RESPONSES TO MOUNT ST. HELENS ERUPTION

U.S. Army Corps of Engineers
Portland District

Chris Budai
Paul Sclafani
Karl Ahlen
Valerie Ringold

14 October 2021

US Army Corps of Engineers®

PRESENTATION OUTLINE

- Introduction and history
- Emergency Actions
- Sediment Management and Level of Protection
  - Sediment Retention Structure (SRS)
  - Fish Collection Facility (FCF)
- Columbia River Navigation Channel
- Section 408 Program
- Other authorities

TIMELINE OF EVENTS AND CORPS ACTIONS FROM 1980 TO CURRENT

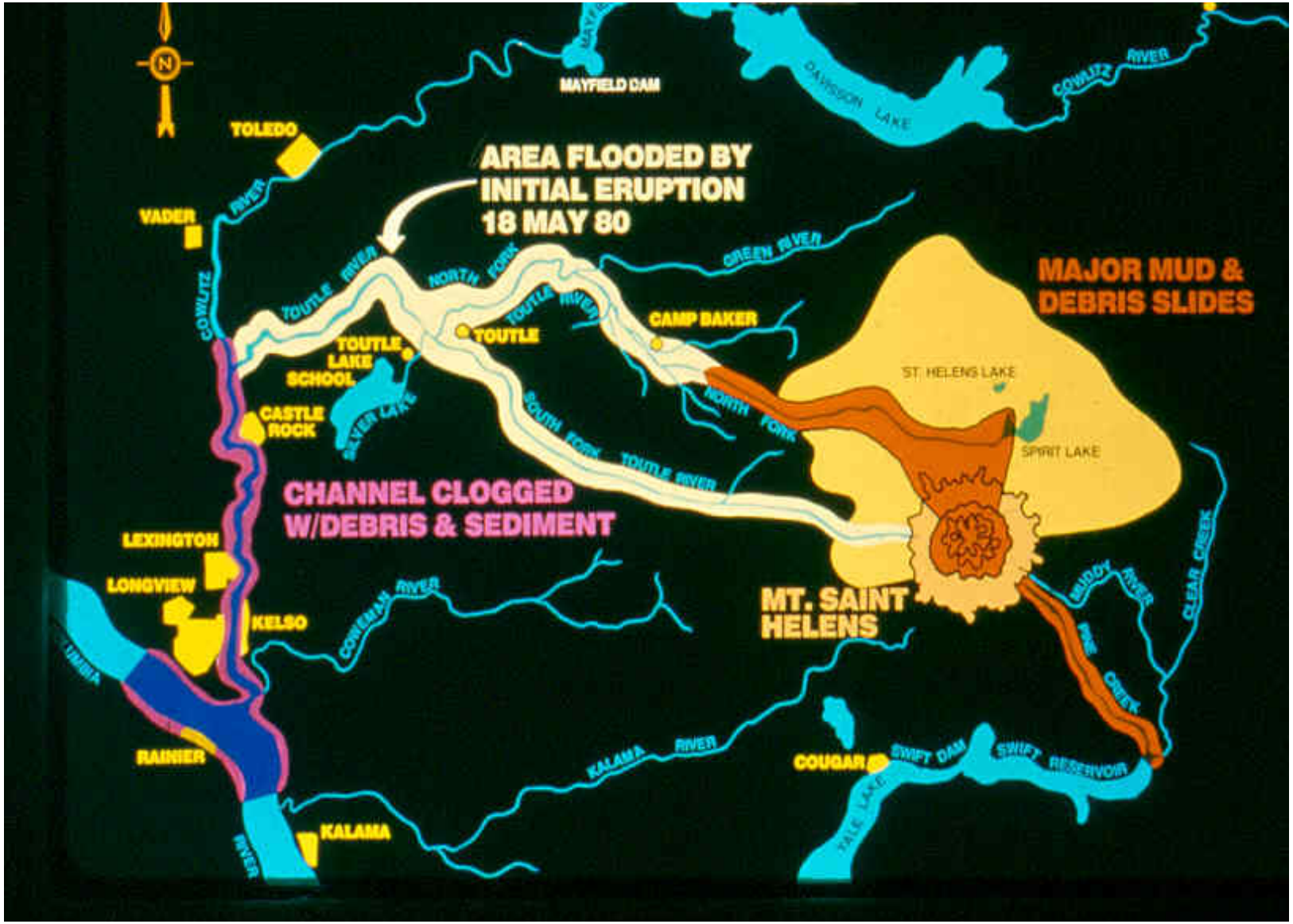
1980	Eruption - 3 billion cubic yards of debris
1980-1983	Emergency actions temporary structures, levees, dredging
1985	Long Term Plan finalized
1986	LCA Executed
1989	Sediment Retention Structure (SRS) constructed
1993	Fish Collection Facility turned over to Washington State
1998 to present	Increased flow of sediment passing SRS
2005	Cowlitz River sediment build-up
2007- 2012	Interim sediment management actions
2012	First Crest Raise
2018	Limited Reevaluation Report (LRR) and Supplemental Environmental Impact Statement (SEIS) approved
2021	Design started on Second Crest Raise and Fish Collection Facility Upgrades

Mount St. Helens - Pre-Eruption

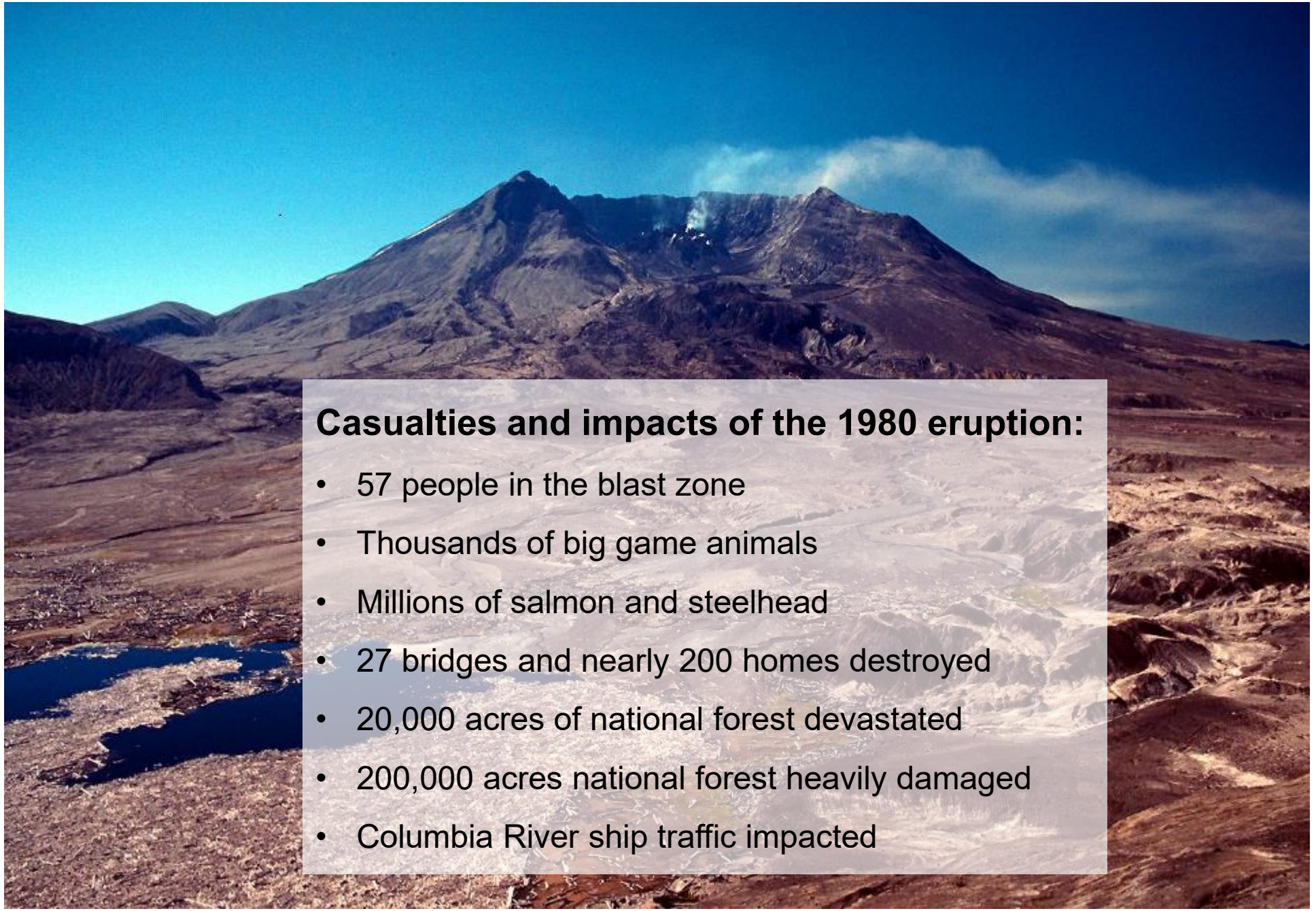
May 18th 1980

North Side of Mountain Slid Away

Photograph by USGS



Area of Impact

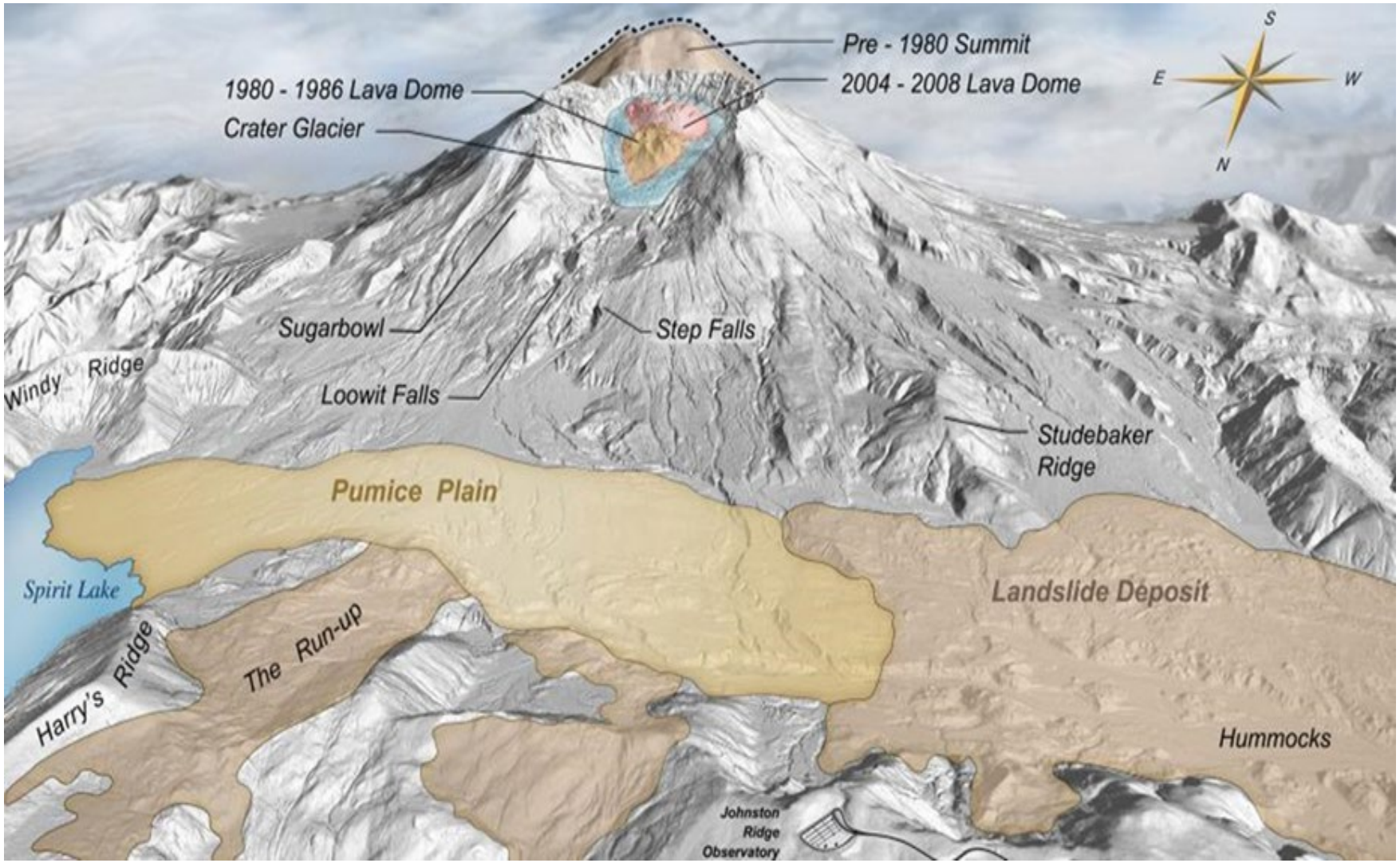


Casualties and impacts of the 1980 eruption:

- 57 people in the blast zone
- Thousands of big game animals
- Millions of salmon and steelhead
- 27 bridges and nearly 200 homes destroyed
- 20,000 acres of national forest devastated
- 200,000 acres national forest heavily damaged
- Columbia River ship traffic impacted

