high wall from vertical to about a 2:1 slope was done in early summer of 2005.
- No vegetation was present on the reclaimed area.
- The reclaimed material consisted principally of unconsolidated colluvium. Some large rounded blocks of sandstone from the basal Hartshorne Formation are contained within this unconsolidated material. The colluvium varies in thickness on the SSE-facing hill side, but averages ~ 8 to 10 feet thick.
- At the base of the colluvium is weathered shale/clay, derived from the underlying upper Atoka Formation.
- Total thickness of colluvium plus weathered shale/clay is ~ 15 feet, thus limiting the depth to the surface of rupture to less than 15 feet.

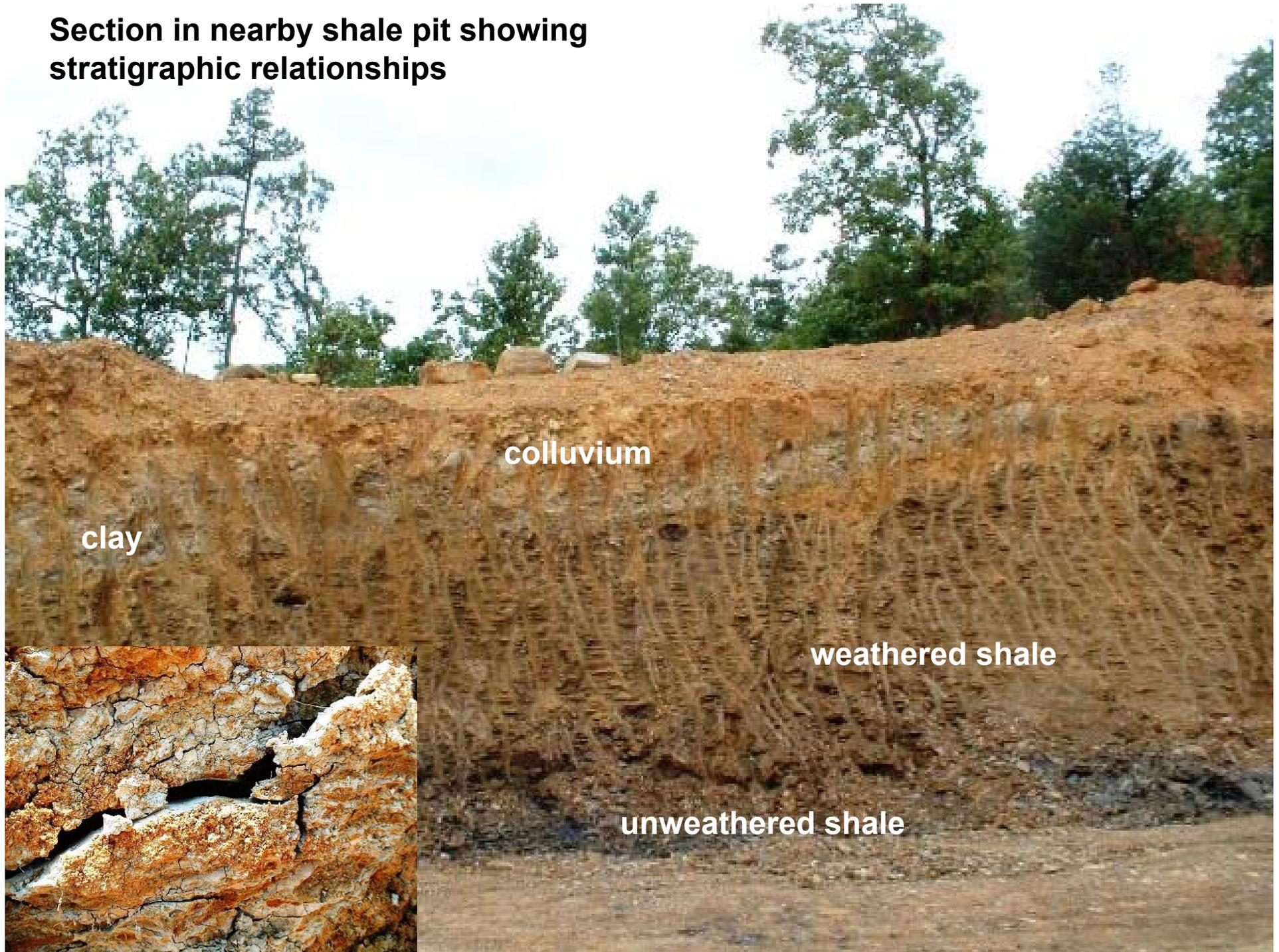




Gently dipping Atoka shales that underlie the weathered zone clays and colluvium.

Abandoned shale pit just west of landslide site.

Section in nearby shale pit showing stratigraphic relationships





35 15 08.56,-93 01 28.88

Interstate 40

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Pointer 35°15'06.13" N 93°01'27.55" W elev 470 ft Streaming ||||| 100%

Eye all 3455 ft



←Note this large ss boulder

Tom Jones house

Jack Jones house

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Pointer 35°15'09.54" N 93°01'28.34" W elev. 502 ft Streaming [|||||] 100%

