CHINOOK PASS CABIN OWNERS' FIELD TRIP 24 July 2010 Saturday afternoon

Meet at Eagle Rock Store at 1:00 p.m. Consolidate participants in as few vehicles as possible.

Stop 1. Junction FR 1500 & S. Nile Road (now WA 410 detour), S of bridge over Rattlesnake Cr
Best place to bring a beginning class in geology—test one's observational powers.
Four views reveal different geology:
NE: steeply dipping SW flank of Cleman Mtn anticline, of Grande Ronde Basalt (GRB) lava flows. Note change in bedding (dip) to SE.
SE: an anomalous structure, possibly a slump block, in NW part of Sanford Pasture landslide.
S: small quarry, containing much talus, covering yellow-white sand of Ellensburg Fm. Overlain by rubble of Meeks Table (MT) lava, a run-up deposit of Sanford Pasture landslide.
W: stratigraphic section of Ellensburg Fm, composed entirely of volcanic rock, within about 12 miles of its eruptive source at Old Scab Mtn.

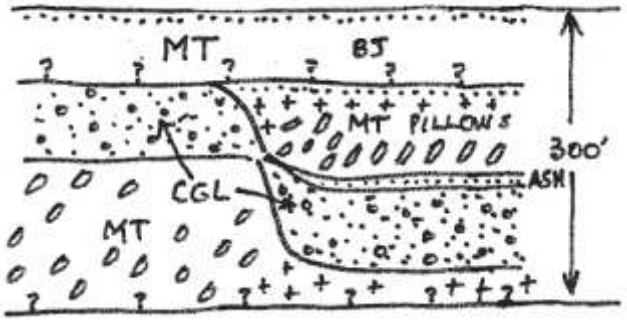
Stop 2. Eagle Rock Store.
What do we know about the Sanford Pasture landslide? Who was the first to recognize it and name it "Sanford Pasture"? Maybe Bob Bentley, now retired geology professor at Central Washington University. Landslide shows clearly on digital map of United States. Possibly one of the largest slides in North America, pre-human history.
Size: 5.5 mi long x 2.1 mi wide x 1000 ft headwall; volume of displaced rock: 2.3 cu mi
Evidence for: large amphitheater with steep headwall and side walls, generally a hummocky topography within the amphitheater.
Evidence lacking: little landslide debris in Naches River valley; most if not all removed by Naches River during time of glaciation, of high stream flow volume, between 1.5 m.yrs. and 15,000 years ago.
No lake deposits have been reported upstream. Realizing that the base of the run-up deposit lies 100-200 ft above present valley level, a lake could have existed as far upsteam as Squaw Rock resort or Rock Creek.
Why no lake deposits? Water was able to flow through rock debris, or small amount of lake deposits, if lake was short lived, have been eroded.
Run-up deposits occur at Eagle Rock; a lesser volume occurs at Horseshoe Bend (Stop 7). Run-up deposits suggest that slide may have been catastrophic-broke suddenly, flowed rapidly, momentum carried debris up opposing slopes. Need observations along W side of Naches River at foot of steep slopes, starting S of here (actually S of Forgey's ranch) and extending to Horseshoe Bend, where few of any roads or bridges give access to west side.
On the other hand, the landslide could have been piecemeal, parts slide at different times.
What clues are revealed in the topography of the landslide? High ridge here descends southward to a low terrace N of Horseshoe Bend. About halfway S another ridge, forms in back of the first ridge, and decreases in height southward. Careful study of the colored geologic maps reveal the ridges. Why the two ridges at the foot of the slide? Why do they descend in height to the S? In back of these ridges the topography is relatively flat. Is there a story here? Maybe the ridges are remnants of the piles of landslide debris?
How old is the Sanford Pasture landslide? No means of dating the slide have been found. I speculate that the Cowiche Gravels, mapped and named by George Otis Smith, in the early 1900s, could be the remnant of a large fan deposit of the Naches River at the time it was clearing

the river of landslide debris. Filling a channel cut into the gravels is the Tieton Andesite lava flow, of 1.64 m.yrs. ago, which indicates to me that the landslide could be 2-3 m.yrs. old.

