An aerial photograph of a volcanic landscape. The central feature is a large, flat-topped mountain peak, likely a cinder cone, with a dark, rocky surface. The slopes are covered in dense evergreen forests, interspersed with areas of exposed volcanic ash and scoria. The background shows more distant, hazy mountain ranges under a clear blue sky.

Mass Wasting in the Swauk Watershed, Washington: Spatial Extent, Timing, and Implications

Karl Lillquist

Geography Department & REM Program
Central Washington University

Recent Central WA Mass Wasting

Blewett Pass highway still closed today

Blewett Pass highway, closed since Thursday due to a slide and roadway washouts from what has been termed the "Great Flood of 1996," will remain closed to all but local traffic until state crews can make it to the site to assess the damage and make repairs, according to Don Senn, regional administrator for the state Department of Transportation from Wenatchee.

And state crews already have

their hands full — officials said Stevens Pass, White Pass and Satus Pass remain closed this morning due to water over the roadway, washouts and mud and rock slides. State Highway 97, the Blewett-Swauk Pass Highway, has problems on both sides of the Wenatchee range — bridge washouts and slides.

Damage to the bridge at the Liberty turn-off was first reported by

local resident Barb Snyder late Thursday night when she discovered a guardrail was missing from the bridge and portions of the roadway had eroded.

Contrary to what appears to be structural damage to the bridge, "it is the wingwall on the side of the bridge which is washed out," according to Senn. The wingwall is the concrete wall which leads the creek under the bridge.

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PIONEER DAYS
PHOTOS / 6

Daily Record

ELLENBURG, WASHINGTON • Monday, July 8, 1996 • Volume 97 No. 140 • 50 CENTS, 33 CENTS HOME DELIVERY

SPORTS
ANDERSON HAY 3-2
AT TOURNEY / 10

Fierce storm, slides close Canyon Road



By ANDREA SULLIVAN
Daily Record Staff Writer

ELLENBURG — Torrential rains straddled fourth of July, causing washouts and mudslides as well as a slide on a five-severe mud and rock slide closed portions of State Route 97 from midpoint 38 to 21 Friday afternoon.

According to Washington State Patrol Sgt. Scott Martin, the slides, triggered by an hour-long break rain storm, have closed the scenic corridor to traffic for an indefinite period of time.

"We were called around 2:40 Friday afternoon with reports of slides covering the roadway," Martin said. "There are at least five large slides — two of which are a third of the way into the river. There are also several smaller slides and the road is washed out at the Wynne Clark."

A two-man BNSF train crew became trapped when their freight train encountered a slide blocking the tracks. Neither train was reported to have sustained any injuries and both were rescued by Kittitas County Sheriff's Department Detective Clayton Morley and reserve deputy with the department's at head, Martin said.

Martin said numerous campers, cottagers and vacationers straggled between the slides, prompting him to turn northbound to escape the danger on the Canyon Road. No one was reported injured.

"Theoretically, better sites are one of the best to come on scene," Martin said. "I parked his car across the road at the first slide he came to at about mile post 21. From there he started walking, looking for anyone trapped or injured."

Estimates of rainfall and, in some instances, late-morning rain, vary. The sudden storm also being blamed for widely-dispersed power outages throughout the Ellensburg area. Earlier reports by the Washington State Patrol in Pendleton, Ore. said the storm hit the Ellensburg area about 2:30

of rain throughout the Kittitas and Yakima valleys.

An emergency flood-guard warning was issued shortly after the storm hit the region. In Ellensburg, reports said, incidents of roadways in the Badger Pocket area being washed out and irrigation ditches being breached are also being attrib-

uted to the storm as are reports of flash flooding in downtown Ellensburg during the storm.

"I am amazed how much damage was caused by a 45- to 60-minute rain storm," Martin said. "Everything turned out quite well for all the damage we had. It was amazing no one was hurt."

The Cascade Irrigation District main canal sustained two breaks in a two-mile stretch at the end of its system, located between the Badger Pocket area and the Fort and south of Ellensburg, according to Tony Jettner, CID manager.

"The major break is in the area between Payne Road and Stone Road where an estimated 40-foot section of the canal was washed out by cascading stormwater that dug a 25-foot deep channel. Another break in that same area is about 12-feet wide and 5-foot deep."

Jettner said the district had an emergency team, the Carlson Creek Logging Co. in Pendleton, take repair work starting early this morning. Irrigation water has been turned off to the damaged stretch, but Jettner said he expects repairs to be completed sometime Wednesday and water deliveries to resume in Friday.

He also said there were several

slides on the steep slopes of Mountain Ridge washed out or damaged irrigation canal access roads. These, too, will have to be repaired.

Jettner said the hope is that irrigation water demand will be low to that area for awhile due to the heavy rains that saturated the ground on Friday. According to the national weather data collection station at the city of Ellensburg, "weather" treatment plant, 27 of an inch rain fell during the Friday July 6th.

Kittitas County Sheriff's Department crew and contractor Greg Fisher broke logs Friday afternoon to seal a KRD canal breach that runs underneath Interstate 92 near the Fort and south of Ellensburg, according to KRD Manager Jack Carpenter.

The KRD hired Fisher on an emergency basis to provide track hole and backhoe equipment services, including KRD types and heavy equipment at the site. Also filled with debris was the canal on the north side of the breach.

Ernie said, great rocks and other debris from I-92 and the Mountain Ridge slide filled the 45- to 60-foot long hole that is 15-foot across. The soil is part of the subsoil system that serves several irrigation and residential areas.

He also said there were several slides on the steep slopes of Mountain Ridge washed out or damaged irrigation canal access roads. These, too, will have to be repaired.

Photo and CANALS, Page 14

INSIDE
'OKIE' CULTURE
LIVES ON / 7

Daily Record

ELLENBURG, WASHINGTON • Tuesday, April 25, 1995 • Volume 94 No. 098 • 35 CENTS

SPORTS
ROGERS WINS 10th
FOR WILDCATS / 6

KRD's main canal blows

Mishap disrupts power, phone service, delays irrigation water deliveries



By MIKE JOHNSTON
Record City Editor

What the lack of water did last summer in shutting down early the Kittitas Reclamation District, the abundance of water did again late Monday night by washing out a 25-foot section of the KRD's main branch canal and canceling plans to start water deliveries May 1.