Eye alt 1738 ft



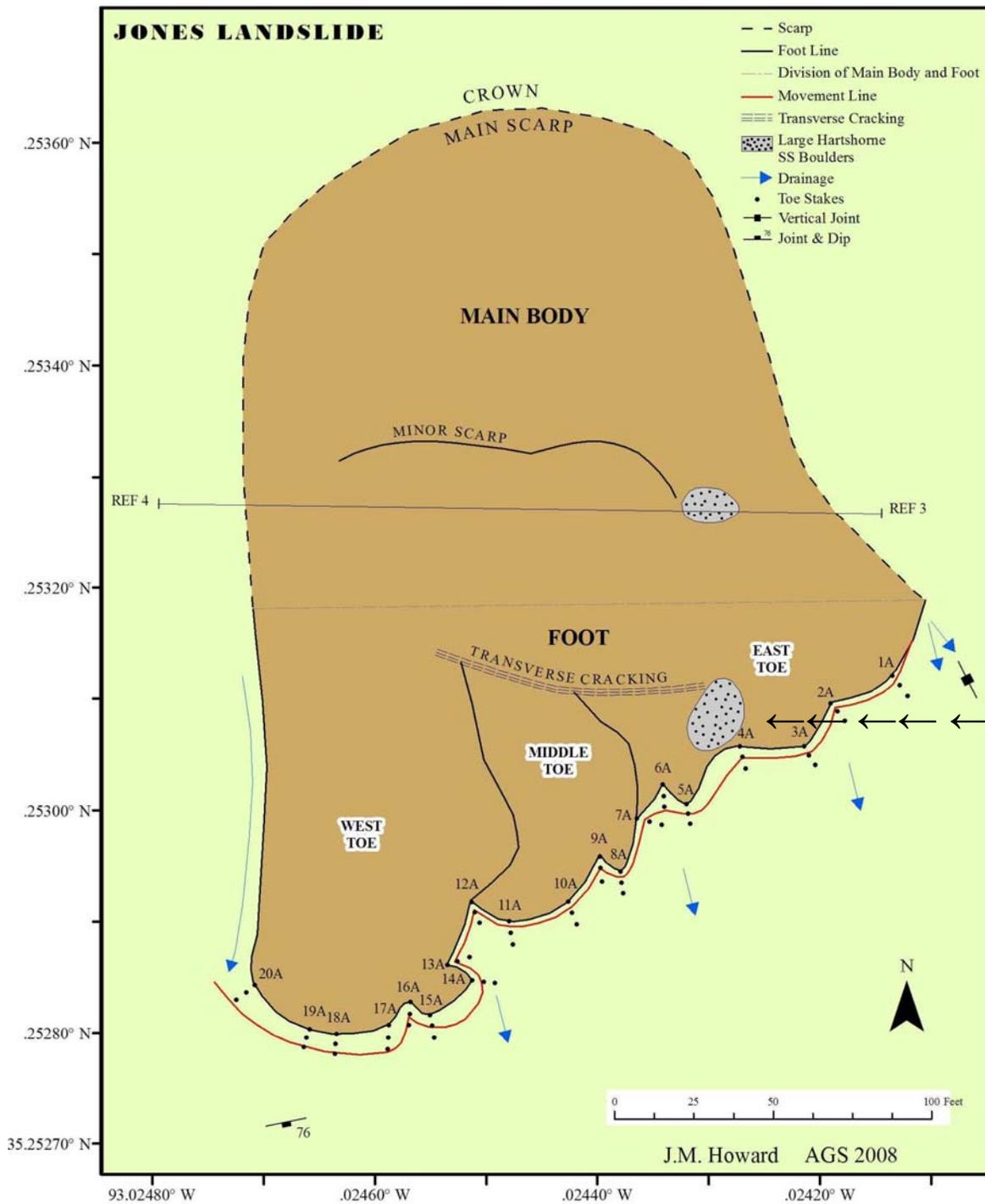
Crown

← Main scarp

Reclaimed area
that remains
stable

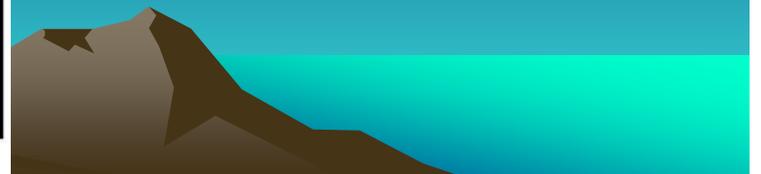
3 toed foot

Bottom of abandoned
shale pit



Map displaying major features of Jones Landslide

Note large boulder in colluvium

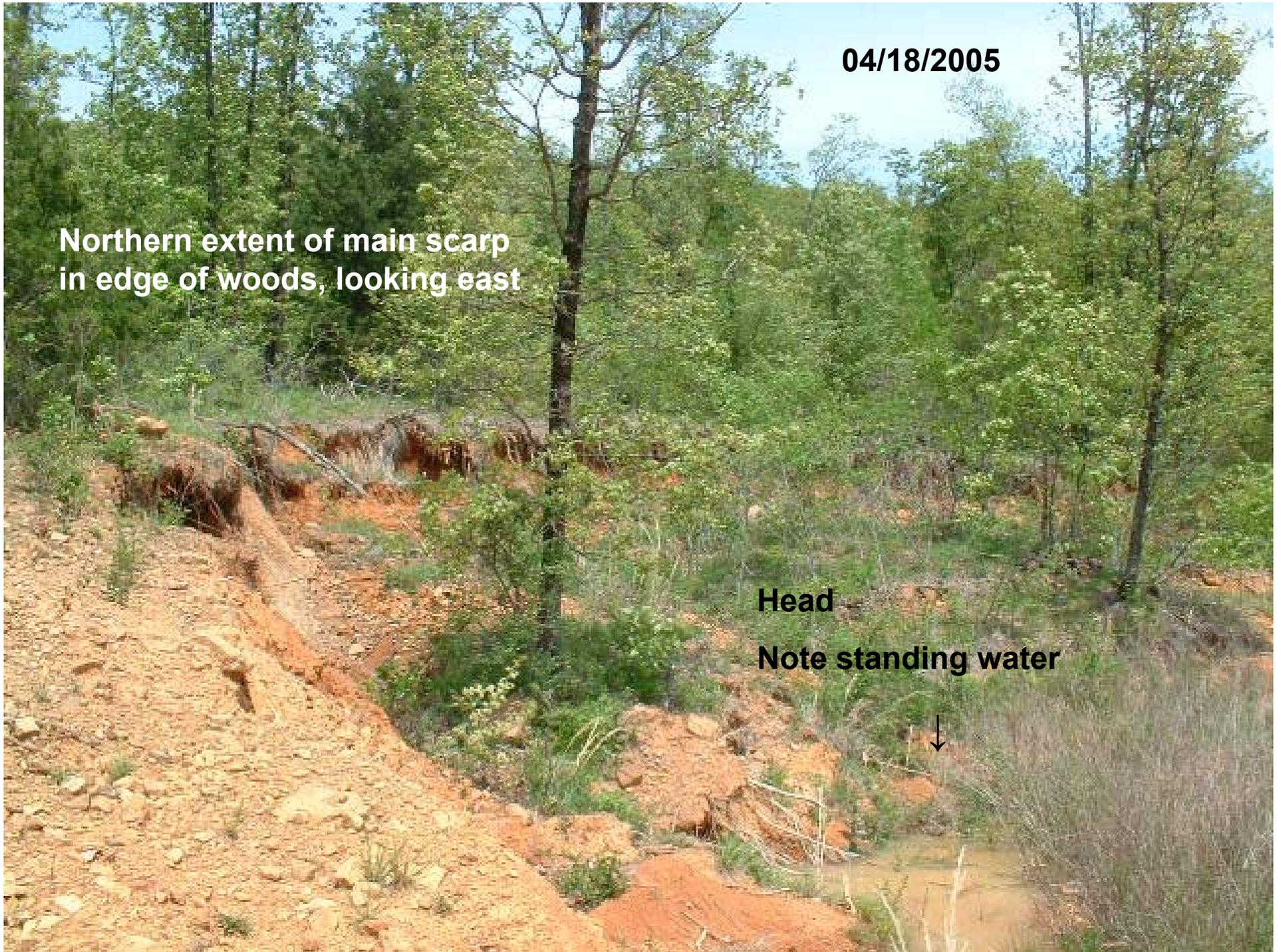


04/18/2005

Northern extent of main scarp
in edge of woods, looking east

Head

Note standing water



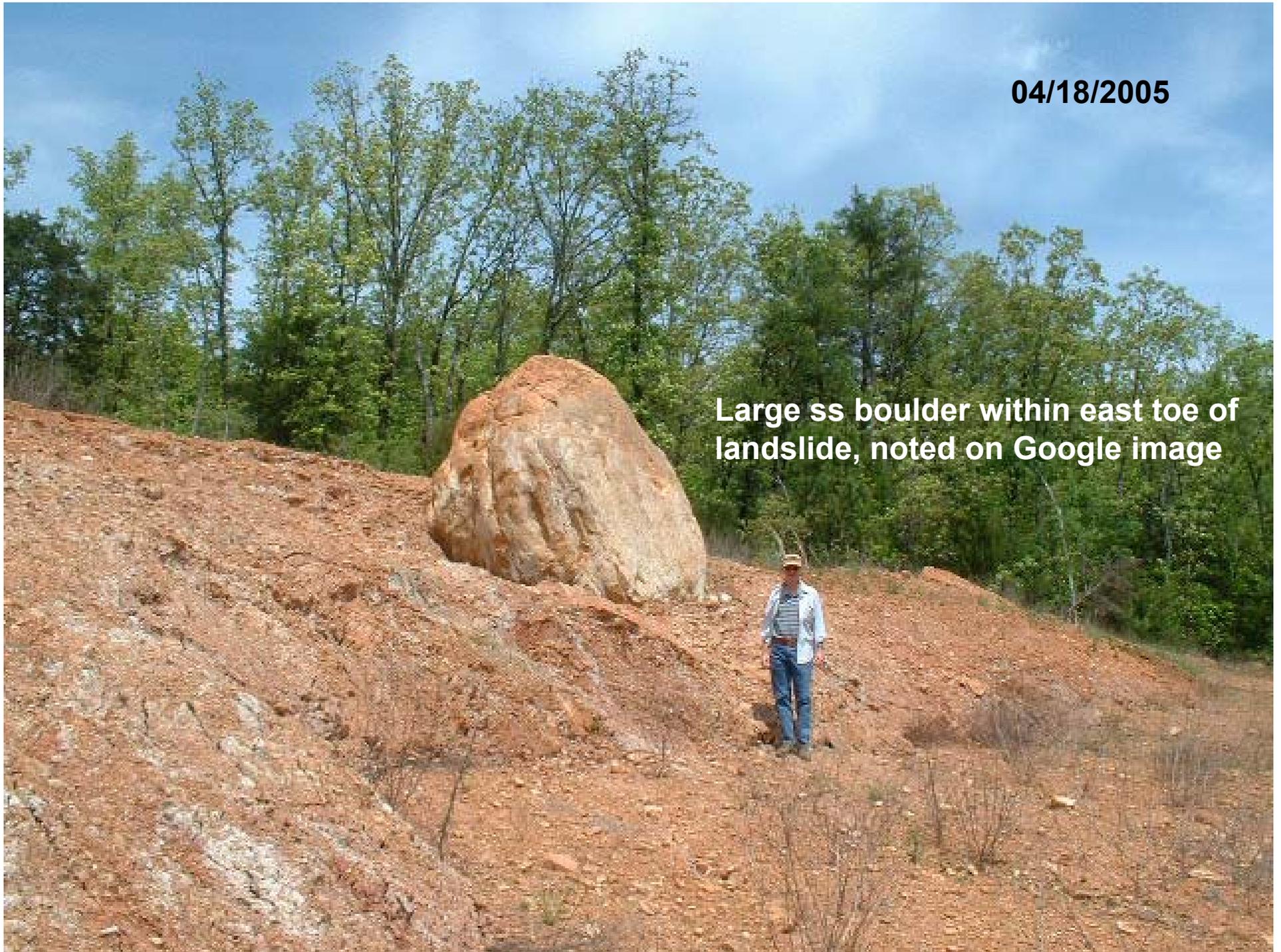
04/18/2005

East bounding minor scarp in