Stop 3. SW corner of Nile landslide.
Occurred 11 October 2009 Sunday before dawn? Largest landslide in Washington in historic time. Covers >80 acres. Damaged several homes (destroyed, homes had to be evacuated), and diverted Naches River. Interpreted to have occurred in two stages or pulses. S part flowed into Simmons Rock Pit and shoved nearby hill about 5 ft west. Second or N part, smaller in size, flowed in mass, displaced highway and Naches River, causing ground to swell several feet and buckle, thereby destroying homes. From here damaged homes can be viewed but property not entered. A trail climbs snout of landslide but time is too short to walk it.

Stop 4. Drive, hopefully, to saddle E of hill of damaged brown residence. Observe fractured ground. How deep, wide, and long is the fracture? Which side moved? How much?
Return to hwy 410 and head S.

Stop 5. Bedrock hill of Meeks Table lava flow with interbed of conglomerate and overlying tuff (volcanic ash).
One of the most intriguing exposures along the Naches River and WA 410. How does a lava flow encorporate a conglomerate deposit? MT here consists almost entirely of pillow lava, indicating that flow advanced into water, possibly a stream. Note that conglomerate has foreset-bedded cobbles, indicating direction of stream flow.
Some geologist argue that this hill is a landslide block but preservation of bedding, especially the finely layered tuff, indicates to me that this hill is in place and Sanford Pasture landslide overroad it.
Continue south.



Stop 6. Forgey Ranch along WA 410.
From here S to Horseshoe Bend, W side of valley is bound by ridges with steep slopes. By studying ridge through field glasses what are indications of dipping lava flows?
A short distance S of here valley narrows and E side is bound by cuts, some steep, in landslide debris.
Continue S to Horseshoe Bend.

Stop 7. Horseshoe Bend
Williams quarry on inside of bend.
Attention is drawn to hoodoo rock across Naches River, a part of landslide run-up deposits which cap ridge. Rims of MT lava flow occur in base of ridge. Ortley lava flow underlies highway. A good sequence of gravel deposits underlie terrace to N. Well sorted stream gravels form lower

part of deposits. Unsorted debris flow deposits form upper part. A darker-colored soil horizon may separate two deposits. Similar deposits are exposed along highway. Here upper debris flow deposit contains 2-3 ash (tuff) beds. These deposits have not been studied, but I speculate that lower deposit was stream deposit before Sanford Pasture landslide. Upper deposit is part of landslide debris that was carried away by the ancestral Naches River. A date of the tuff may give a minimum age of the landslide.
Return N to S Nile Road.

Stop 8. Distant view of Nile landslide from new highway stretch. Picture stop.

Head N to junction of N Nile road with WA 410. TURN right and head S to barricade on NW side of Nile landslide.
Stop 9. NW corner of Nile landslide.
Walk S to foot of steep front of landslide debris, composed entirely of basalt lava blocks. Note warped and broken highway surface and bent guard rail. A steep trail ascends landslide front to its top. Does this trail join with one from the S? WA DOT has diverted Naches River into its new course at this location. A short article in the *Oregonian* newpaper reported that DOT was planning a new highway around the front of the landslide. This plan may not necessitate building one or two expensive new bridges.
About midway between the barricade and the landslide, cuts along the east side of the highway expose a steeply dipping (striking N63°W, dipping 74°NE) thrust fault with hanging wall breccia over 4 yds thick, in the McCoy Canyon lava flow. This fault is buried by the Sanford Pasture landslide. But it suggests that the amphitheater of the landslide is cut by many faults, contributing to the weakness of the landslide mass and its cause.

END OF FIELD TRIP

Illustrations:

A. (Figure 20)* Google image of Sanford Pasture landslide, area of this field trip.

B. (Figure 22)* Geologic maps of parts of Hammond's field maps, Nile and Milk Canyon 7.5' quadrangles. (Two adjoining sheets)