"This will be the biggest canal break the KRD has ever had to contend with, as far as I know," said Paul Devenport, KRD manager, via cell phone at the washout site west of Ellensburg and between Ch. Elms and Elk Heights this morning. He said the location was a remote section about a half-mile downstream from where Interstate 90 crosses the canal. "This is going to be a major project, no doubt about it."

The washout occurred while the KRD was in the middle of priming or filling its irrigation system with water, and a May 1 date had been set for the beginning of most deliveries to the district's 1,991 customers in its 39,342-acre service area.

Devenport speculated that the washout, hole or void in the concrete lining and dug out underneath the concrete and eroded away the earthworks and hillside. The water erupted into the Yakima River area west of.

Brian Lenz, Puget Power's Kittitas area manager, said the three, 95-foot wooden transmission and distribution poles went down about 11:30 p.m. Monday, when power went out. Power was restored in about five minutes for the main transmission line, but power to about five homes in the Look Out Mountain and Redfoot Falls area went out.

firm's long-distance lines between Eastern Washington and Seattle. Also, several 3,800 watt-free lines have been affected.

A spokesman for Ellensburg Telephone Co. said AT&T officials have been notified of the damage and some long-distance service is available by using operator service in routing the calls. Devenport said his "very rough" estimate was that earthwork repair and new concrete lining will take a week to a week and a half to complete. He said that will push the water delivery date into the first week of May or beyond. When asked if there are any estimates of cost, he said it was too early to give a good estimate and "that's going to be scary."

He said work will begin on repairs as soon as heavy equipment can reach the site. The KRD recently completed work on collapsed earthworks at the end of a south branch canal near Elk Heights, a project that cost an estimated cost of \$15,000.

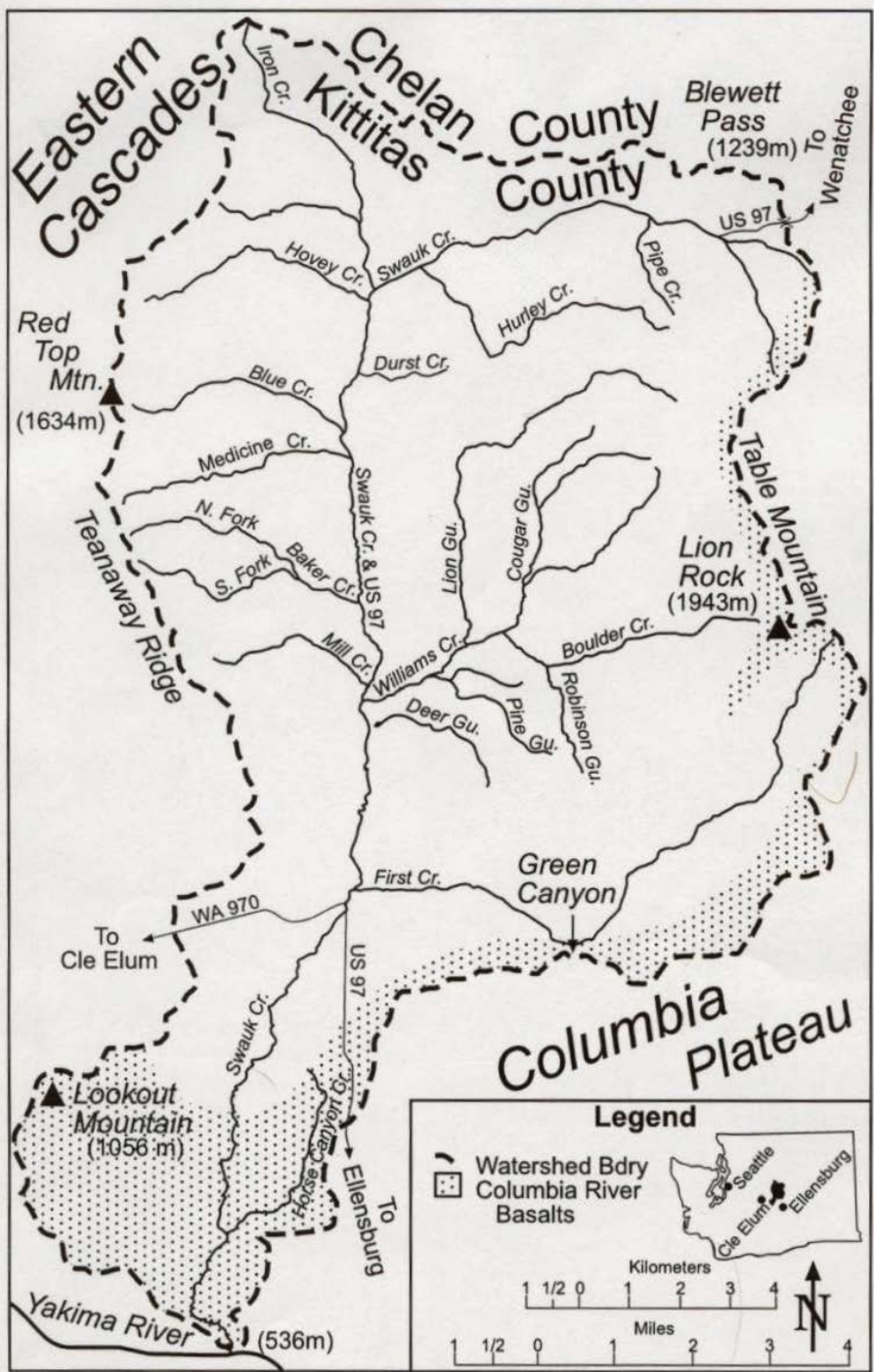
Devenport said engineering assistance is forthcoming from the U.S. Bureau of Reclamation. Some officials speculated that damage could have been much greater if the breach happened later when a much greater volume of water would be flowing in the main canal.

Officials surveyed the scene of the wrecked KRD Highline Canal this morning. The ruptured canal released a wall of water that wiped out power and telephone lines. Irrigation water deliveries will be delayed until the canal is repaired, officials report.