edge of woods, looking northwest



04/18/2005

**Large ss boulder within east toe of
landslide, noted on Google image**





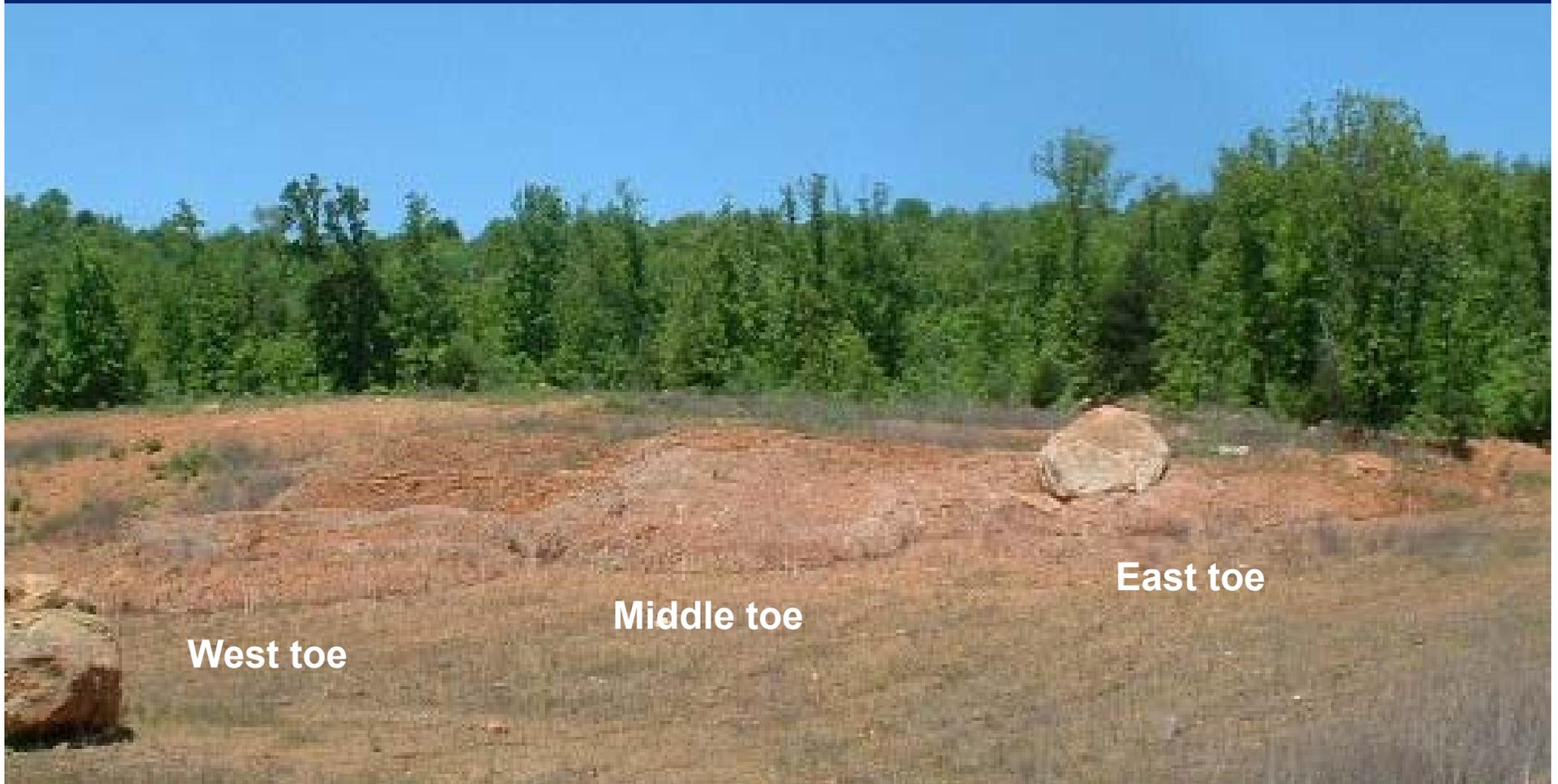
04/18/2005

West drainage

Active west toe

View ~ normal to landslide toe showing 3 distinct toes

04/26/2005



04/26/2005

Minor scarp

Zone of transverse cracks

Middle toe

West toe



Monitoring activities

- Placement of mid-slide stakes on a string line to give a baseline for surface movement down slope. 04/26/2005
- Placement of sets of stakes on toes and normal to toes at 3 foot intervals to monitor movement over time. A total of 20 sets of stakes were set and labeled from east to west. 04/26/2005
- Observation of movement and changes in surface features, scarp, and toes from 05/03/2005 to 08/09/2007.
- 5 observational visits – 3 in 2005, 1 in 2006, 1 in 2007.
- For 1 year, rainfall amounts were charted from the Russellville airport NOAA rain station, just in case another major rainfall happened early in the landslide's history.