Debris Avalanche Blocked Spirit Lake Outlet

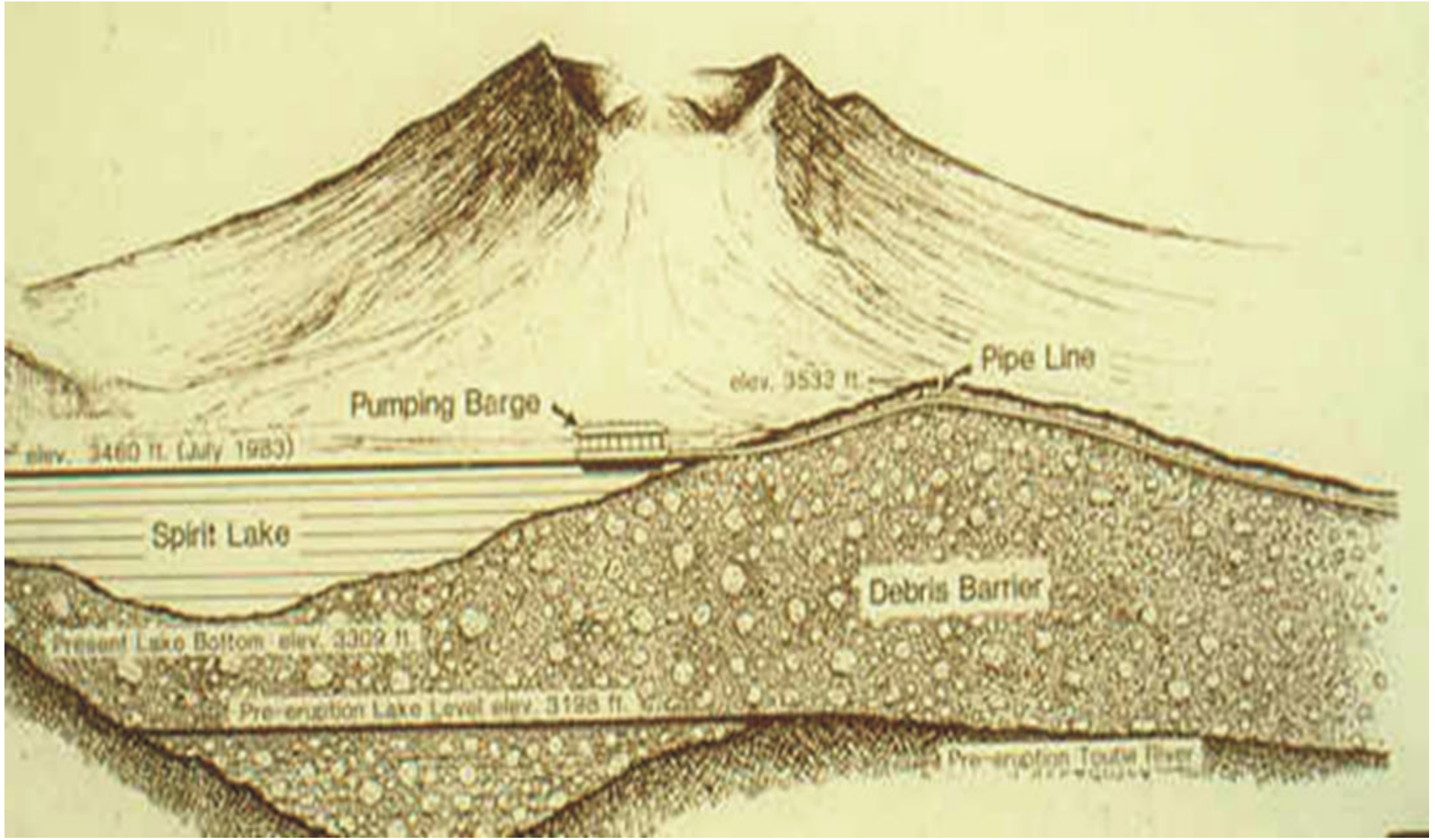
May 18th volcanic deposits. The Pumice Plain is the key deposit where internal erosion would initiate, and breach would occur. It is formed from air fall ash and pyroclastic-flows of gravel, sand, and silt size volcanic ash and pumice.



EMERGENCY ACTIONS

- Spirit Lake
  - Interim response
  - Long-term solution – Outlet Tunnel
- Castle Lake
- Coldwater Lake
- Downstream responses

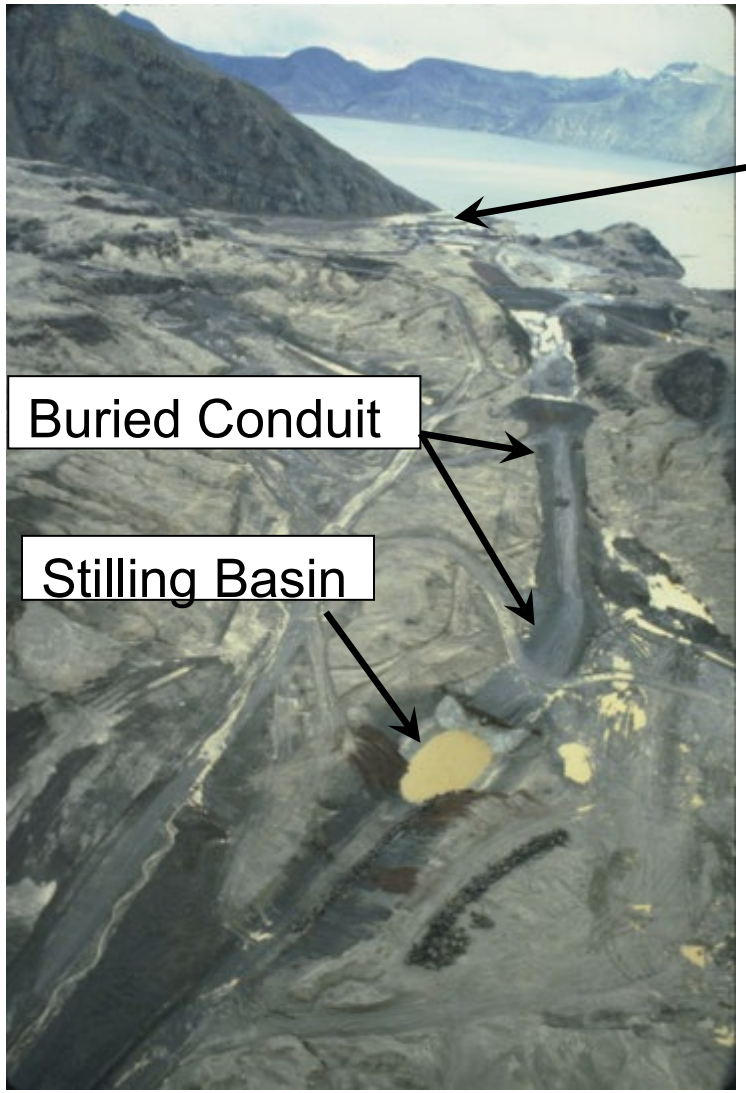
Interim pumping facility to pump water up over a 90-foot divide



Interim solution: barge-mounted pumps and 3,500-foot pipeline

20, 10-in pumps pumped 110,000 gpm to 2, 36-in pipes, then into one 5-foot diameter pipe

Interim Solution: Pumping Facility



Floating Pumping Station

EMERGENCY ACTIONS

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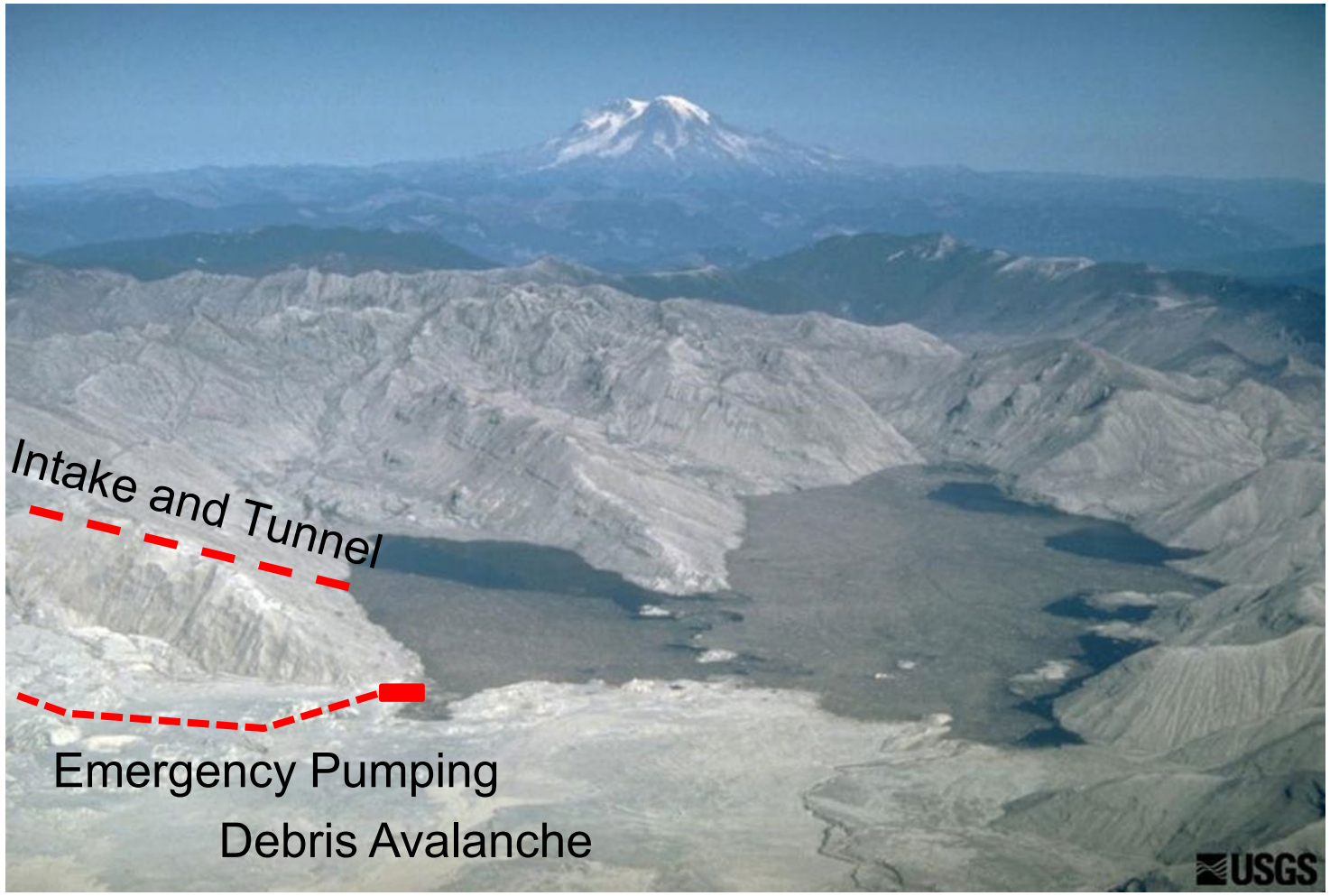
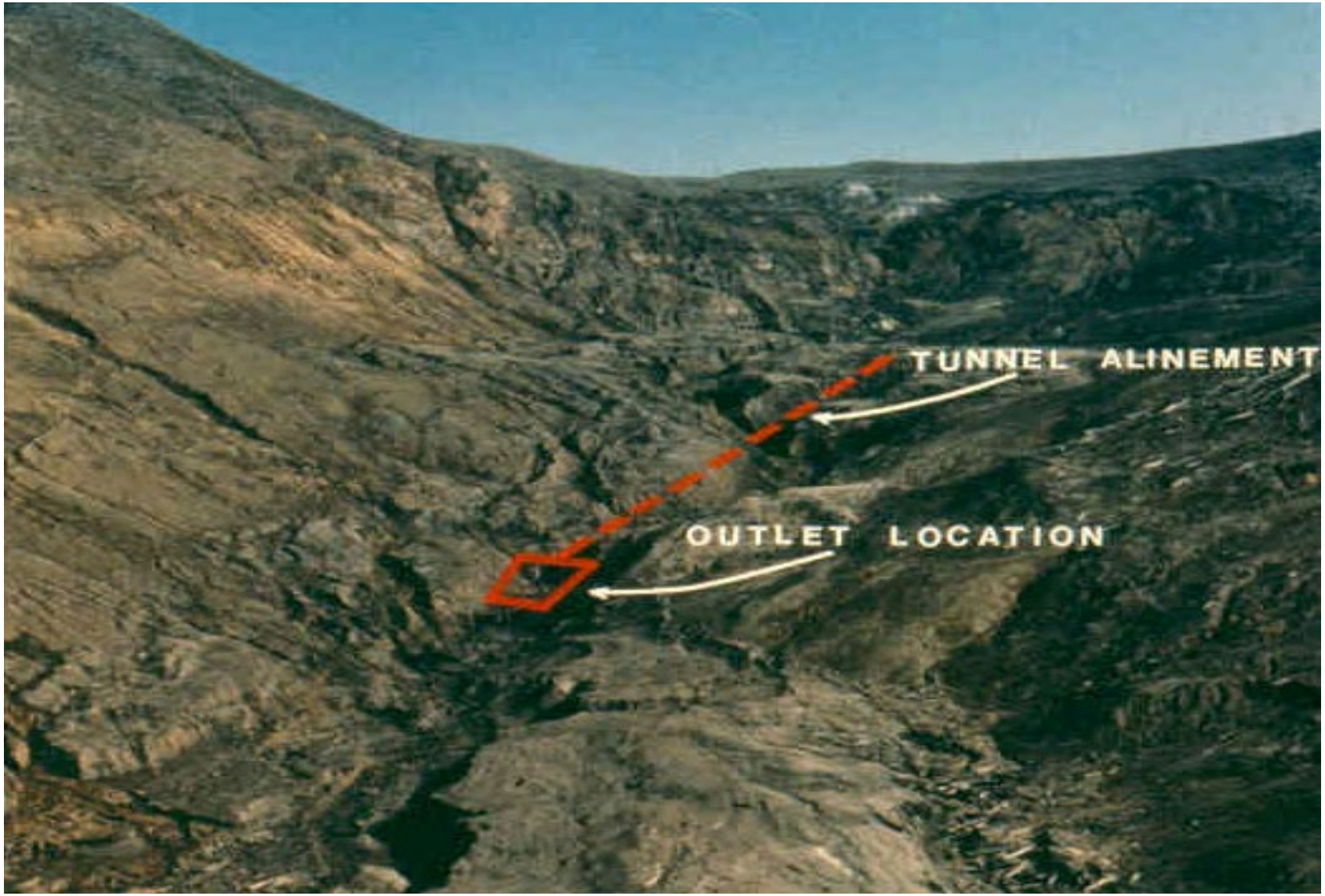
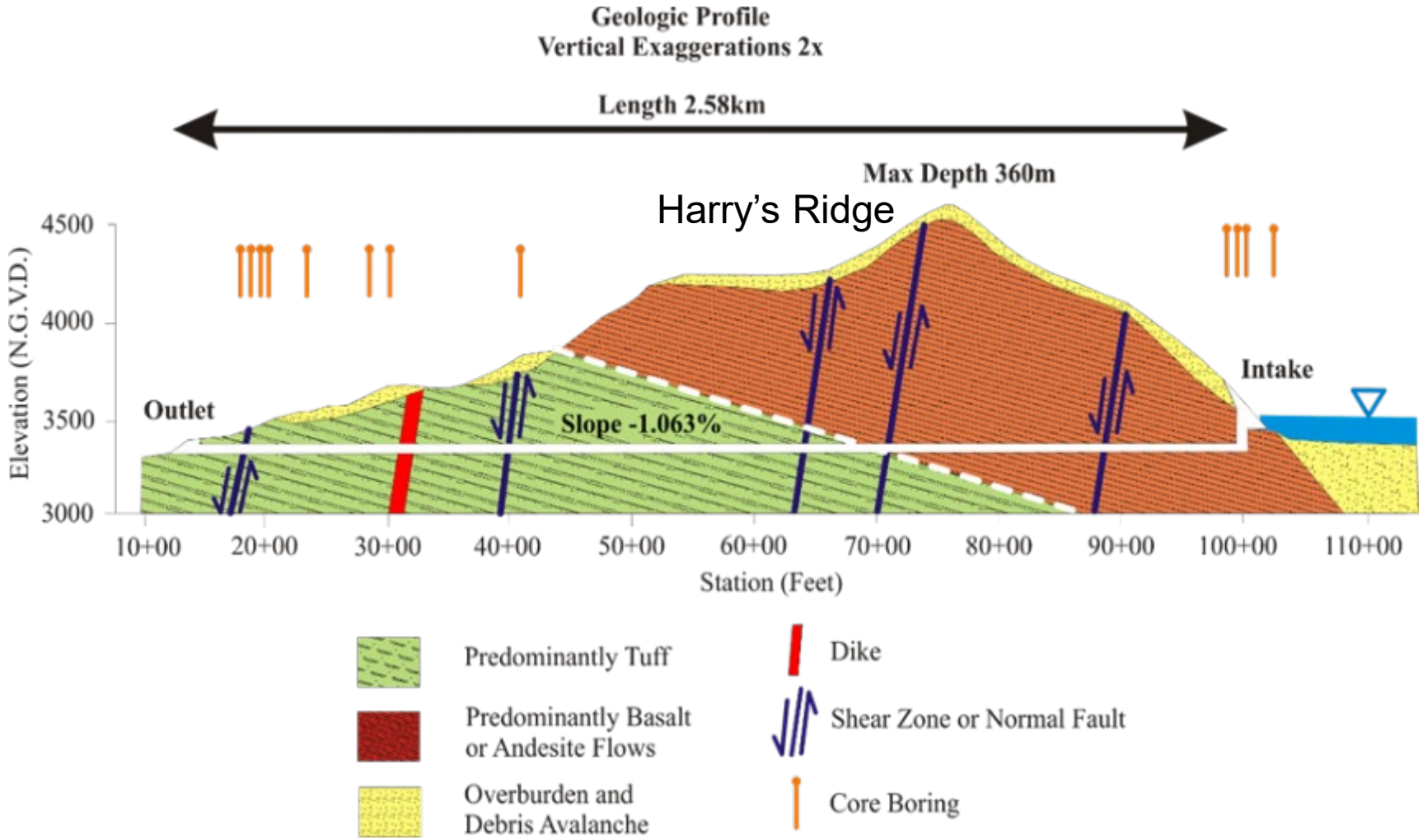
SPIRIT LAKE BASIN AFTER THE ERUPTION