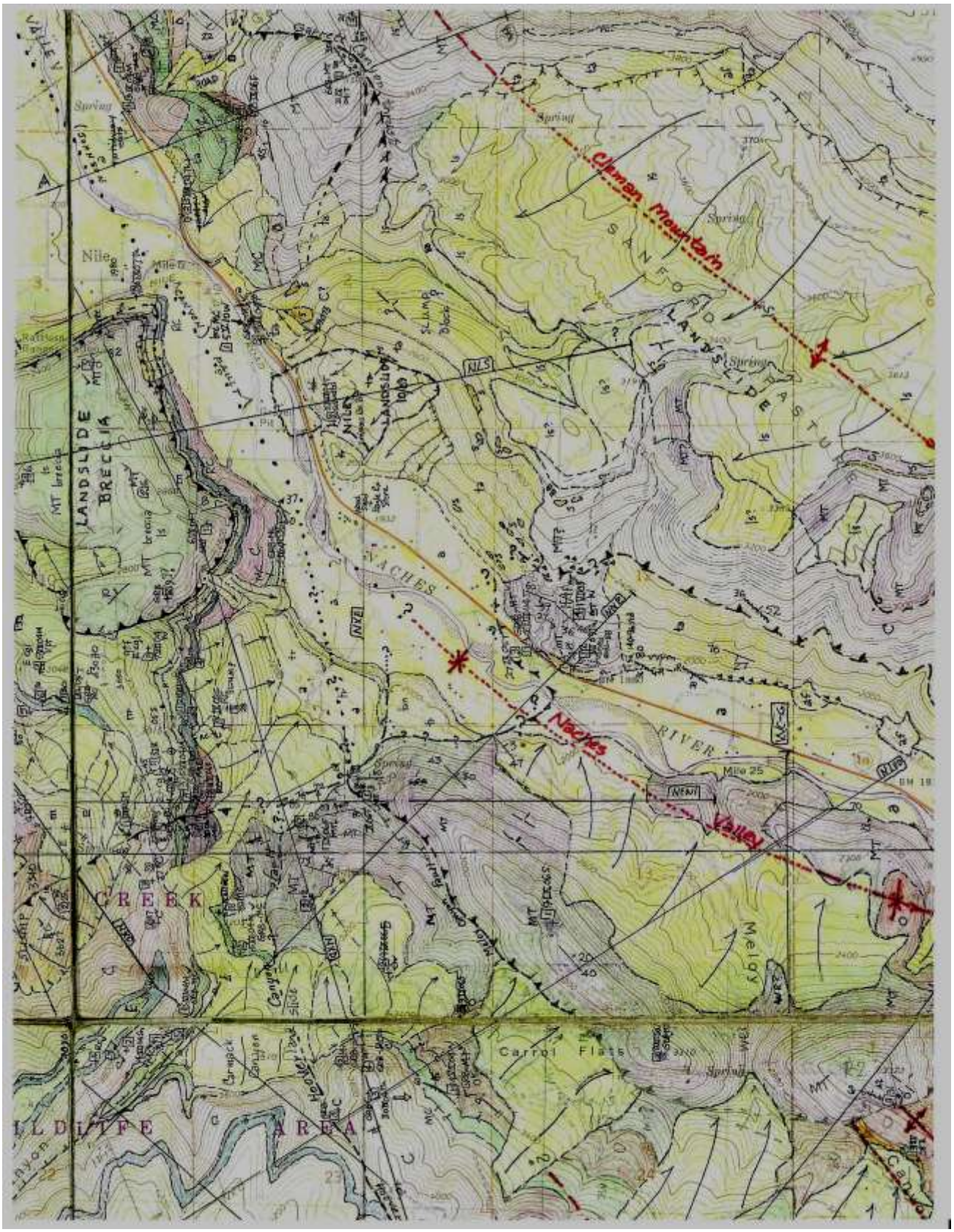
C. Yakima newspaper or WA DOT photograph of Nile landslide from the south.