Report photo by DONNA TYTUS

Central Washington Mass Wasting pre-1995

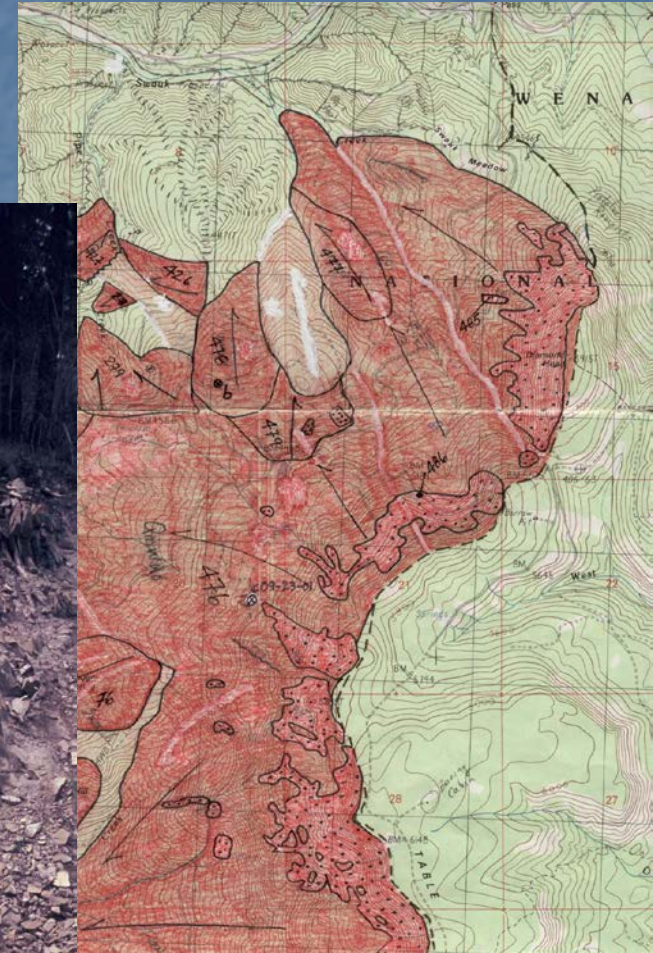




What about mass wasting
in Central Washington's
Swauk Watershed:

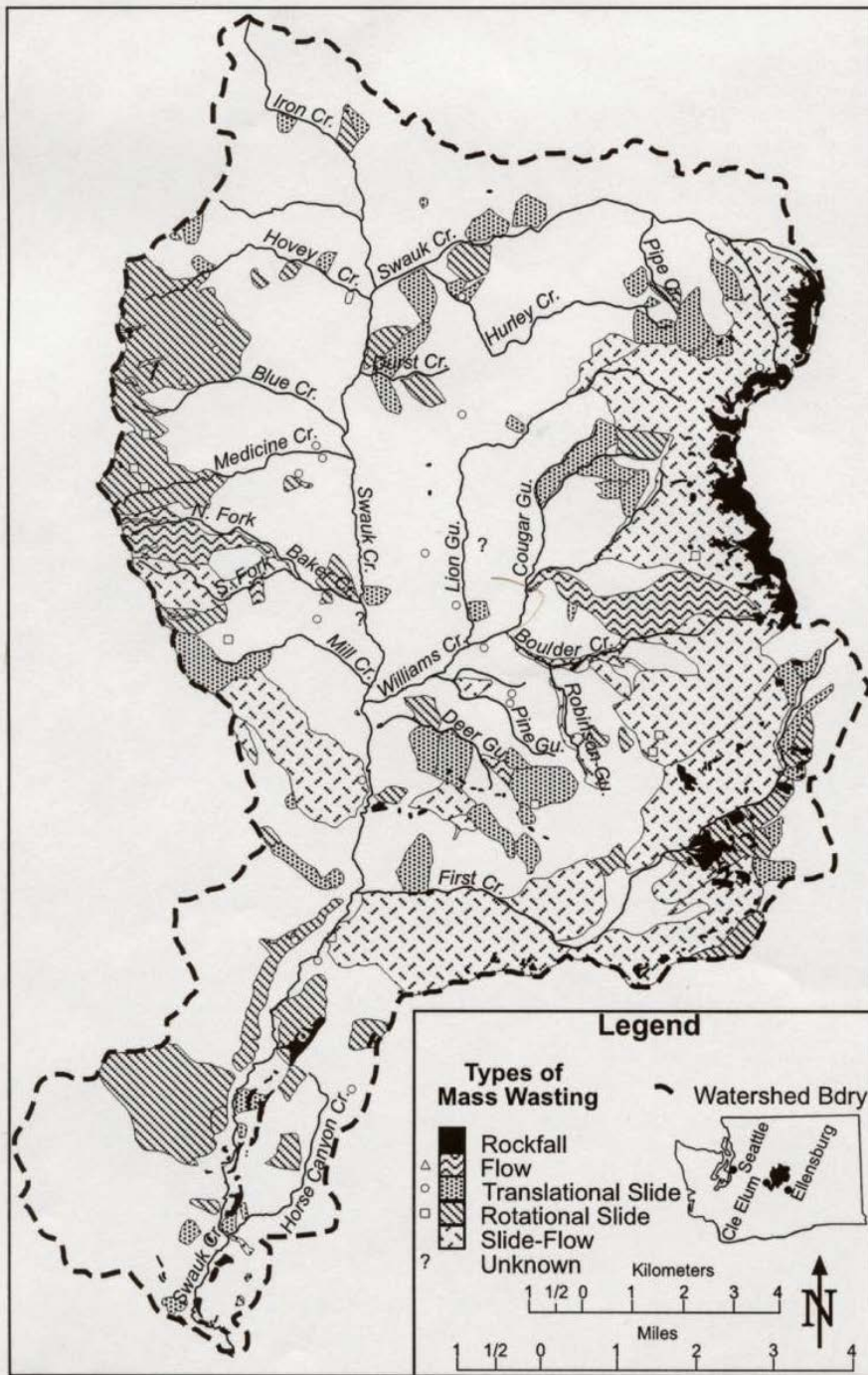
- spatial extent?
- timing?
- implications?