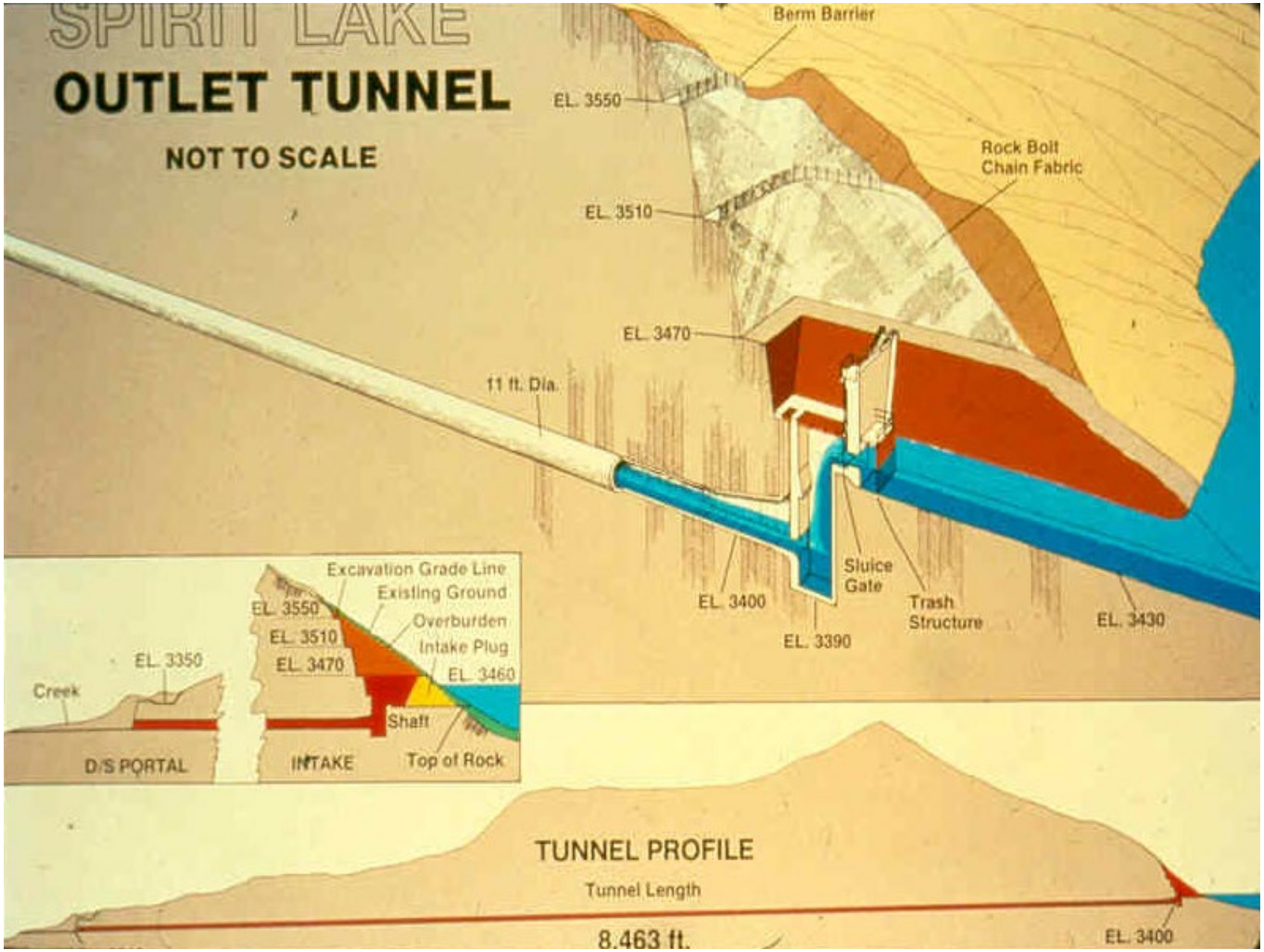


Selected Alternative
8,500-foot tunnel through Harry's Ridge

Spirit Lake Outlet Tunnel Geologic Profile



Designed to Survive Future Volcanic/Seismic Events



SPIRIT LAKE OUTLET CONTROL

Tunnel Boring Machine (TBM) (11-Foot-Diameter)

Downstream Outlet Tunnel Portal

1985

2011

USFS and USACE Sign MOA

US Army Corps of Engineers ®

EMERGENCY ACTIONS

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- Castle Lake
- Coldwater Lake
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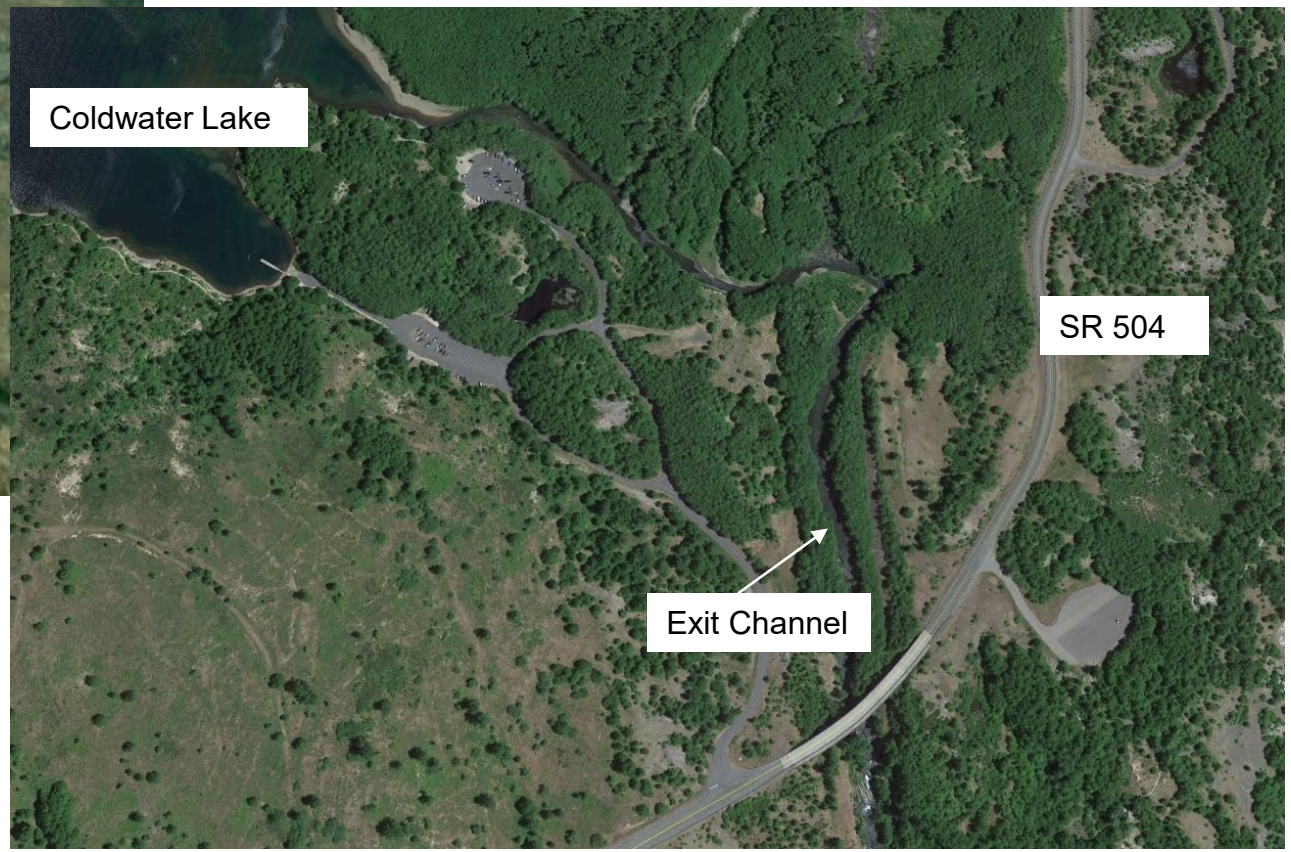
Newly formed Castle Lake with constructed exit channel