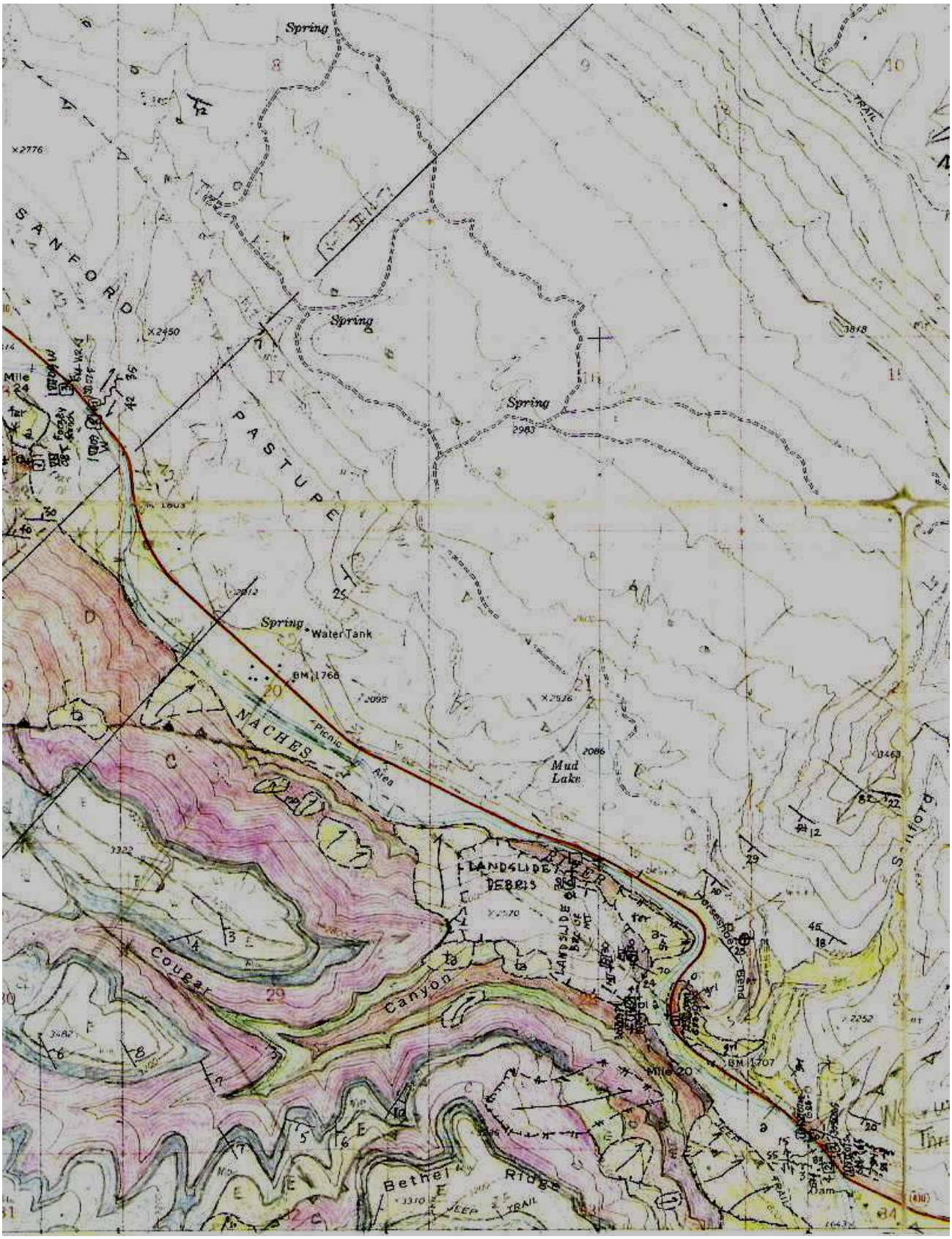
D. Google image of area of landslide with red line approximately outlining Nile landslide.