**Setting mid-line stakes
04/26/2005**

Stakes painted fluorescent orange

West edge drainage developed just east of minor western scarp

Stable reclaimed area west of slide



**Down slope movement by
05/20/2005, 3 weeks after
setting of mid-line string**



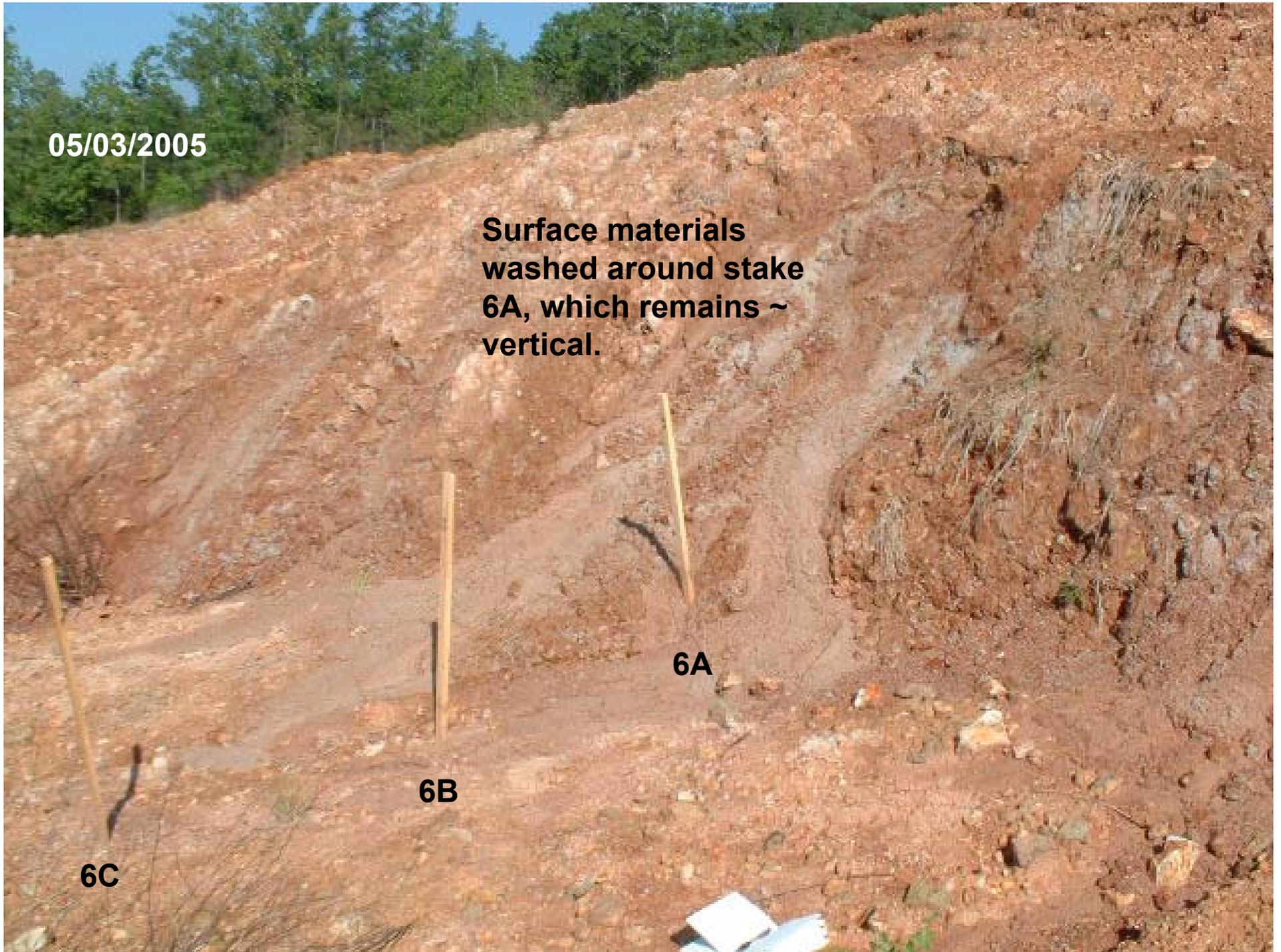
05/03/2005

Surface materials
washed around stake
6A, which remains ~
vertical.