Newly formed Coldwater Lake with exit channel under construction



Coldwater Lake exit channel today

North Fork Toutle – N1 Structure

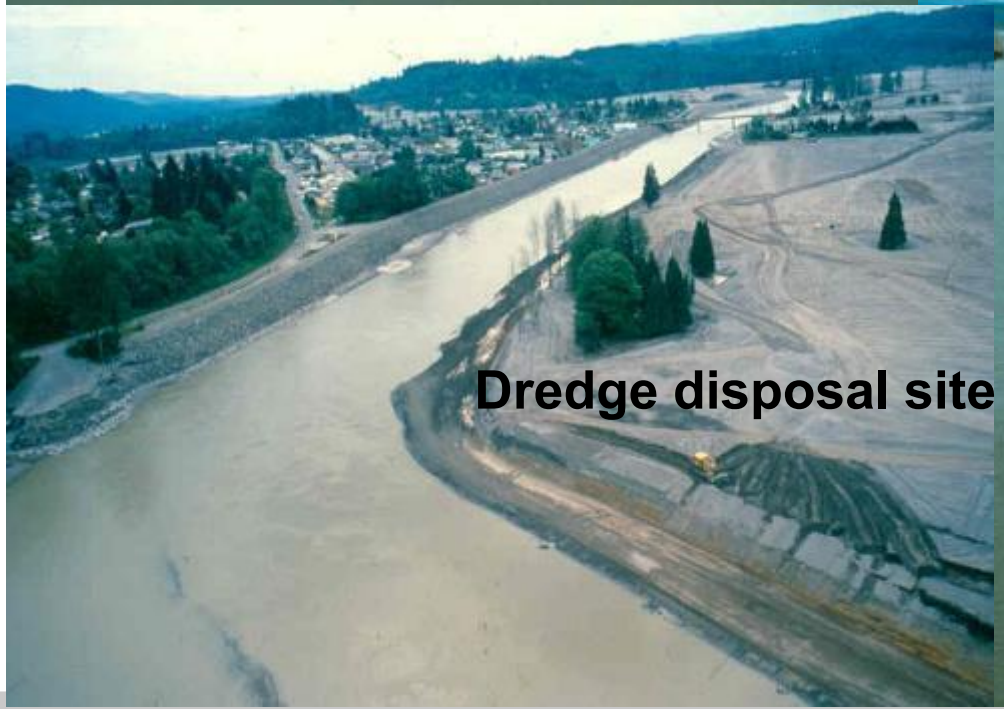
1981

2004

South Fork Toutle – S1 Structure

Navigation was stopped completely in the Columbia River

Dredge moved through Longview



Dredge disposal site

Multiple dredges work to open up the navigation channel

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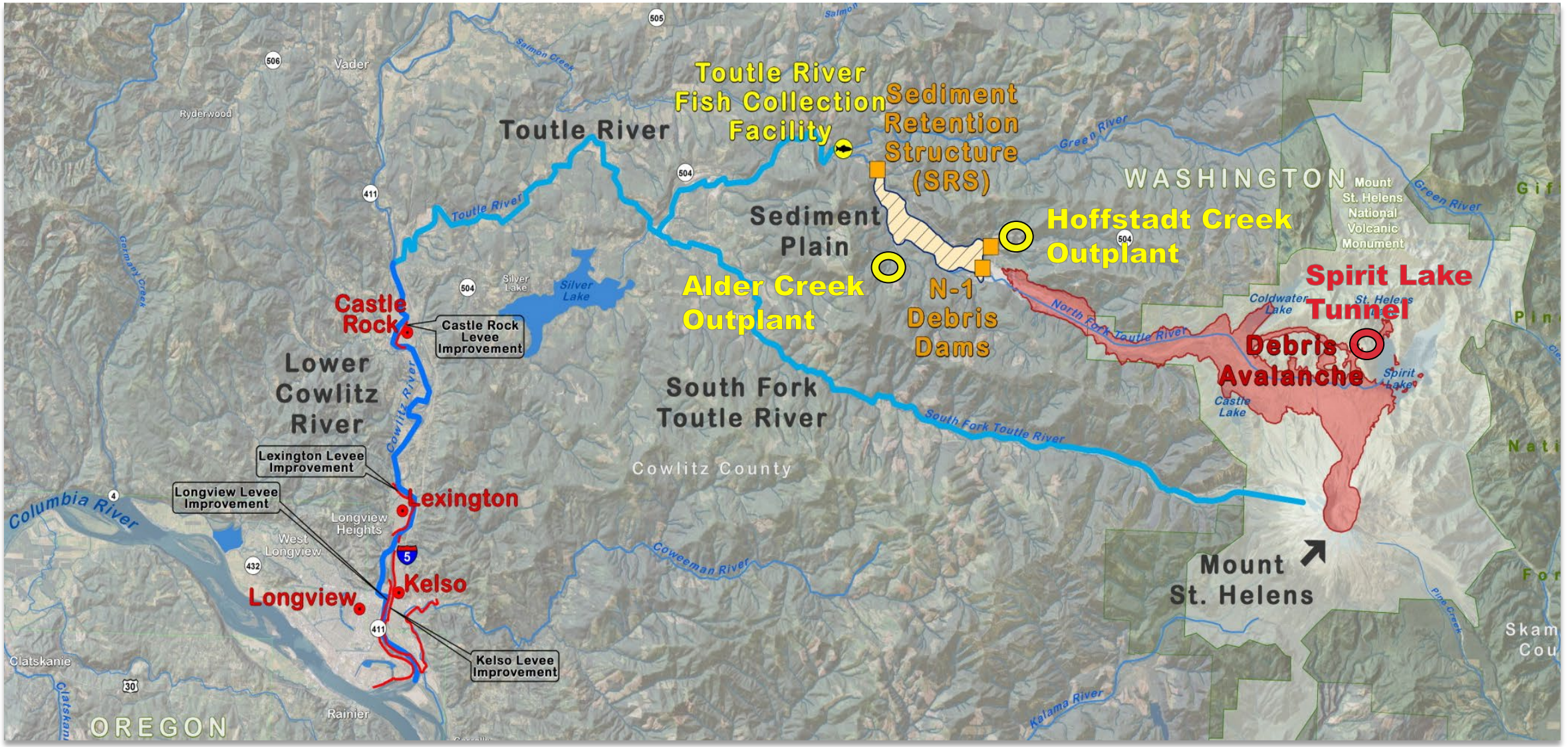
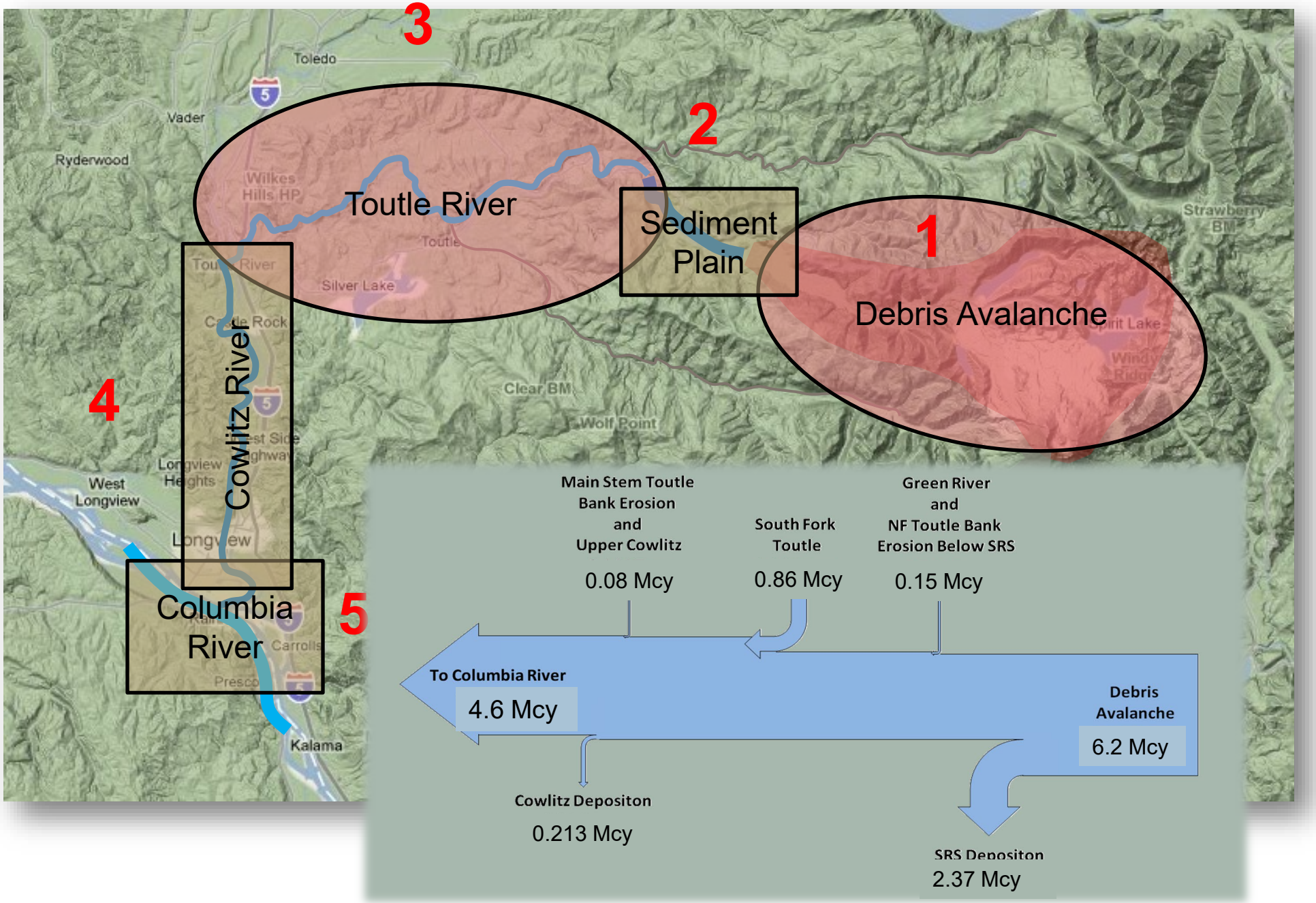
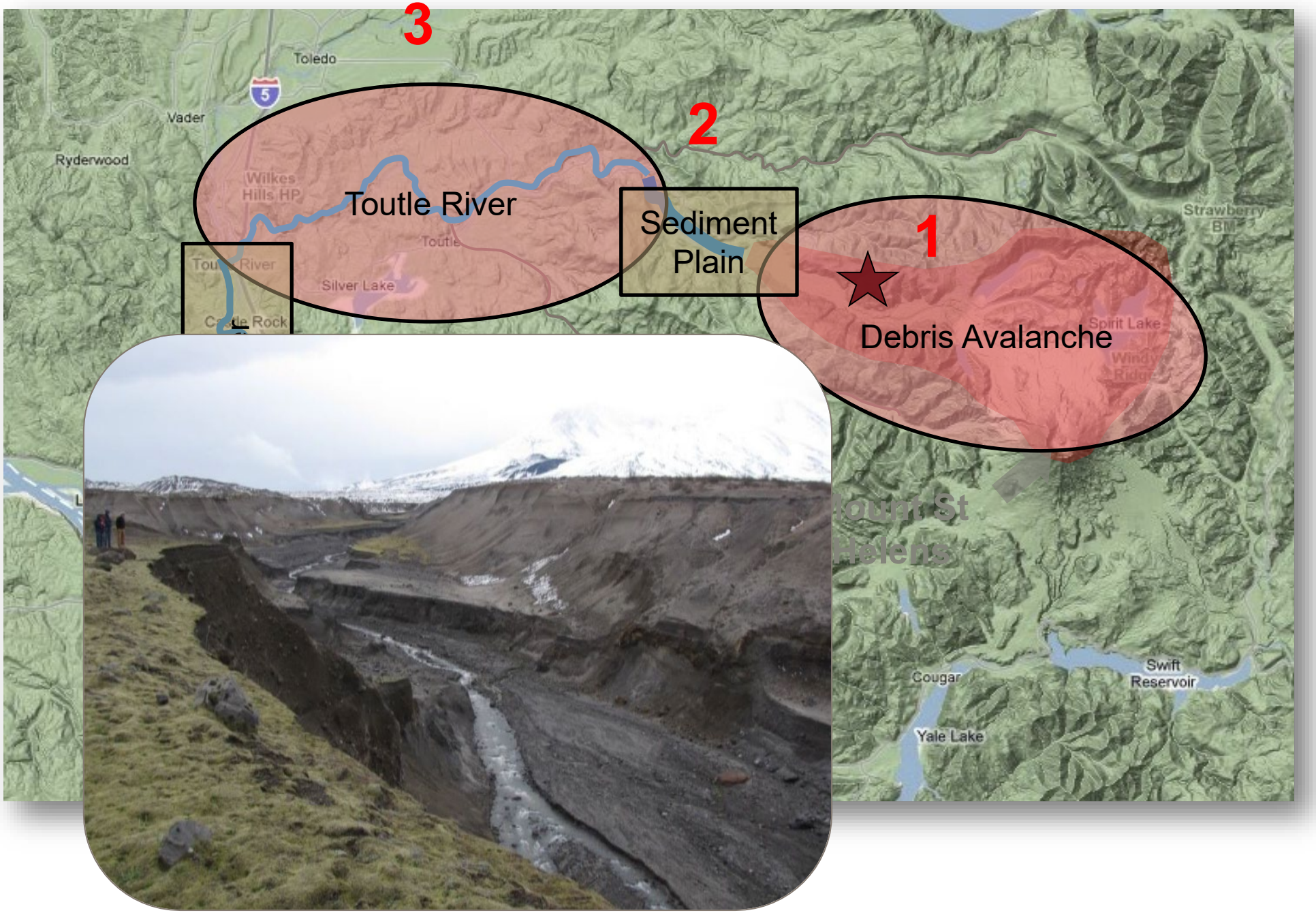
- Other authorities

Major Landmarks:




3
2
1
4
5
Toutle River
Sediment Plain
Debris Avalanche
Cowlitz River
Columbia River
Toledo
Vader
Ryderwood
Silver Lake
Castle Rock
Longview
West Longview
Kalama
Carrolls
Clear BM
Wolf Point
Strawberry BM
Main Stem Toutle Bank Erosion and Upper Cowlitz
0.08 Mcy
South Fork Toutle
0.86 Mcy
Green River and NF Toutle Bank Erosion Below SRS
0.15 Mcy
To Columbia River
4.6 Mcy
Debris Avalanche
6.2 Mcy
Cowlitz Depositon
0.213 Mcy
SRS Depositon
2.37 Mcy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Vader
Ryderwood
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Wilkes Hills HP
Toutle River
Toutle
Silver Lake
Sediment Plain
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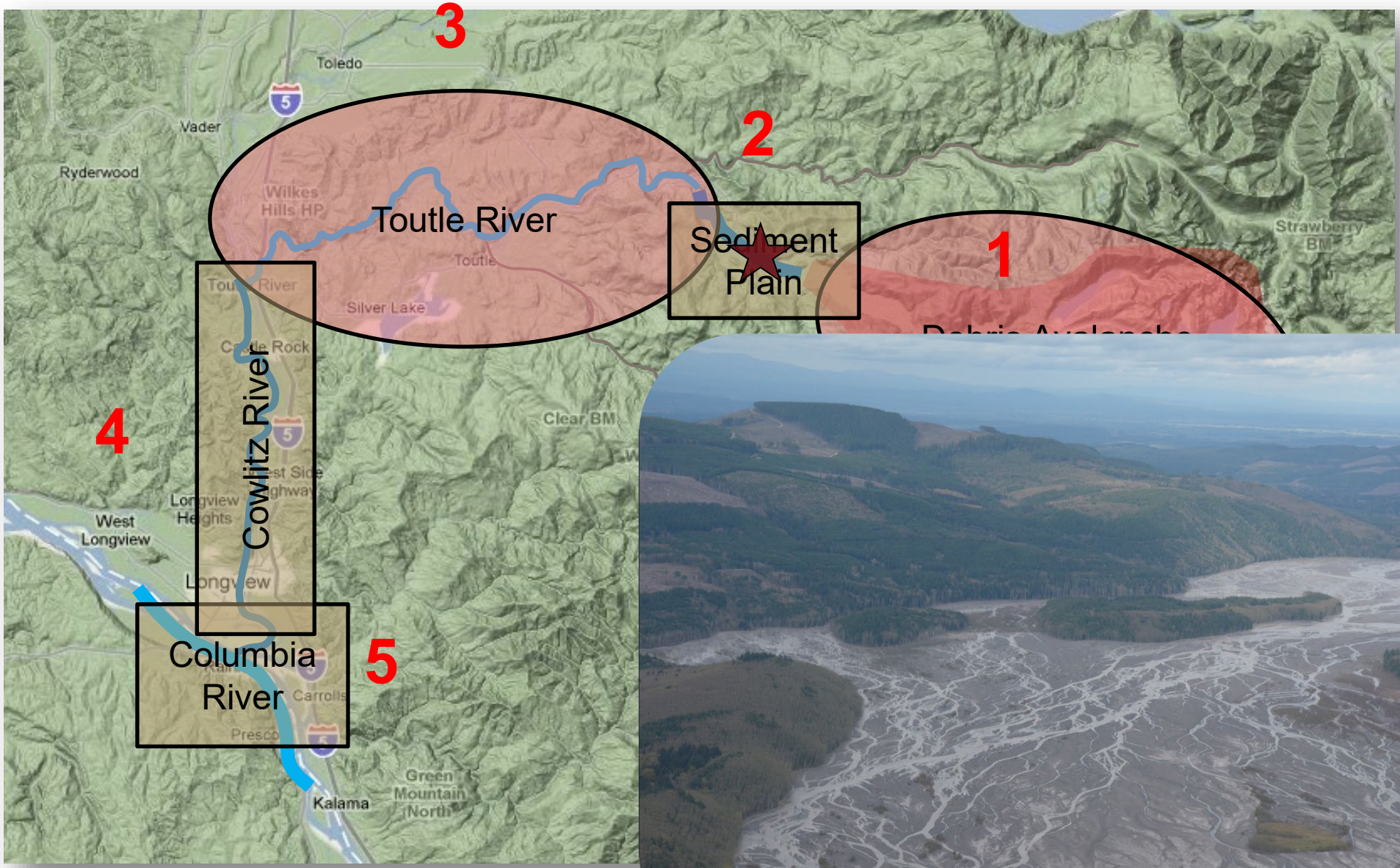
Debris Avalanche
Strawberry Mt
Spirit Lake
Windy Ridge
Mount St Helens
Cougar
Swift Reservoir
Yale Lake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Toutle
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Cowlitz River
Castle Rock
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Clear BM
Longview Heights
West Longview
Longview
Columbia River
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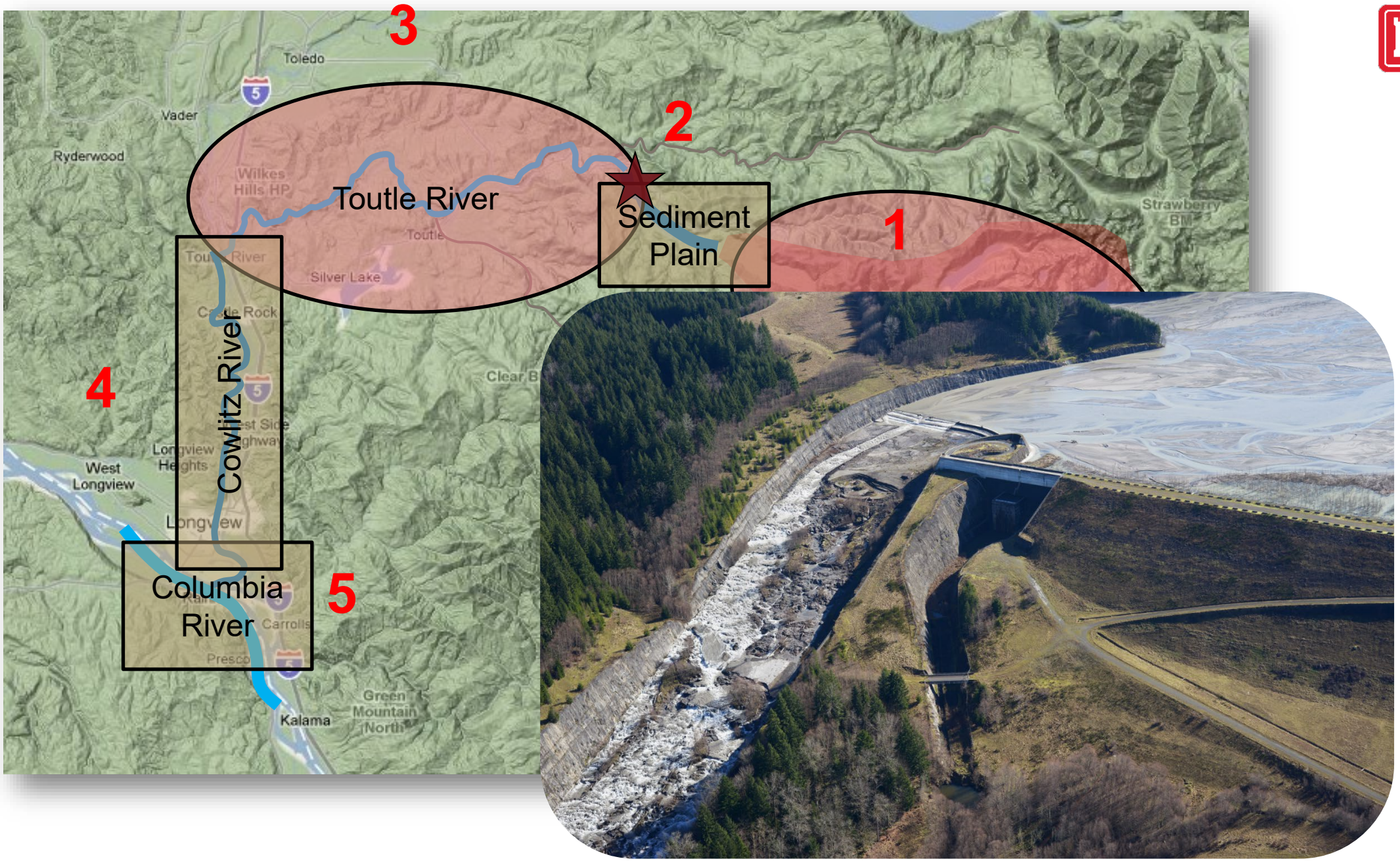
Carrolls
Kalama
Green Mountain North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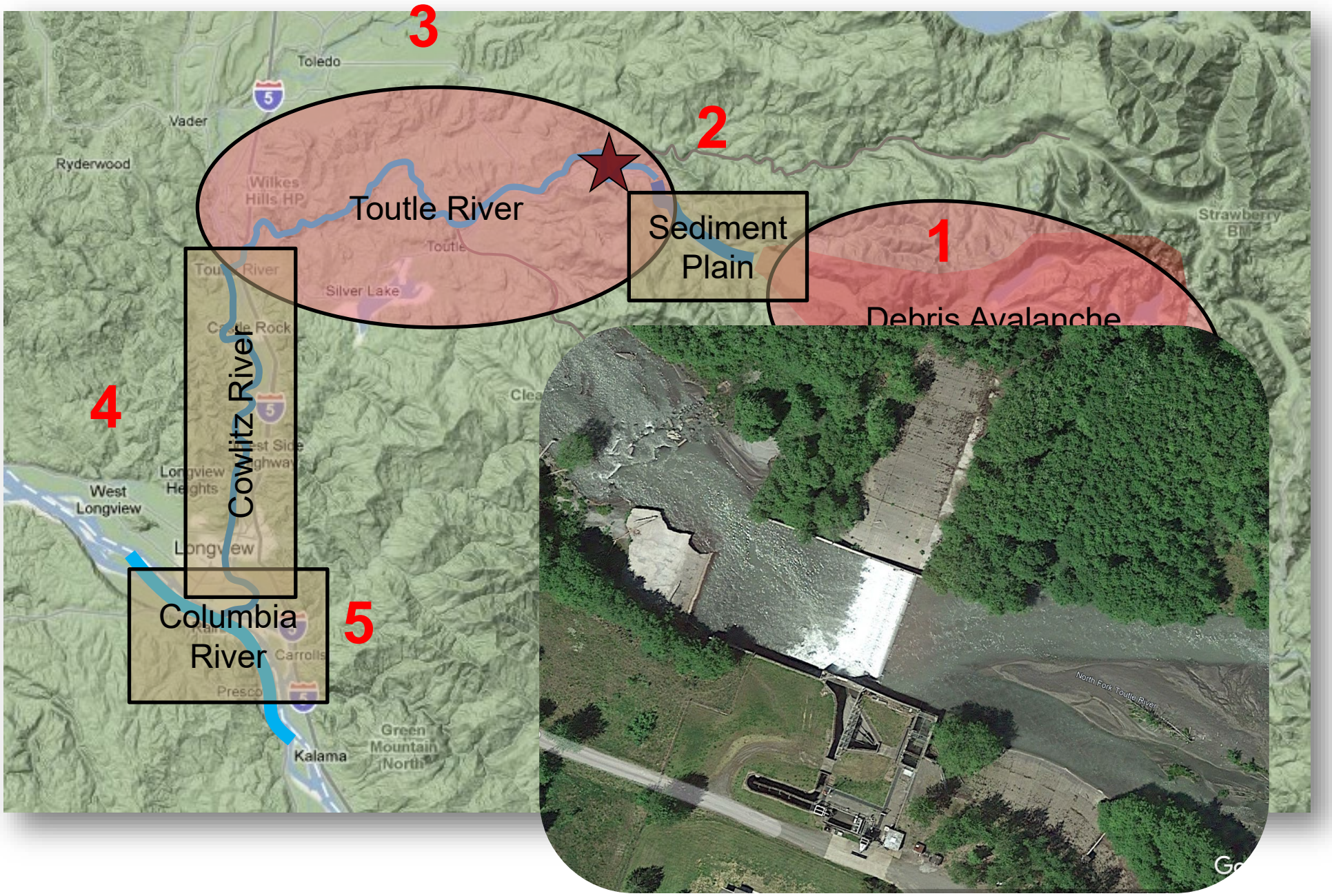
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Silver Lake
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Debris Avalanche
Strawberry Bl
Cowlitz River
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Longview Heights
West Longview
Longview
Columbia River
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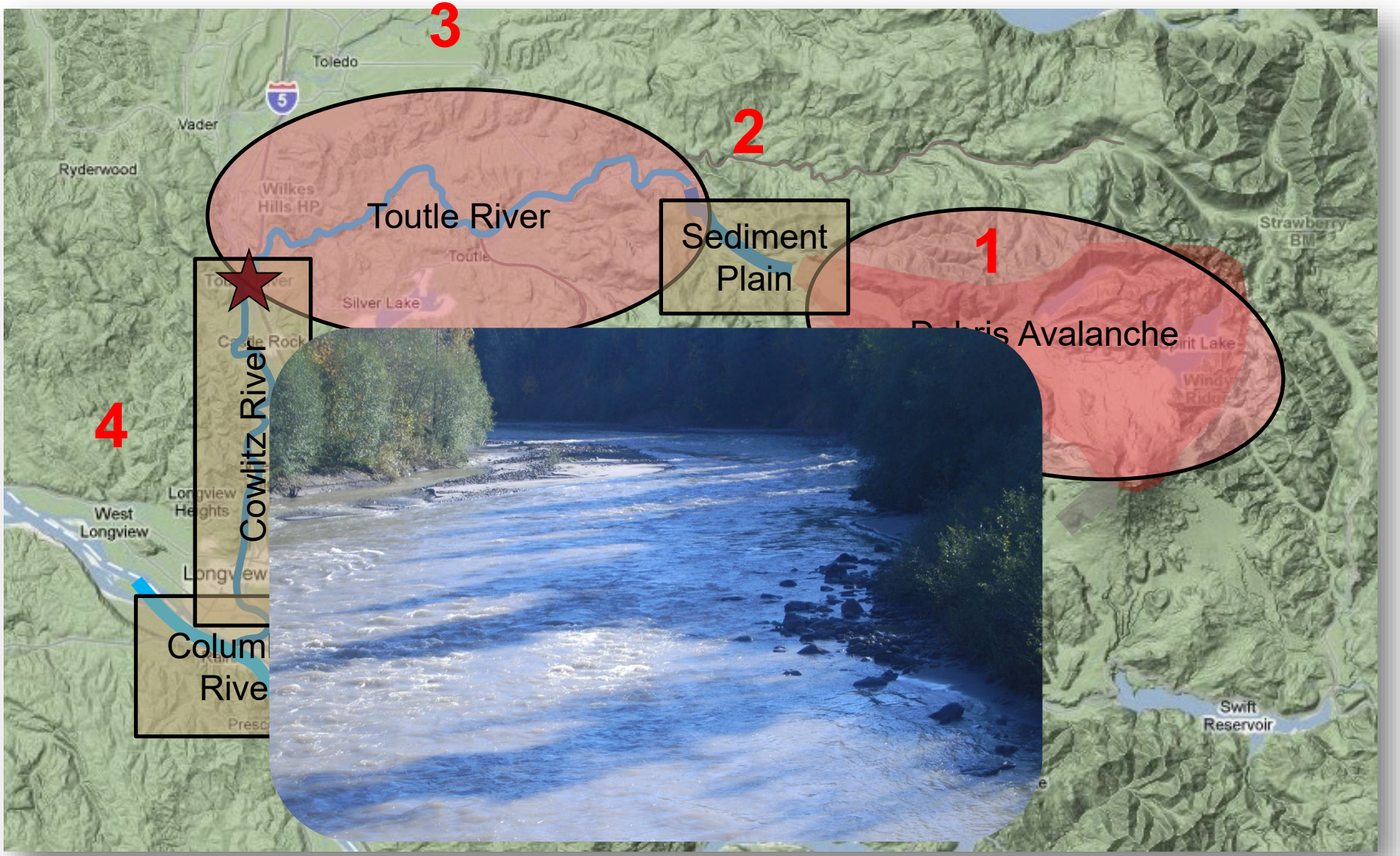
Carrolls
Kalama
Green Mountain North
North Fork Toutle River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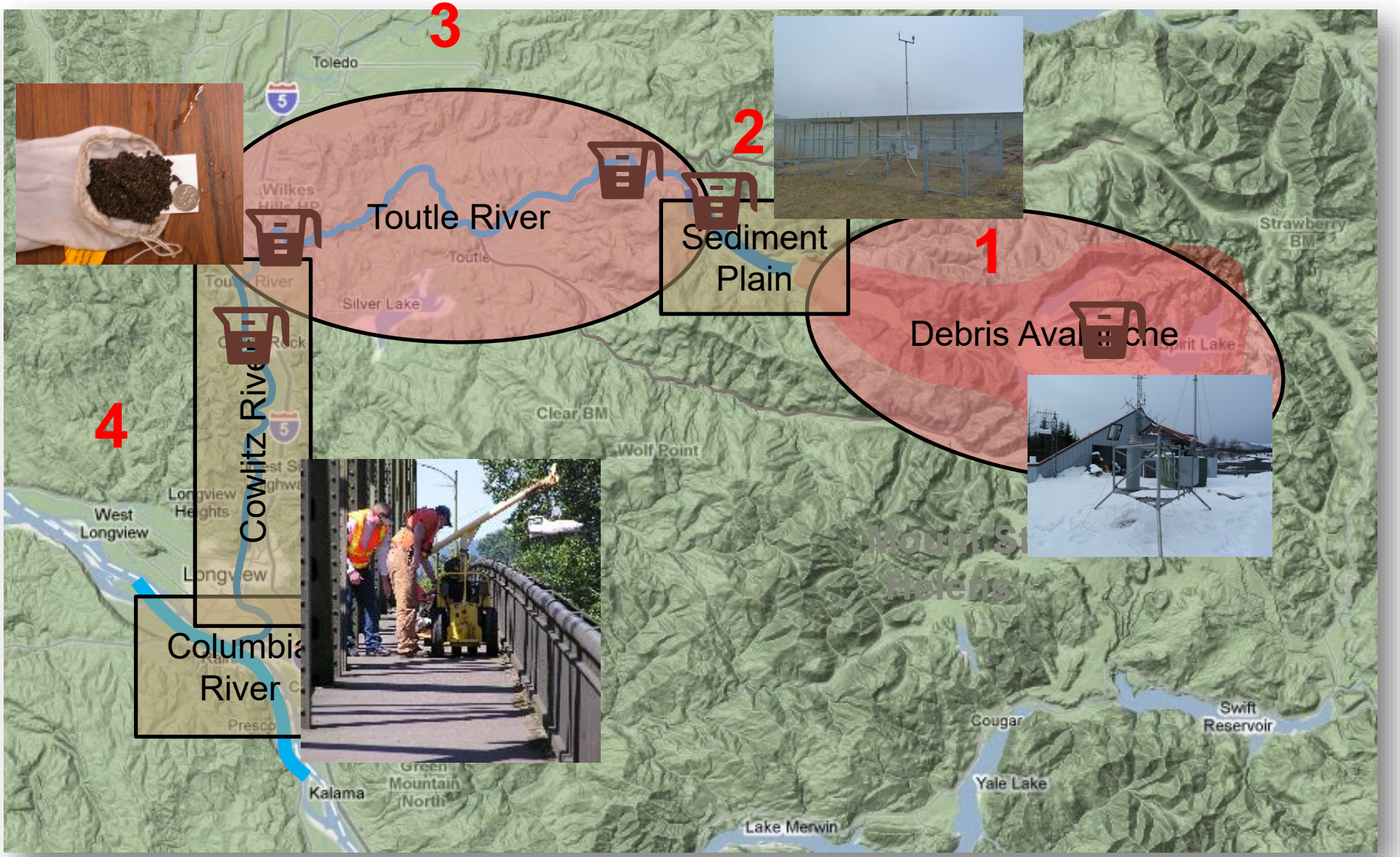
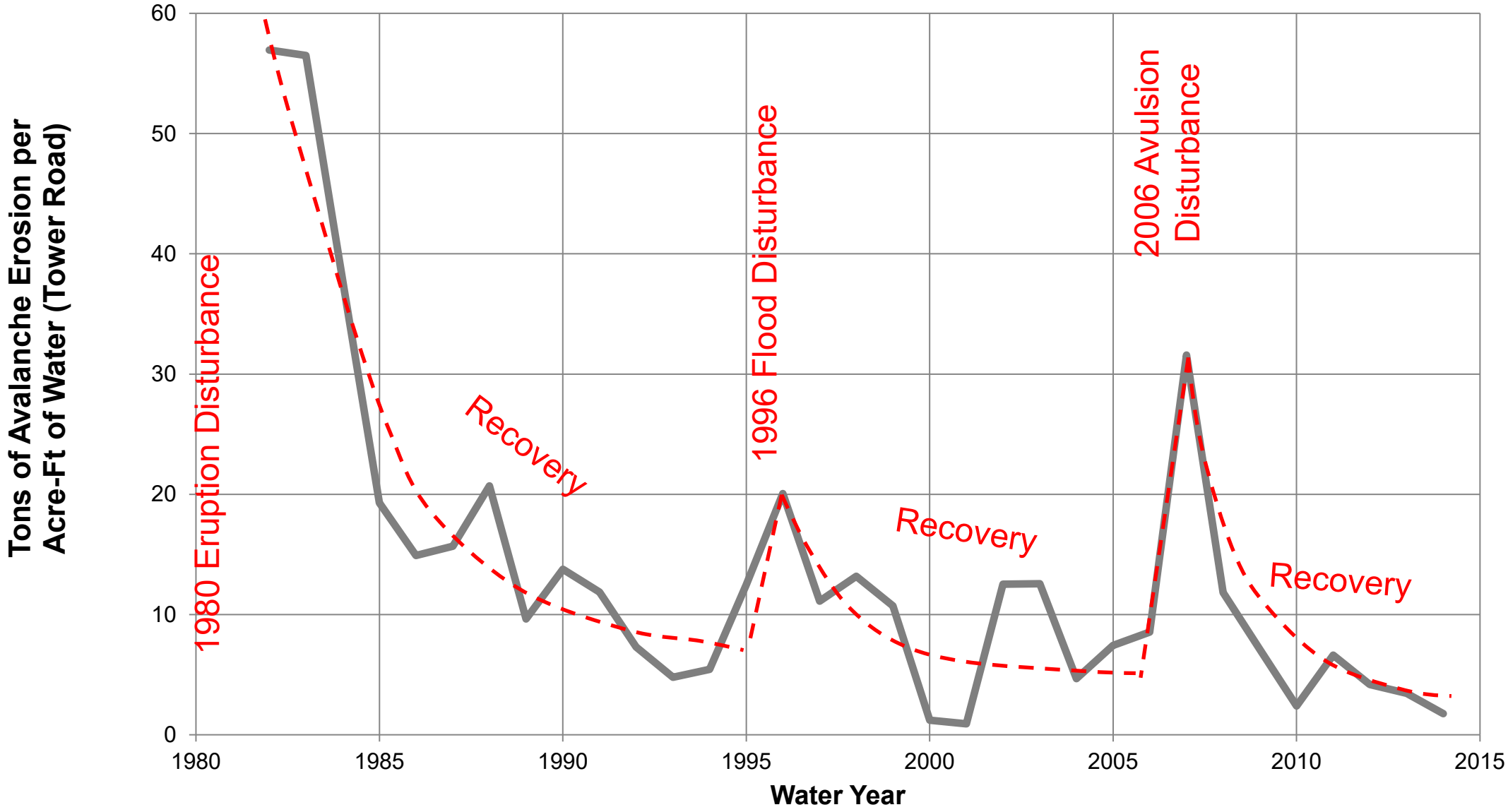