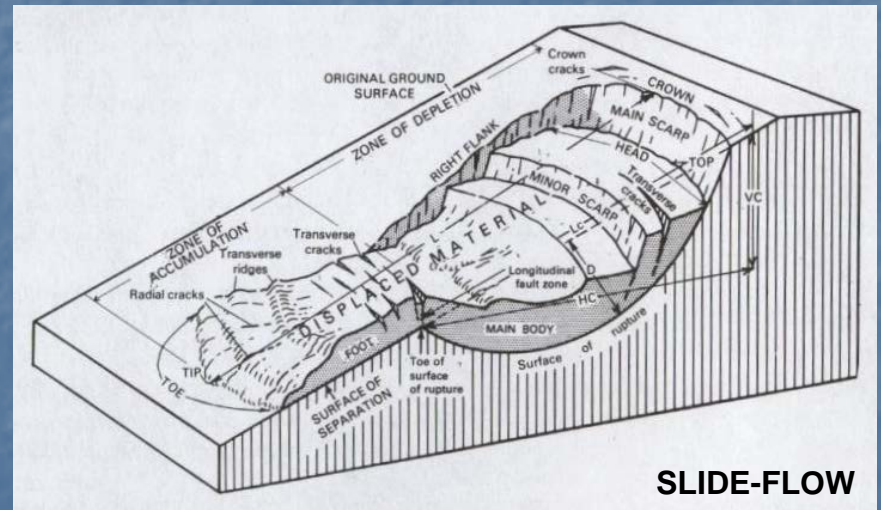
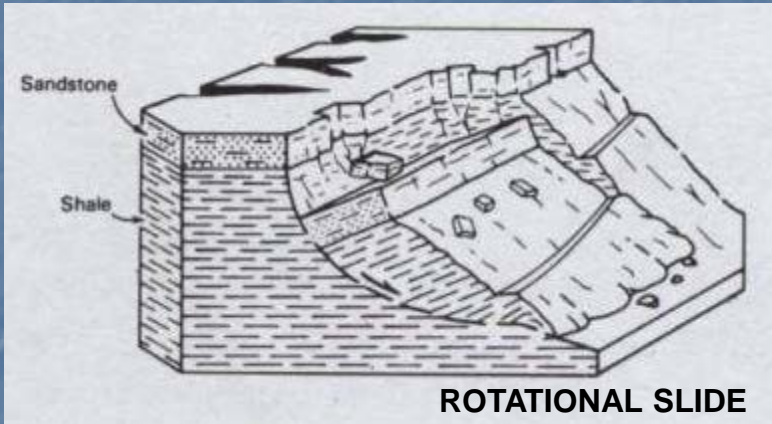
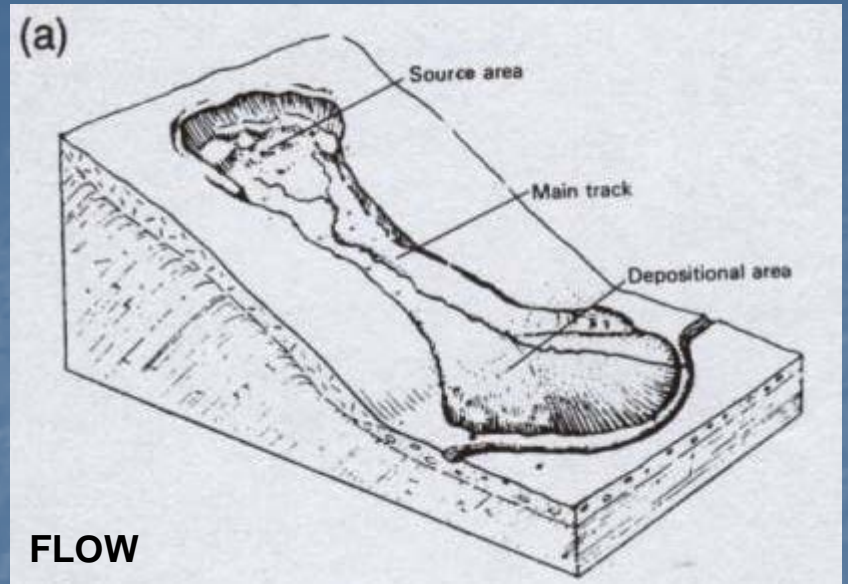
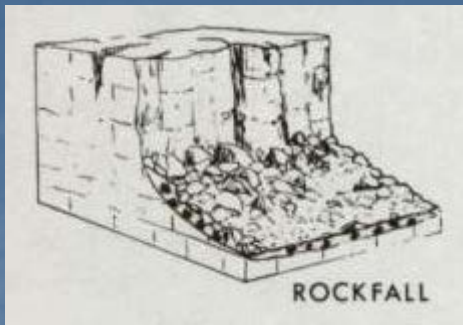
Spatial Extent Methods