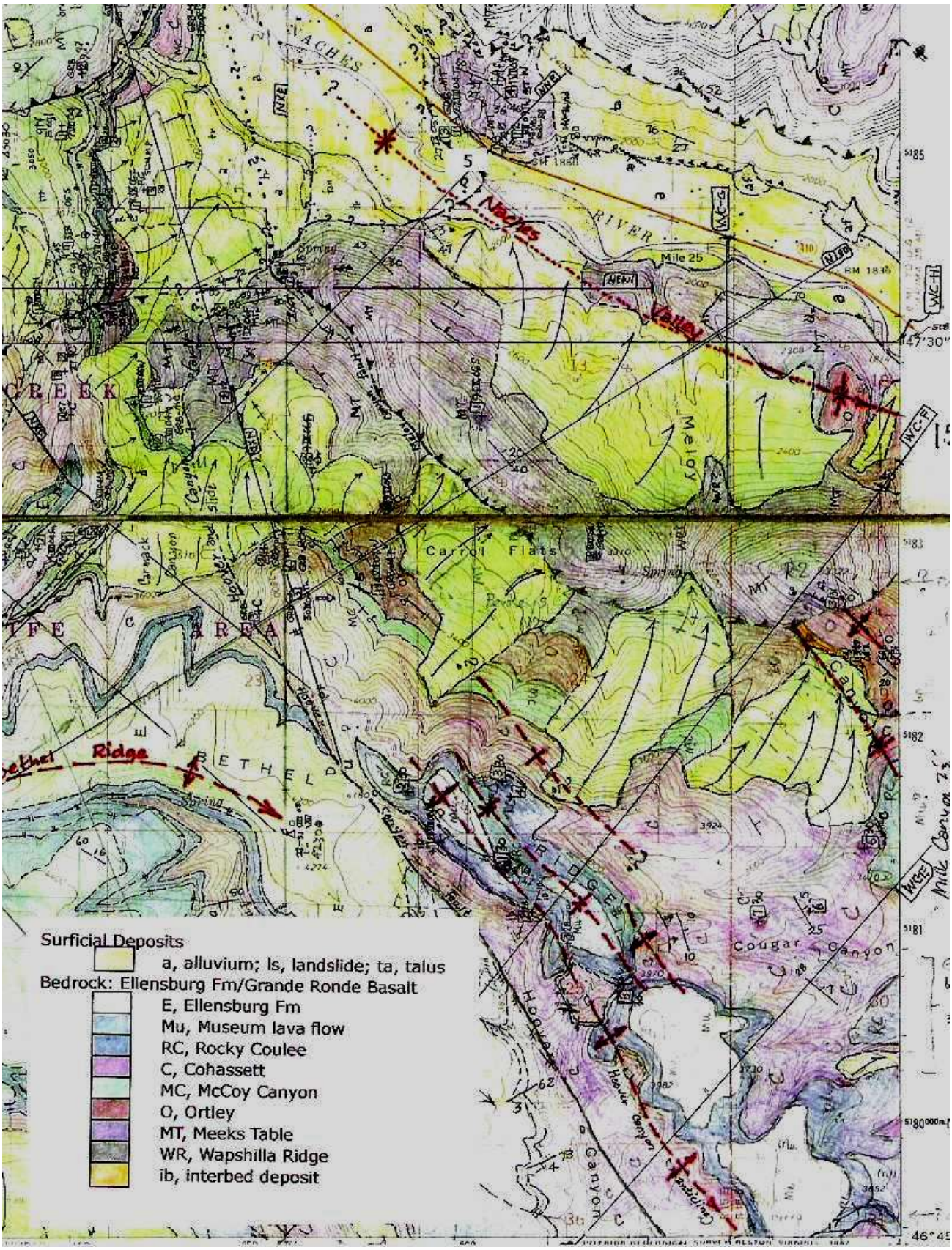
E. (Figure 16)* Cross sections of Cleman Mtn and Bethel Ridge anticlines. A of Cleman Mtn show structures N of landslide; B shows area of Sanford Pasture landslide.

*From P.E.Hammond's Northwest Geological Society field trip guidebook, June 2010.

Figure 20. (Stop 1-3) *Google image of Sanford Pasture landslide. Naches River and hwy WA 410 along base of landslide. Horseshoe Bend, Stop 1-5, in lower right. Sanford Pasture landslide is 5.5 mi (8.8 km) long, 2.1 mi (3.4 km) wide, and about 1000 ft (300 m) thick, giving a volume of about 2.3 mi^3 (9 km^3). Outlines of landslides and titles by Jack Powell (2009).*


Clanan Mountain
Naches
Valley
LANDSLIDE BRECCIA
SANFORD LANDSLIDE
NACHES
RIVER
CREEK
Carrol Flats
Spring
Mile 25


Spring
SANFORD
PASTURE
Spring
Spring
Spring
Water Tank
BM 1768
NACHES
Picnic Area
Mud Lake
LANDSLIDE DEBRIS
Cougar Canyon
Bethel Ridge
BM 1707
Mile 20
TRAIL
JEEP TRAIL


Surficial Deposits
a, alluvium; ls, landslide; ta, talus
Bedrock: Ellensburg Fm/Grande Ronde Basalt
E, Ellensburg Fm
Mu, Museum lava flow
RC, Rocky Coulee
C, Cohassett
MC, McCoy Canyon
O, Ortley
MT, Meeks Table
WR, Wapshilla Ridge
ib, interbed deposit
Carroll Flats
Mile 25
Cougar Canyon
Ridge
Valley
Melony
RIVER
CREEK