6A

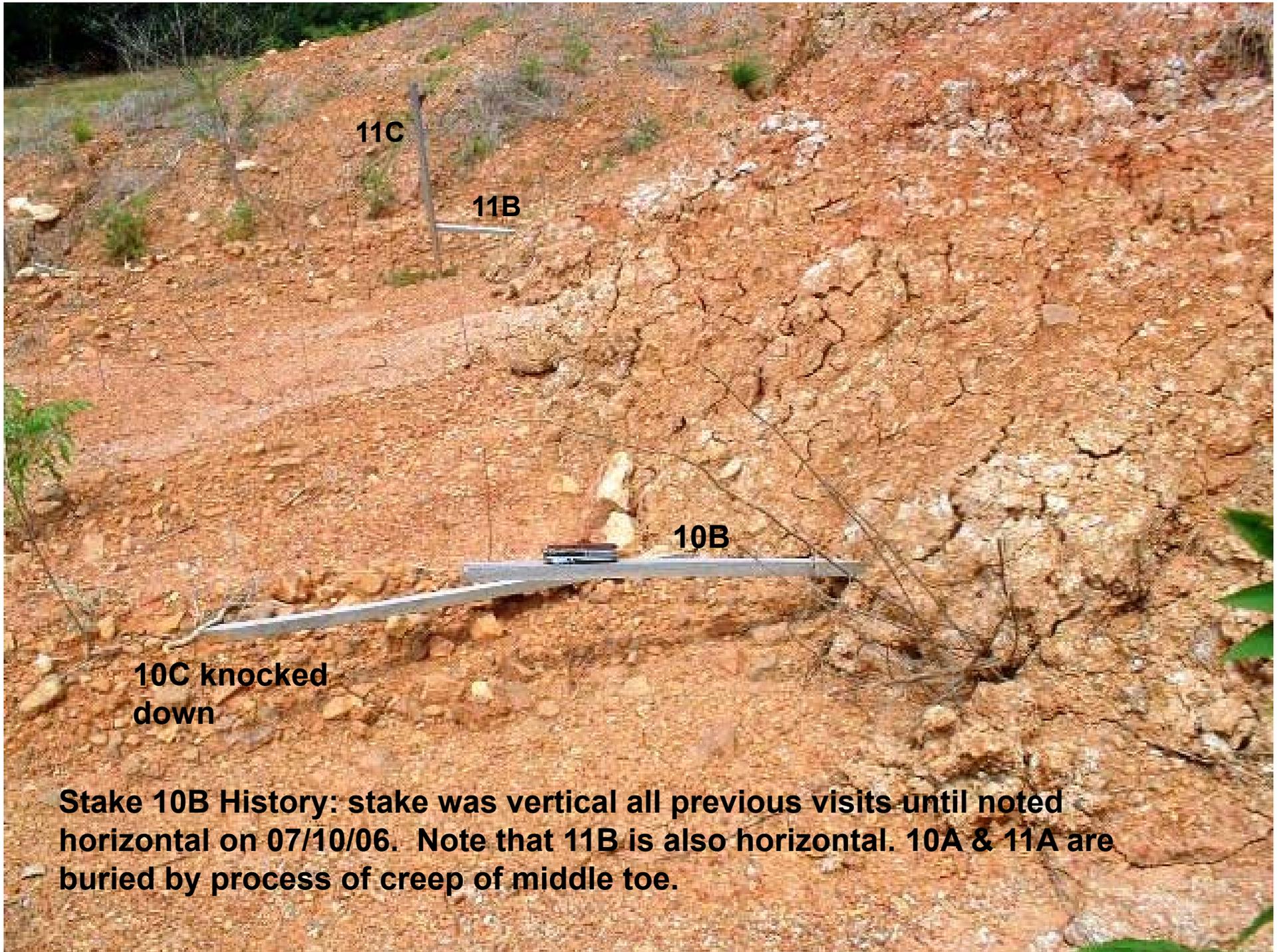
6B

6C



Stake 4A – History: first 2 visits stake was tilted to 30 degrees, 3rd - 5th visits stake was tilted 45 degrees. Last visit stake was buried. Active process was creep of east toe colluvium that pushed the stake over.





11C

11B

10B

10C knocked
down

Stake 10B History: stake was vertical all previous visits until noted horizontal on 07/10/06. Note that 11B is also horizontal. 10A & 11A are buried by process of creep of middle toe.

Creep on middle toe forcing stakes
to lean down slope.

05/20/2005

West toe

Middle toe





**Scott Ausbrooks examining
middle toe creep**

06/23/2005

Surface changes during visits, aside from wash and toe creep

- Formation of new west minor scarp due to development of defined drainage at edge of slide.
- Development of minor block scarp set in main body above mid-line string of slide.
- Development of transverse surface cracks west of large SS boulder extending from east toe onto west toe.
- Development of radial cracks on toes.
- Development of gullies on toes.





**Well defined
scarp crack →**

**Continued erosion by
developing drainage on
west edge of landslide
resulted in development of
scarp crack by mass
wasting of unconsolidated
colluvium into drainage,
looking northeast.**