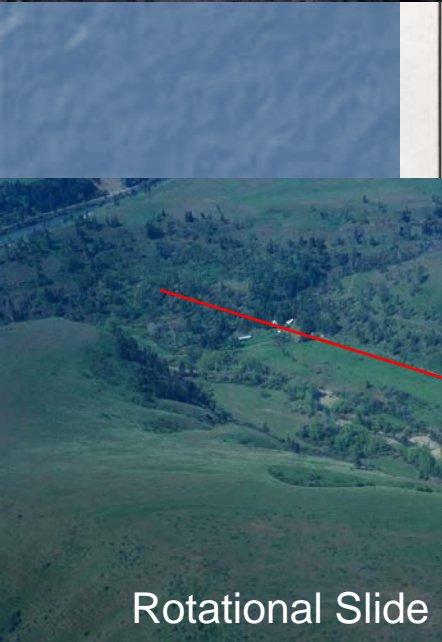
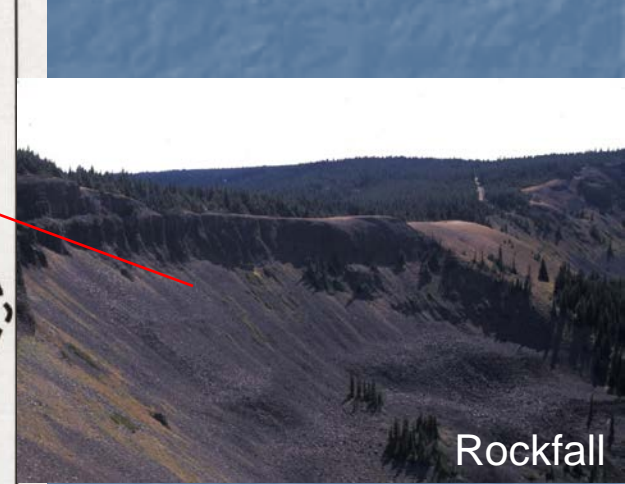
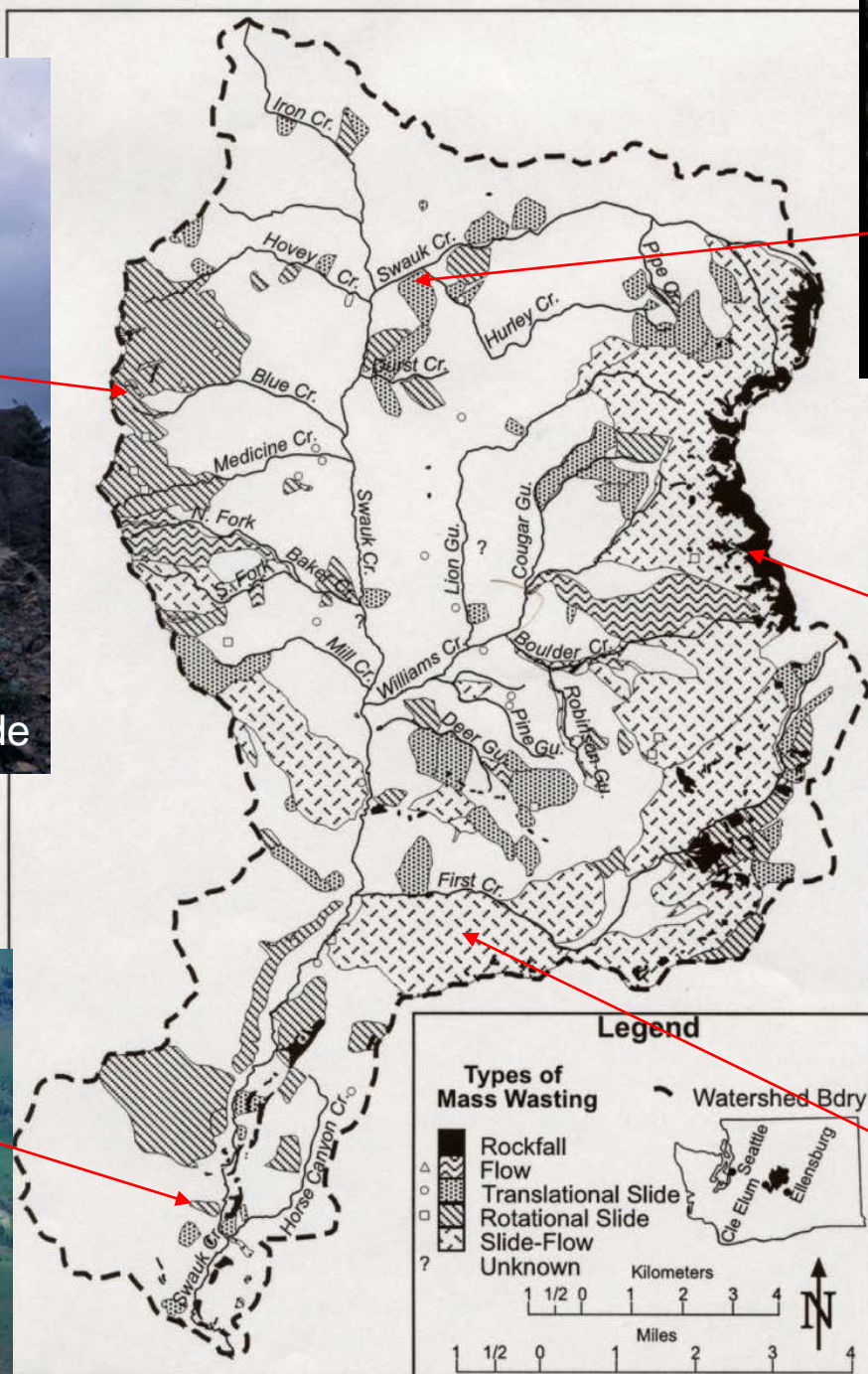


Spatial Extent

- 38% of watershed!
- Mostly in headwaters
- >156 discrete events
 - rockfall
 - flows
 - translational slides
 - rotational slides
 - slide-flows







Relative Timing Methods

Table 1. Preliminary Mass Wasting Age Classification (adapted from McCalpin, 1984; Keaton and DeGraff, 1996).

Activity class	Main scarp	Lateral flanks	Internal morphology	Vegetation	Toe relationships
Active	Sharp; Unvegetated	Sharp; Unvegetated; streams at edge	Hummocky topography with lakes in depressions; Angular blocks separated by unvegetated cracks/scarps	"Jackstrawed" trees /"drunken forest"	Main valley stream shifted by mass; Floodplain covered by debris; Lake behind mass wasting dam
Inactive- young	Sharp; Partly vegetated	Sharp; Partly vegetated; Small tributaries to lateral streams	Hummocky topography with ponds and marshes in depressions; Subangular blocks separated by vegetated cracks/scarps	Different age, type or density than adjacent terrain; Bent older tree trunks	Same as active class but toe modified by modern stream
Inactive- mature	Smooth; Vegetated	Smooth; Vegetated; Tributaries extend into main body	Smooth, rolling topography; No undrained depressions; Deranged drainage pattern	Different type and density than adjacent terrain but same age	Mass wasting debris covers terraces but cut by modern streams; Modern stream has widened floodplain upstream
Inactive-old	Dissected; Vegetated	Vague lateral margins; Vegetated; No lateral drainage	Smooth, rolling topography; No undrained depressions; Dendritic drainage pattern	Same age, type and density as adjacent terrain	Terraces or moraines cut into slide debris; Uniform modern floodplain