USGS Partnerships

FUTURE DEBRIS AVALANCHE SEDIMENT LOAD



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1985 Recovery Plan Components

Authorized Project:

- Sediment Retention Structure (SRS)
- Permanent levee improvements
- Dredging
- Out-year dredging and/or other cost-effective measures
- Mitigation

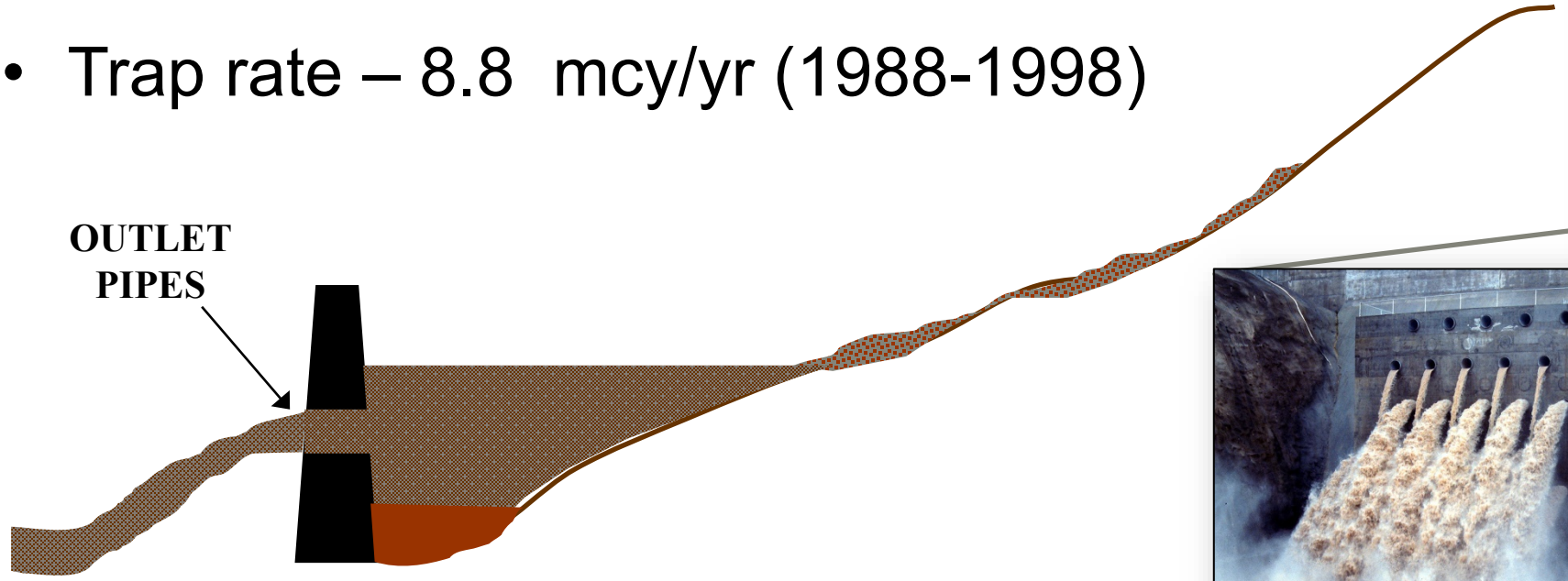
Levee Location	Levee Length (miles)	Percent Chance Exceedance Flood	Average Annual Recurrence Interval (years)
Kelso	5.7	0.70%	143
Longview	2.4	0.60%	167
Lexington	2.7	0.60%	167
Castle Rock	1.5	0.85%	118

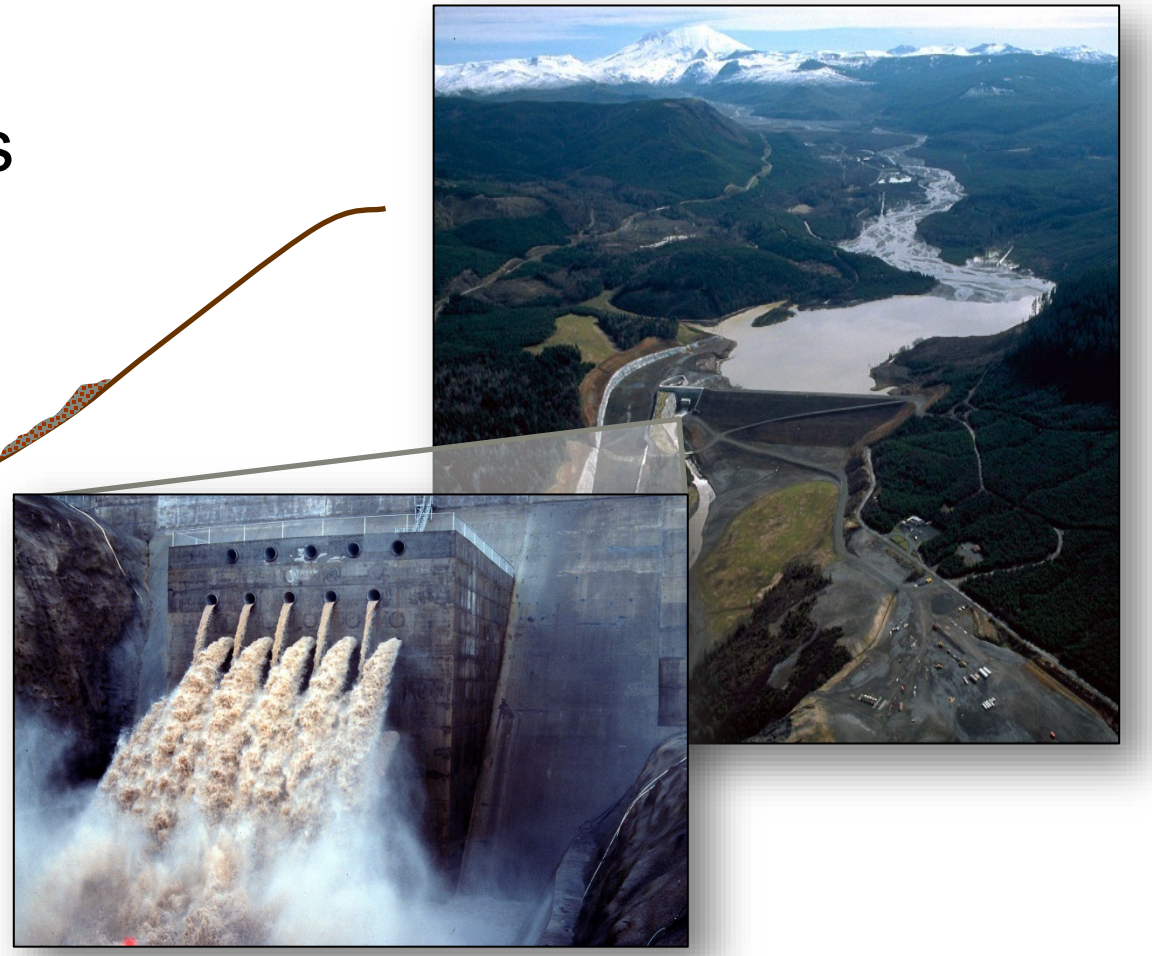
Project Authority:
PL99-88 (1985): Provide flood protection for developed areas along the Cowlitz River and navigation on the lower Columbia and Cowlitz Rivers

Section 339, WRDA 2000: Clarified that the Corps to maintain levels of flood protection specified in 1985 Decision Document