05/20/2005





Same view, 01/17/2008

**Note down drop of slump
block into the slide and
covering of crack extension
by wash. Look direction is
north.**

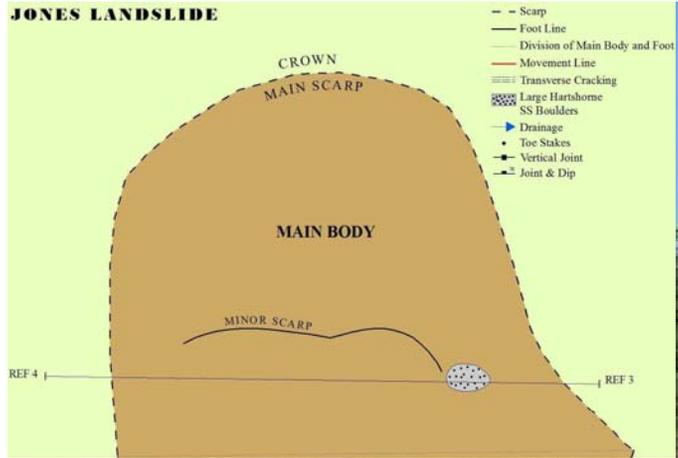


05/01/08

**Continued down drop and
separation of block on west
side to the east**

West scarp again exposed

JONES LANDSLIDE



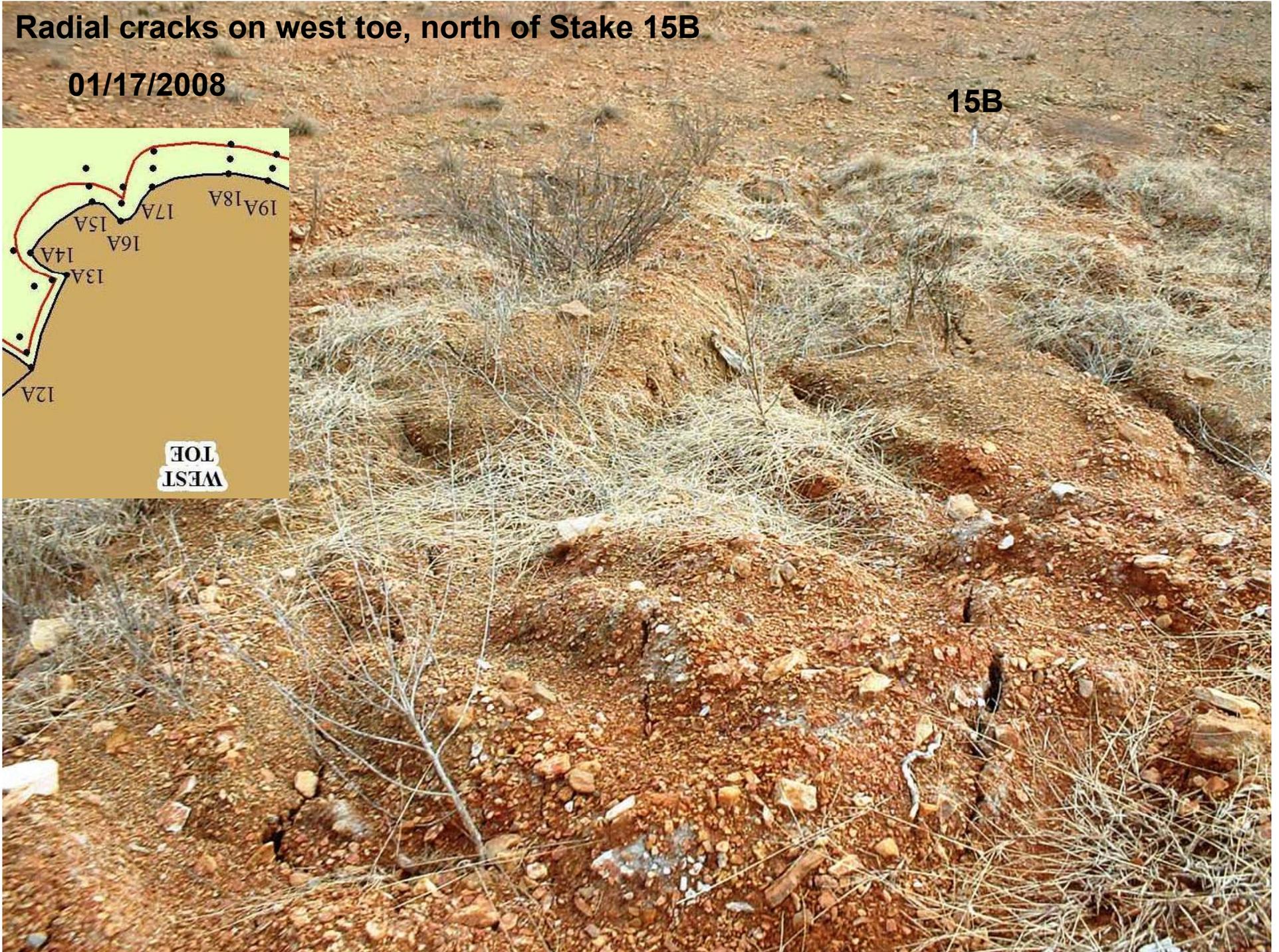
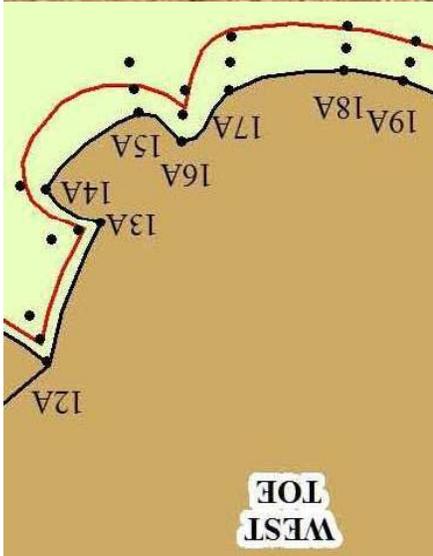
Minor step down scarp development above mid-point of landslide on active middle toe. 05/20/05



Radial cracks on west toe, north of Stake 15B

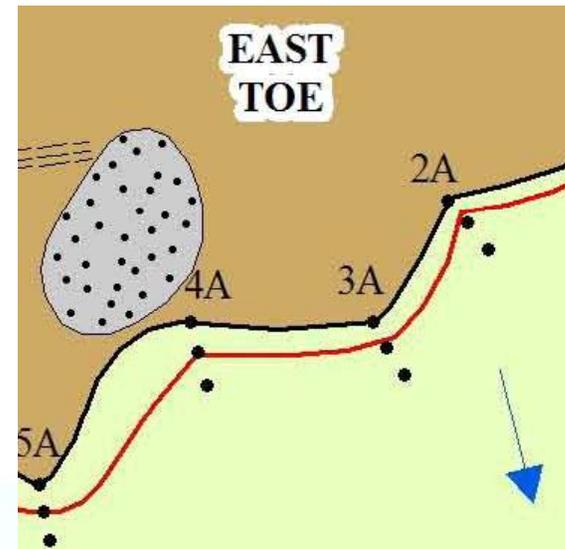
01/17/2008

15B



Active gully development on east toe

01/17/2008



Spring 2008 monitoring

- April 2008 was a period of several major precipitation episodes across Arkansas
- At least one 5 inch rain within a 24 hour period was reported for the Russellville area
- Several notable changes were seen on the May 1st monitoring trip.
- These included gullying, movement across the entire toe area, and the formation of a defined west boundary fracture associated with the formation of a small scarp on the west toe just above where the midline string was placed. Displacement was about 2 feet vertically along the scarp.