Relative Timing

Active—few & small

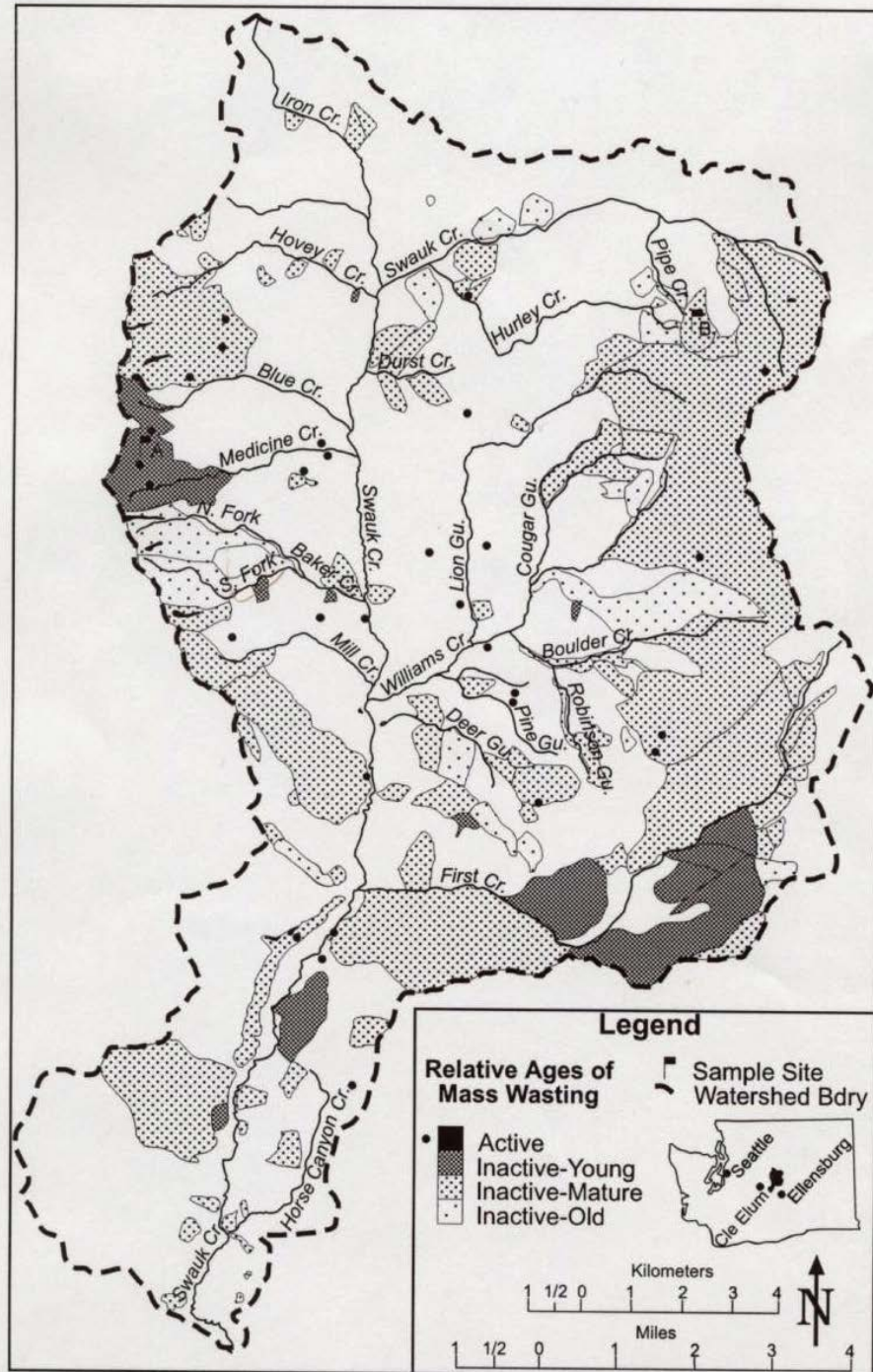
- 40 identified

- <1.2 km²

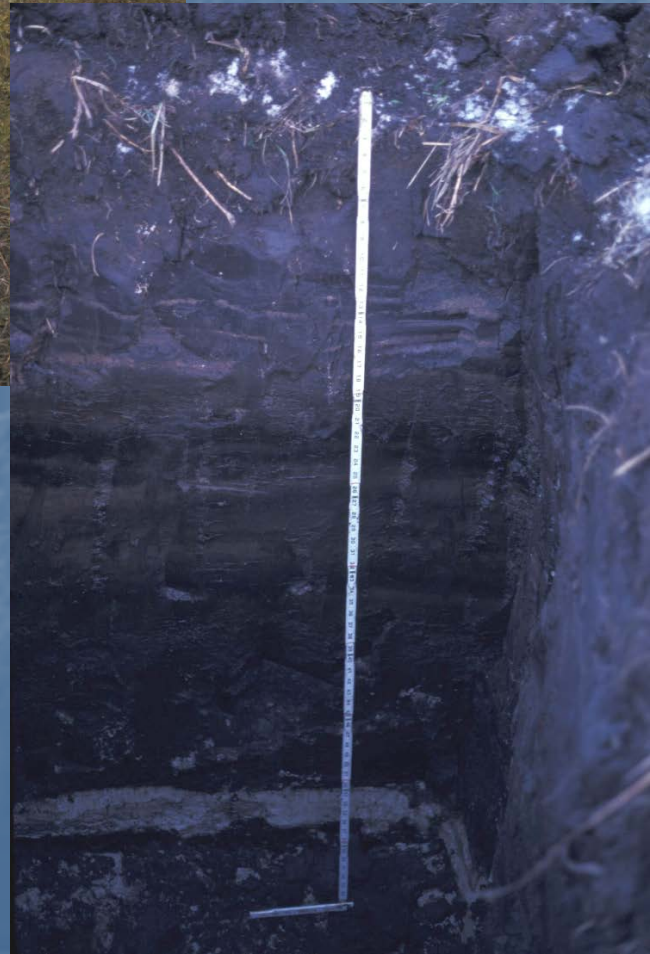
Inactive—numerous & large

- 116 identified

- 0.03-23.6 km²