SRS PHASE I OPERATION: 1988-1998

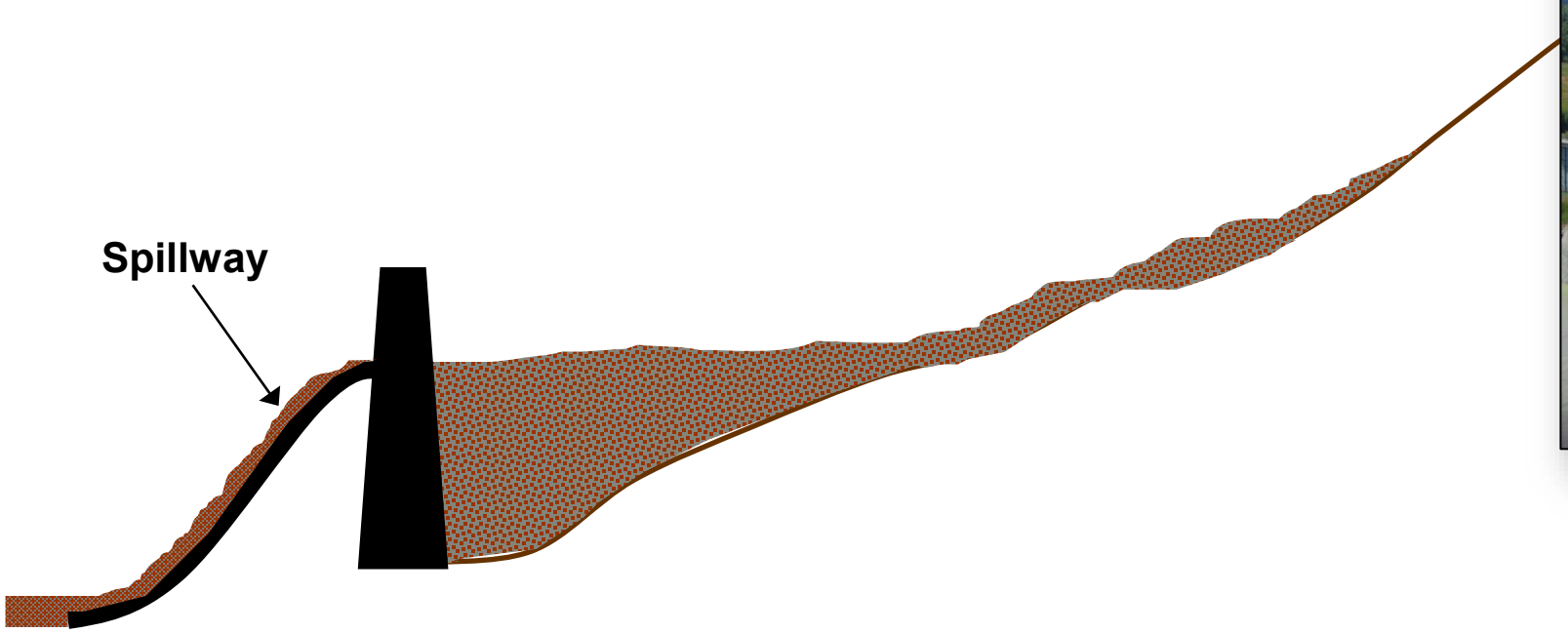
- Most sediment trapped by impoundment behind dam – only fine sediment passes through SRS outlets
- Trap rate – 8.8 mcy/yr (1988-1998)



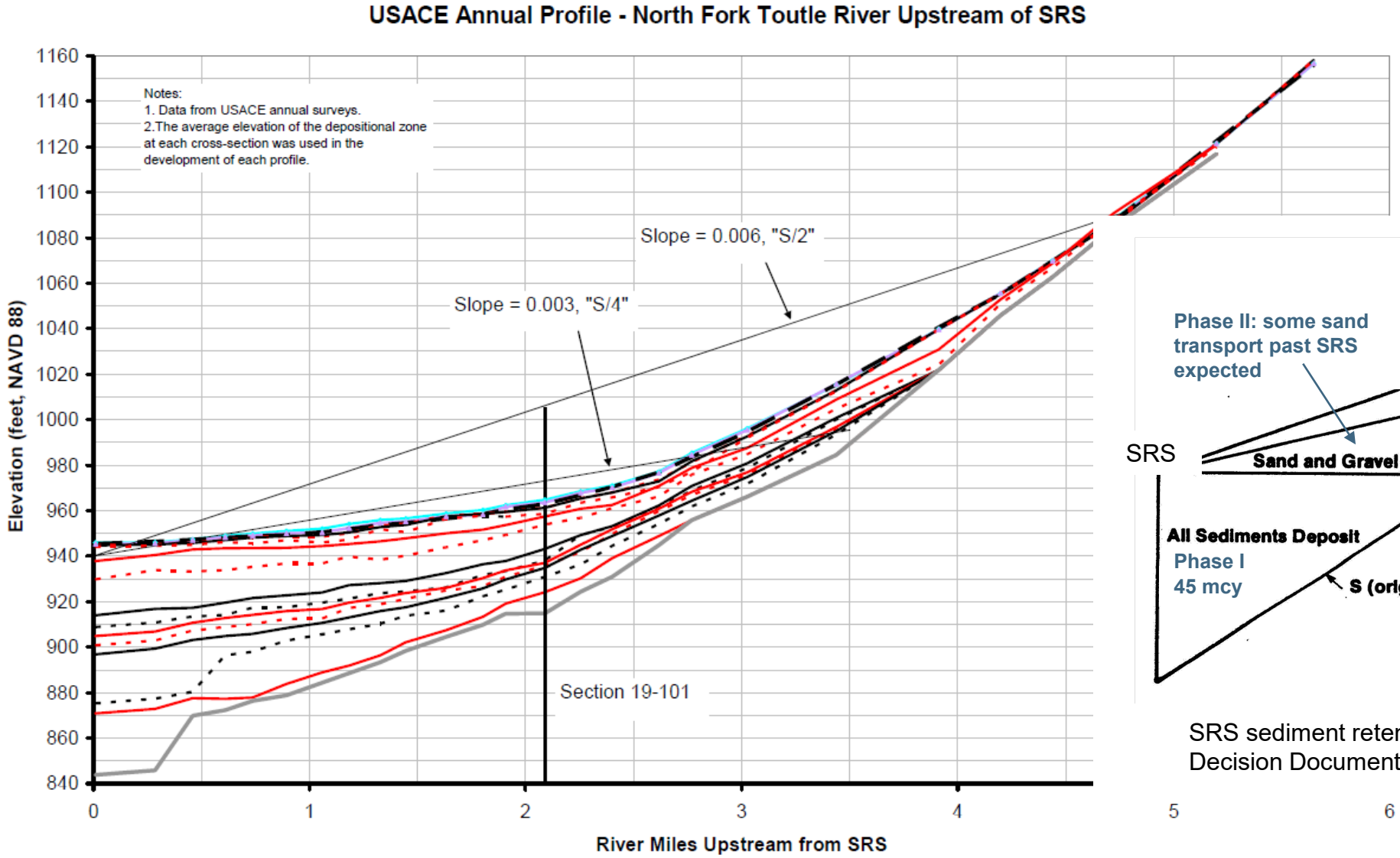


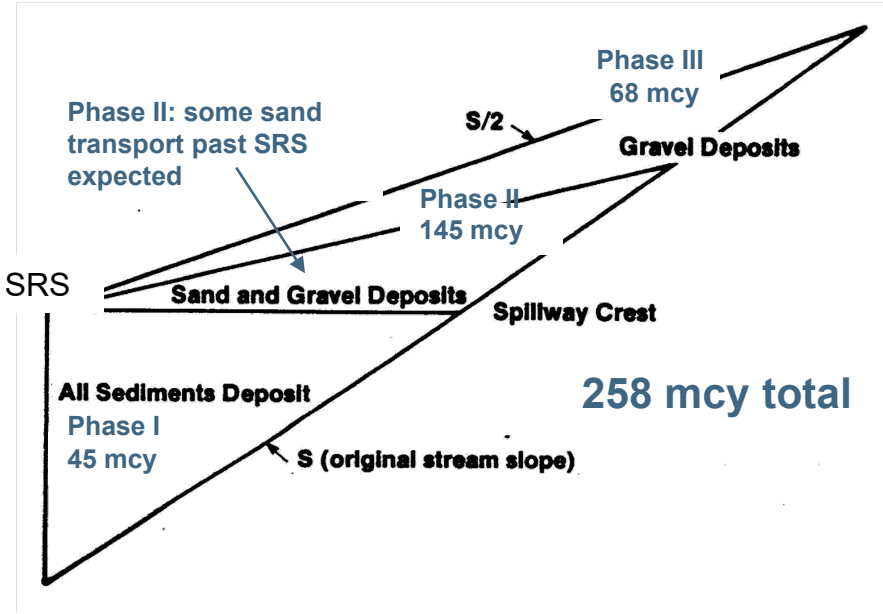
SRS PHASE II AND PHASE III OPERATION: 1998 - 2035

- Coarse sediment and some sand trapped, more sand passes through SRS via outlet spillway
- Trap Rate – 2.2 mcy/yr (1998-current)
- The SRS will continue to fill, but at a slower rate



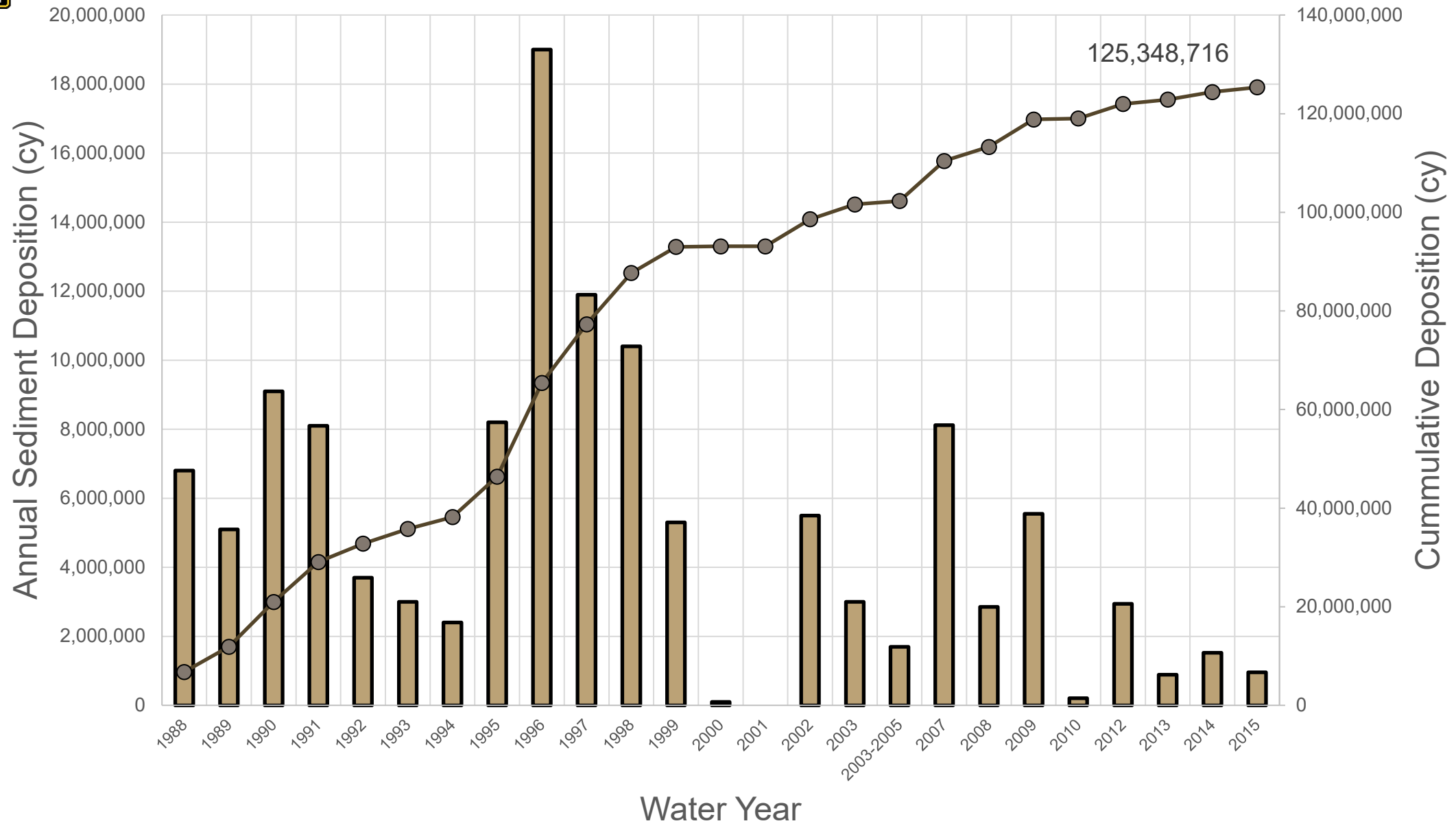
Sediment Retention Structure
Sediment Profile





SRS sediment retention phases figure from 1985 Decision Document

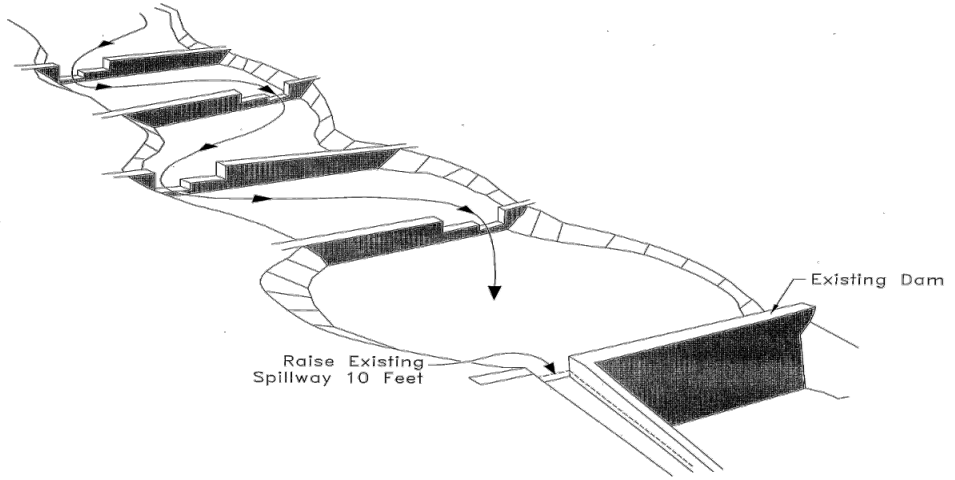
Deposition in the Sediment Plain behind SRS