Nile landslide October 11, 2009

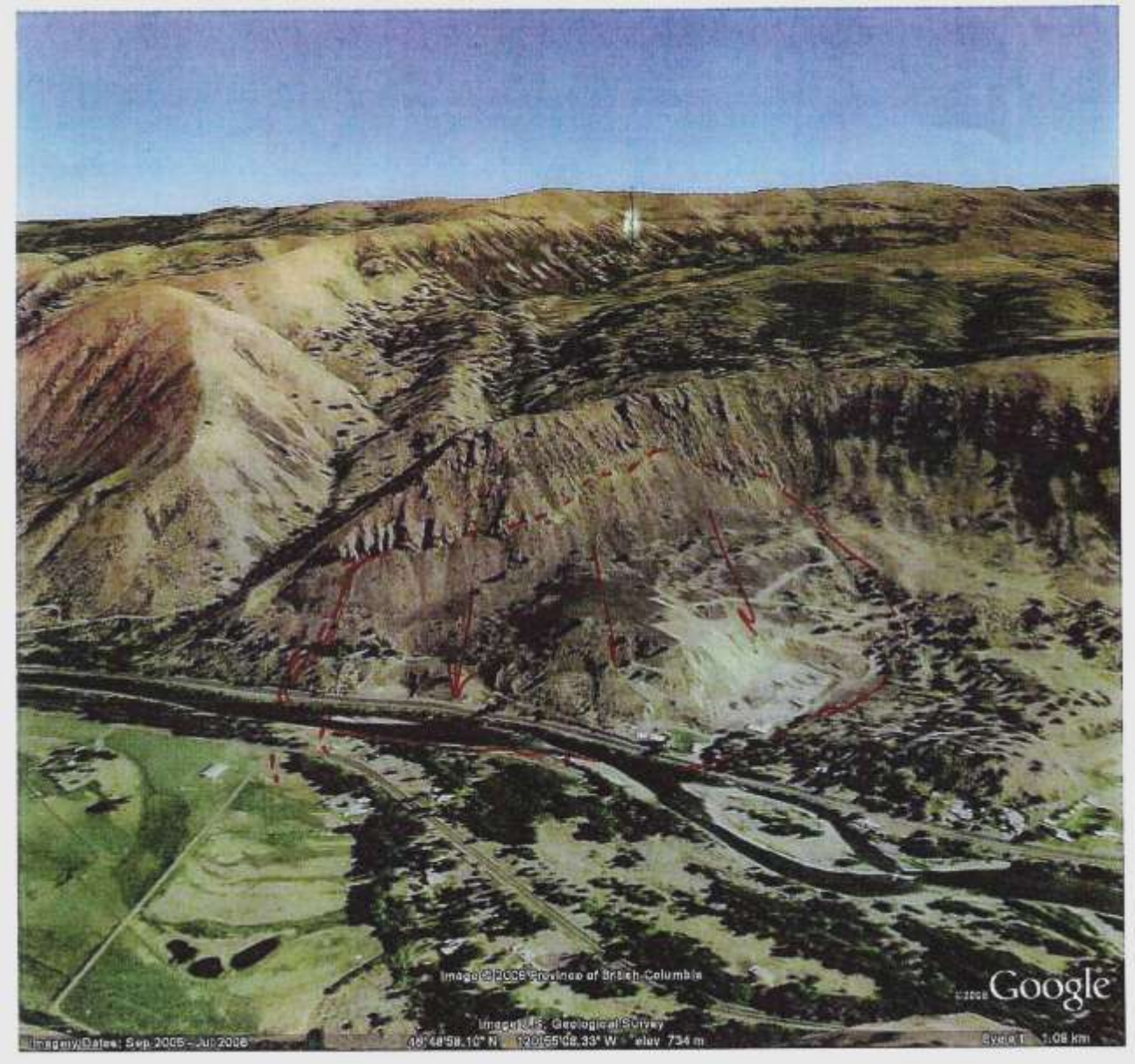


Image © 2008 Province of British Columbia
Image U.S. Geological Survey
Imagery Date: Sep 2005 - Jul 2008
elev 734 m
Google