Absolute Timing Methods

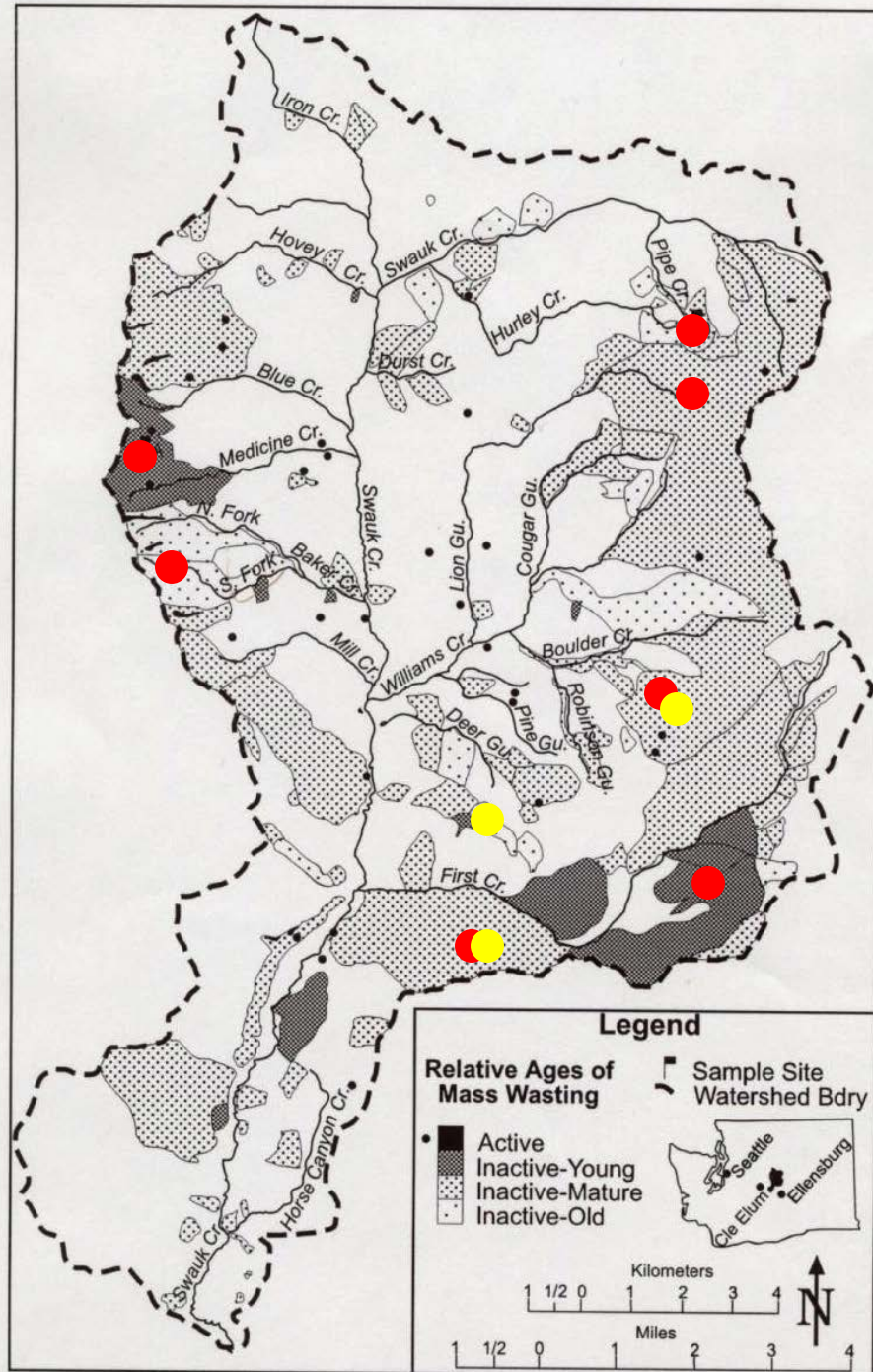


- ^{14}C dating
- Tephrochronology

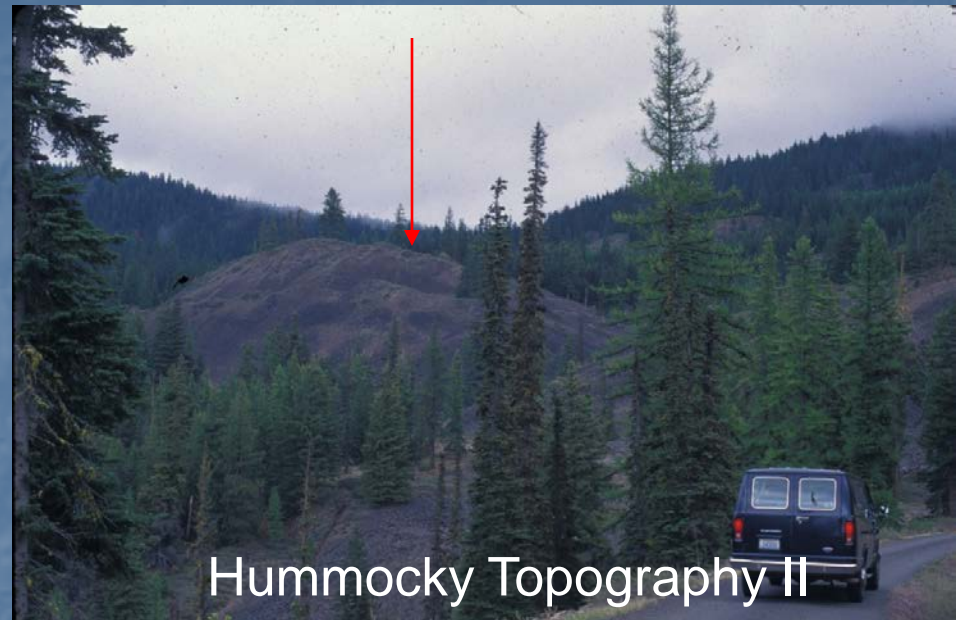
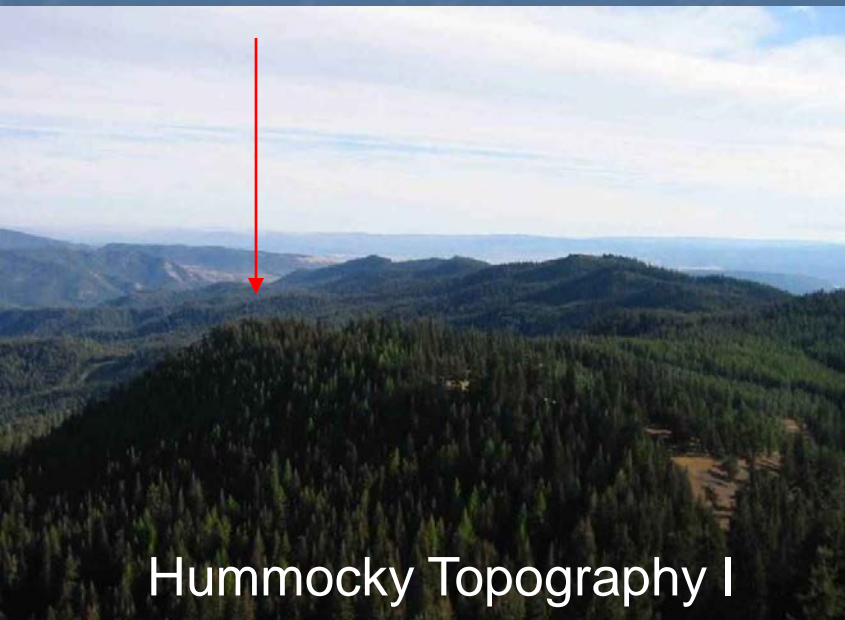
Absolute Timing