**05/01/08 heavy gullying,
both sides of ss boulder,
east toe**

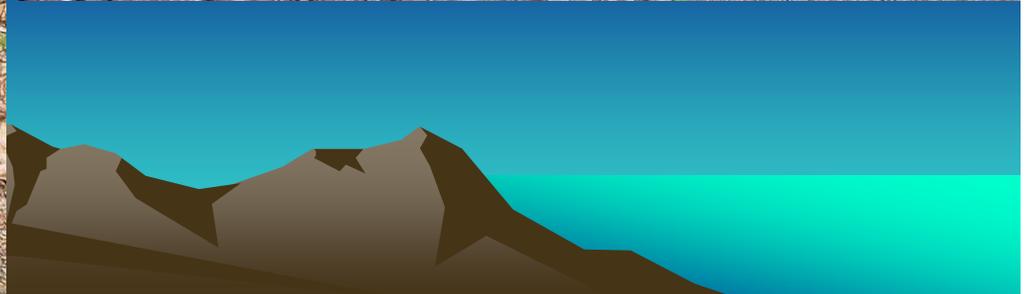


Stake 2C covered, east toe

05/01/08



Middle toe, no stakes visible, 2 year growth pine being pushed over





05/01/08

**2 feet of displacement
on internal scarp, west
toe...looking west**

West edge internal block
scarp, west toe, looking east
05/01/08



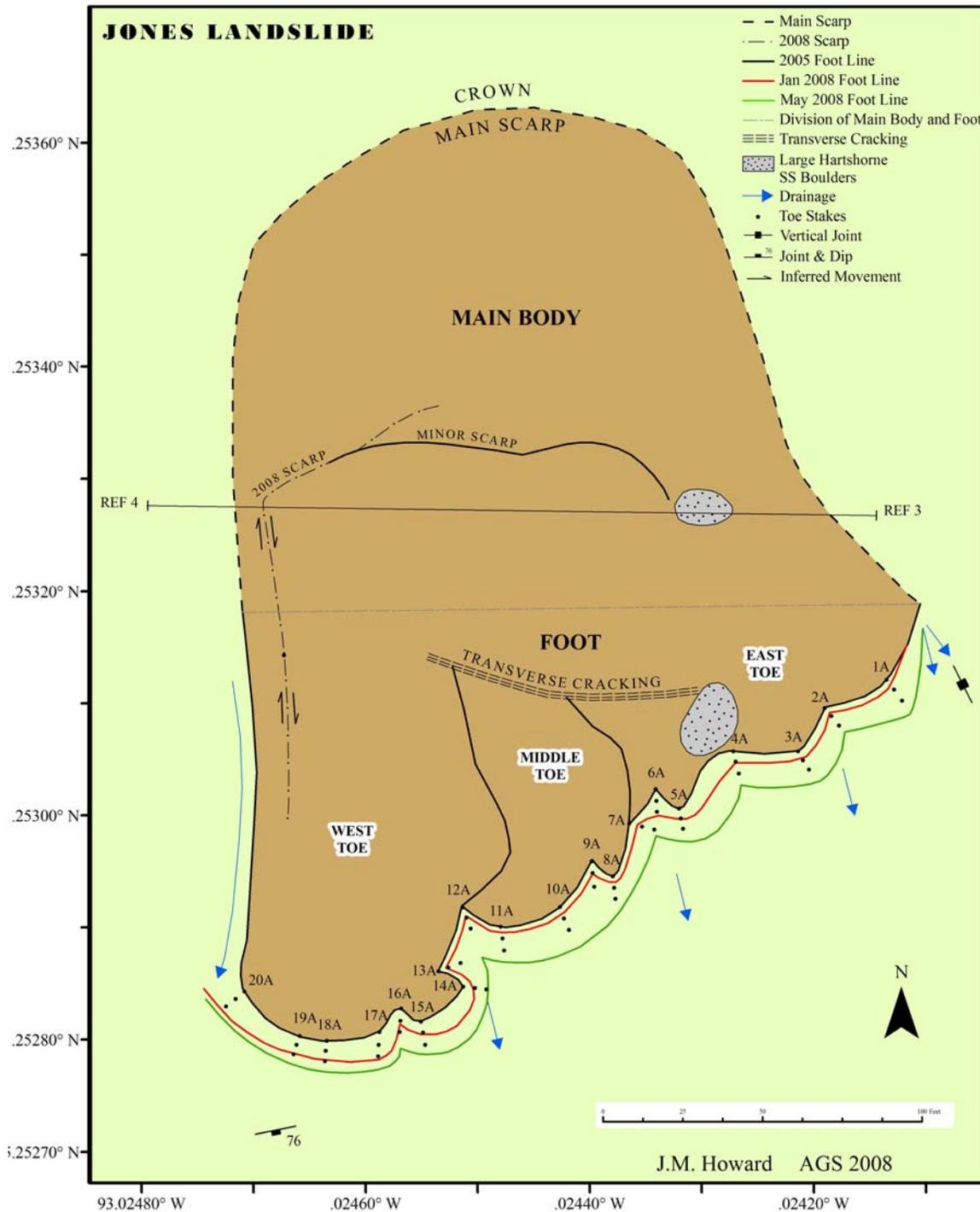
West edge new fracture

05/01/08

Close up with monitoring stakes in place

Both views
looking south





In summary, the Jones Landslide exhibits most of the features of a classic rotational landslide as described by the USGS.

Removal of material during mining created an unstable situation, aggravated by the attempted reclamation and the lack of vegetation.

Heavy rain after a soaking rain created lubrication along the impermeable weathered clay/shale zone at the base of local colluvium.

After the initial rotation and flow, creep has been active. Heavy rains can reactivate portions of the slide.

The site may be usable as a class/field example of small scale mass movement.