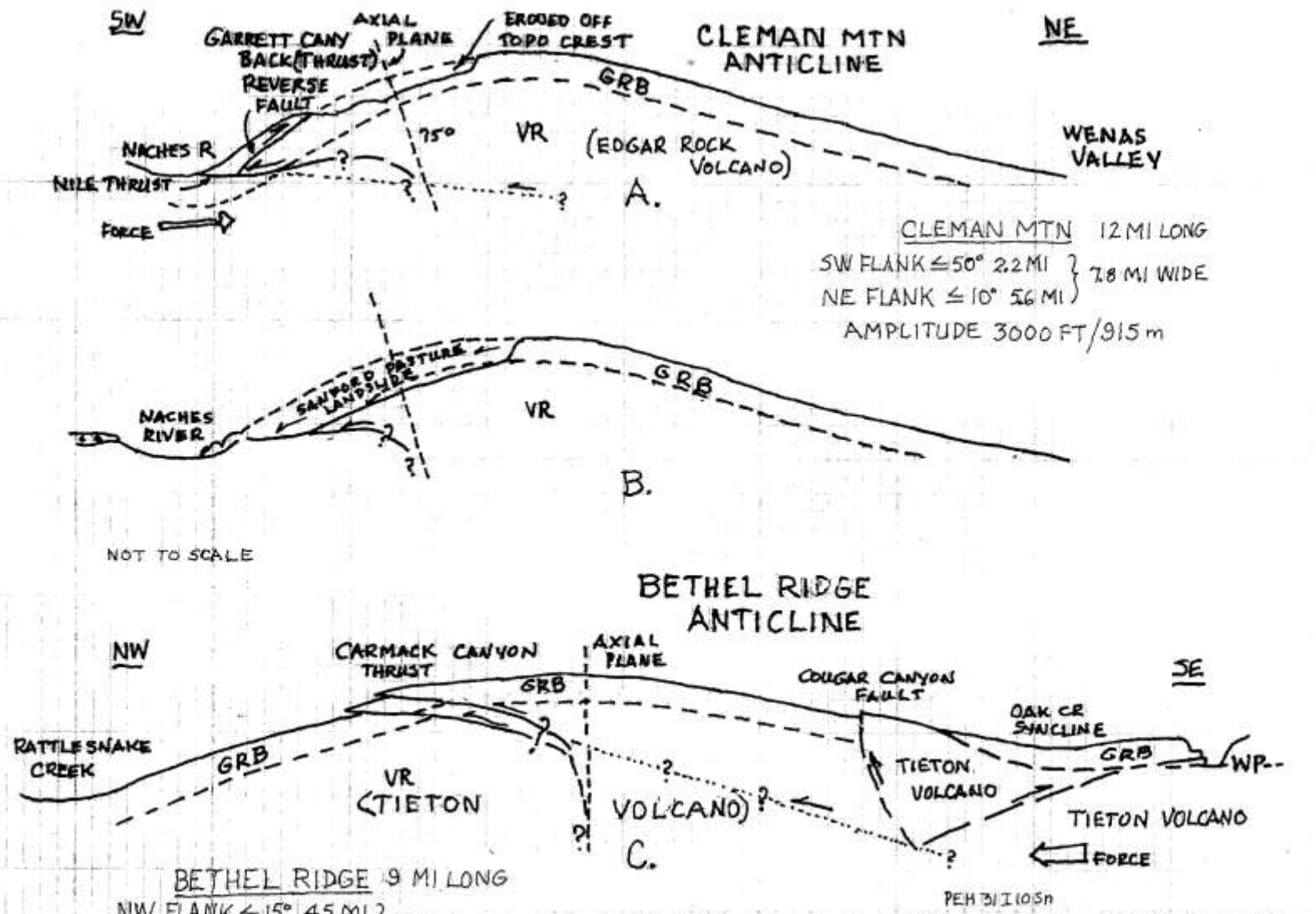


Figure 16. *Simplified cross sections through Cleman Mountain and Bethel Ridge anticlines. (A) Cleman Mountain north of Sanford Pasture landslide. Northeast flank of Cleman Mountain not mapped. (B) Cleman Mountain at Sanford Pasture landslide. (C) Bethel Ridge anticline. Note higher position of thrust faults in Bethel Ridge anticline; also, Windy Point (WP) thrust on southeast side of Bethel Ridge could be forethrust. Then Cougar Canyon and Carmack Canyon could be back thrust.*