- - Radiocarbon dates
- - Tephra date

Activity class	Preliminary radiocarbon age (14C yr BP)
Active	Historic
Inactive-young	<6,000
Inactive-mature	6,000-10,500 ←
Inactive-old	>10,500?



Implications



Implications II

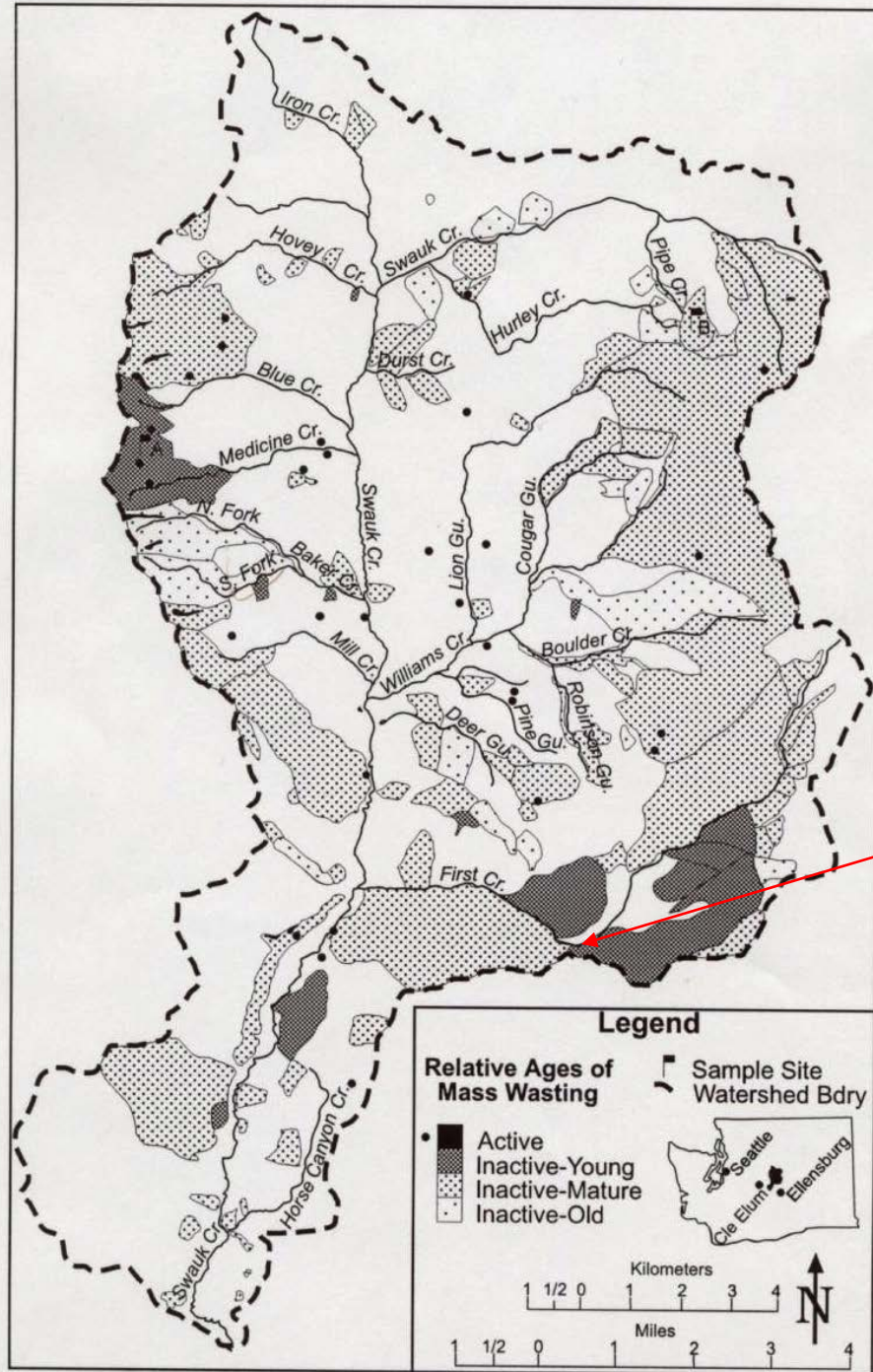


Impacts on Stream Channels:

- temporary dams
- increased sinuosity
- increased sediment load
- increased large woody debris
- increased habitat diversity



Mass Wasting-Induced Capture of "Green Canyon Creek" by First Creek >10,560 ¹⁴C yr BP



Conclusions

- Mass wasting common in Swauk Watershed
- Occurred over time, w/ most apparently in 6,000-10,500 ^{14}C yr BP
- Key factor in topographic & hydrologic patterns in watershed
- Plays a major role in aquatic habitat
- Implications for other Eastern Cascades / CRB-margin watersheds

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