PLAN FOR LONG-TERM FLOOD RISK MANAGEMENT

Phased Construction

- Annual monitoring
- Incremental raises of SRS Spillway Crest
- Grade Building Structures upstream of SRS
- Dredging Lower Cowlitz River as needed
- Modify the Fish Collection Facility (with WDFW) and construct additional fish release site(s)

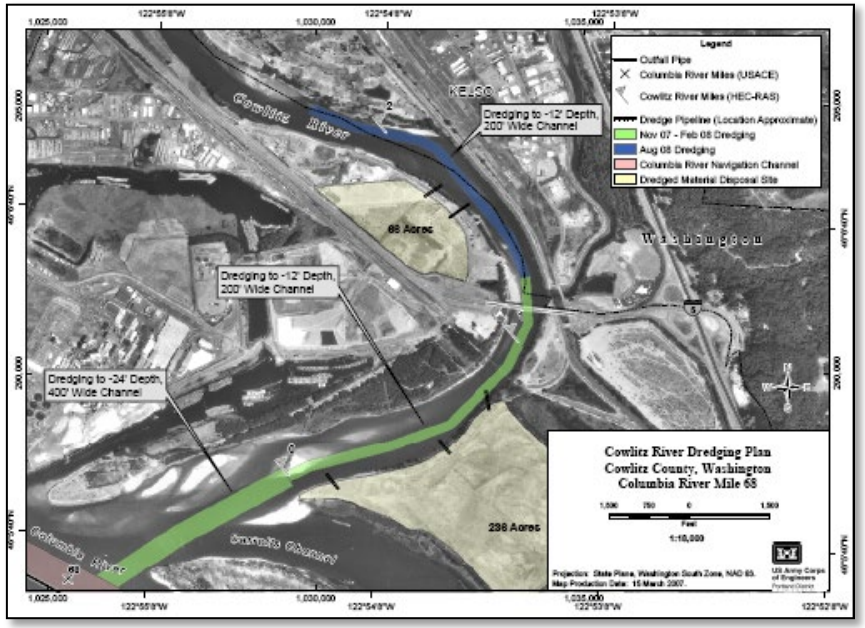


Project Related Actions: Mount St. Helens Project Dredging

Dredge lower 2.5 miles of the Cowlitz River

2007/2008 – Volume of Material Removed

- Mouth to RM 1.3 = 2.2 MCY
- RM 1.3 to 2.5 = 250,000 CY



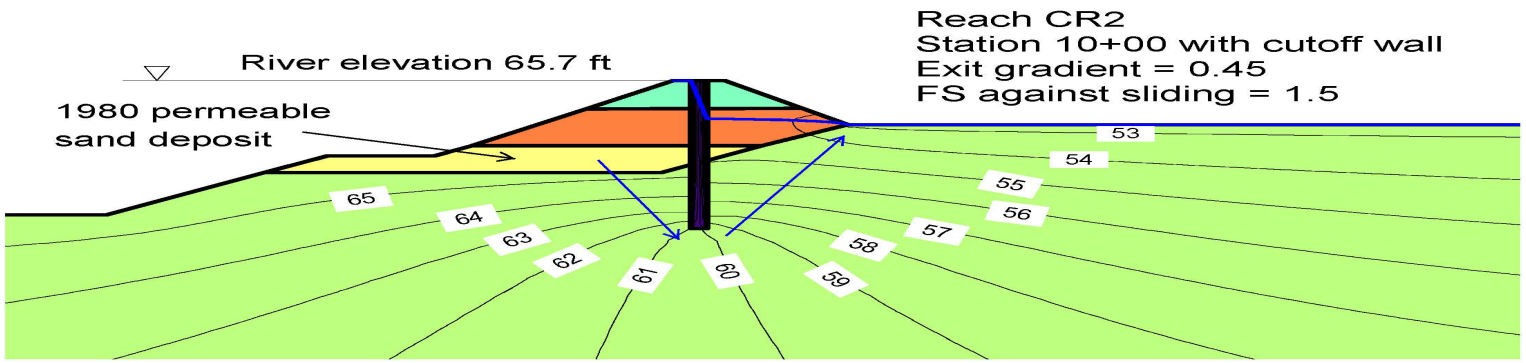
INTERIM ACTION: SRS SPILLWAY CREST RAISE

- 7-ft Raise Constructed Summer 2012
- 30% reduction in sand passing SRS

Interim Actions:
Grade Building Structures Pilot Project

Interim Actions: Castle Rock Levee Cutoff Wall Project

Cutoff wall extends seepage path,
reducing adverse effects of seepage



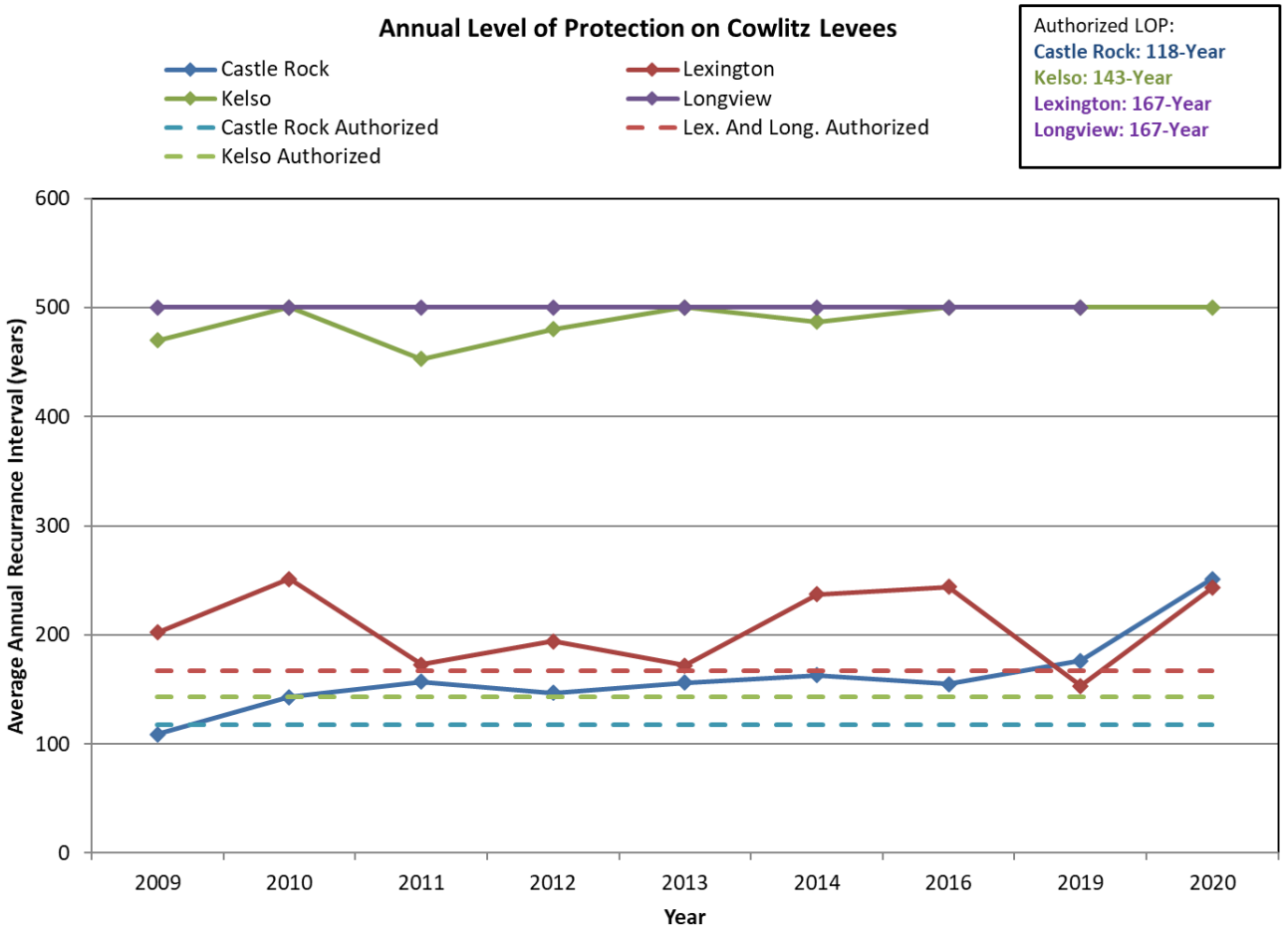
Reach CR2
Station 10+00 with cutoff wall
Exit gradient = 0.45
FS against sliding = 1.5

COWLITZ RIVER LEVEL OF PROTECTION

- Survey of channel bathymetry occurred in November/December 2020
- Data review and hydraulic modeling March 2021
- Level-of-Protection (LOP) analysis April 2021

LOP increased at Castle Rock and Lexington, constant for Kelso and Longview

Levee	Authorized LOP (yrs)	2020 LOP (yrs)	2019 LOP (yrs)	2016 LOP (yrs)
Castle Rock	118	251	176	155
Lexington	167	243	153	207
Kelso	143	>500	>500	>500
Longview	167	>500	>500	>500



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Biological Opinion Requirements:

- Modify Fish Collection Facility with the Second Crest Raise
- Pass 95% if the Coho Salmon and Winter Steelhead coming up the Toutle River.
- Add Deer Creek Fish Release Site

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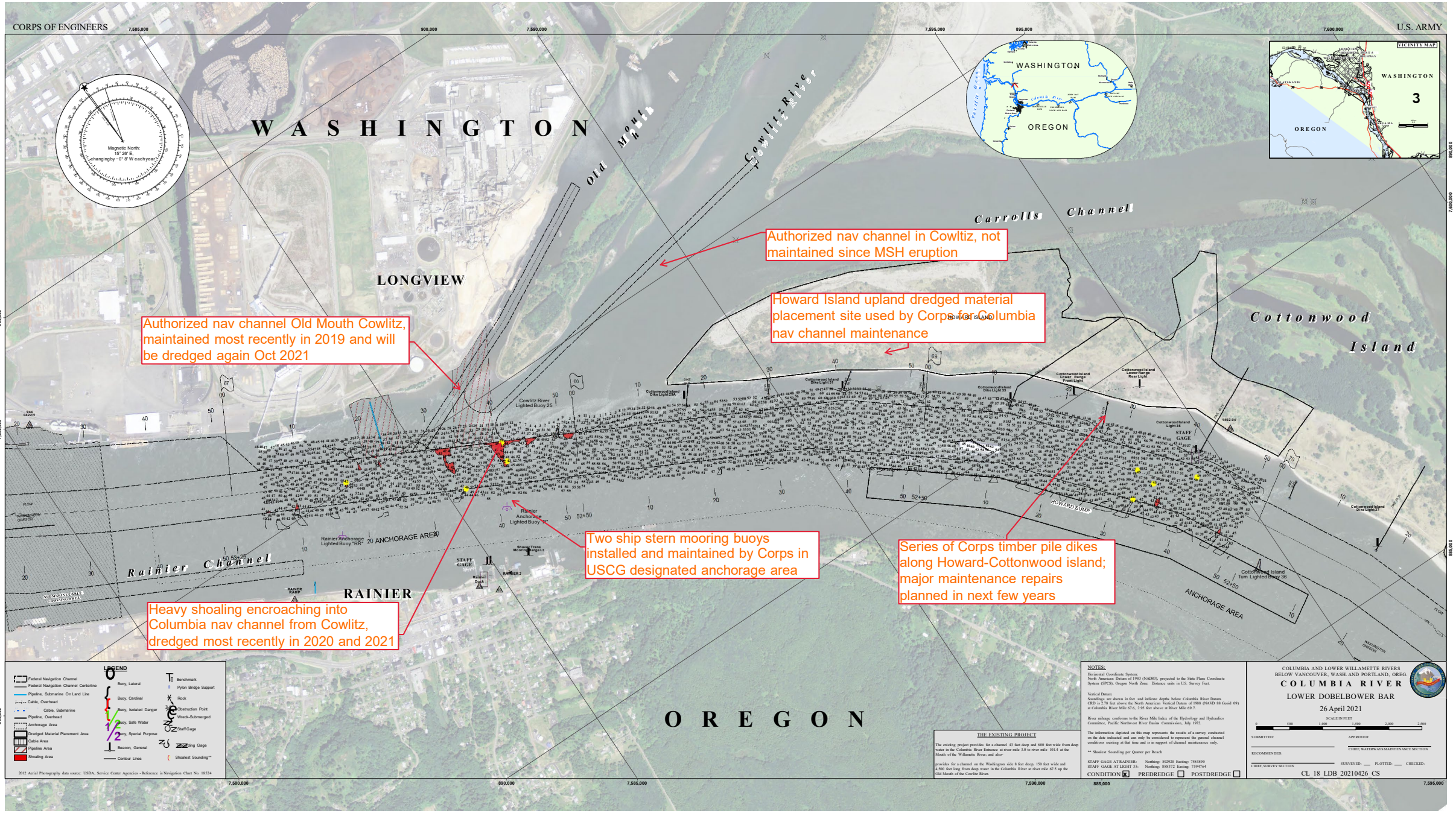
COLUMBIA RIVER NAVIGATION CHANNEL

600-ft wide, 43-ft deep, and extends 106.5 miles from the mouth of the Columbia River to Vancouver, Washington


CORPS OF ENGINEERS
U.S. ARMY
WASHINGTON
OREGON
LONGVIEW
RAINIER
Old Mouth
Cowlitz River
Carrolls Channel
Cottonwood Island
Howard Island
Rainier Channel
ANCHORAGE AREA
HOWARD BUMP
Authorized nav channel in Cowltiz, not maintained since MSH eruption
Howard Island upland dredged material placement site used by Corps for Columbia nav channel maintenance
Authorized nav channel Old Mouth Cowlitz, maintained most recently in 2019 and will be dredged again Oct 2021
Two ship stern mooring buoys installed and maintained by Corps in USCG designated anchorage area
Series of Corps timber pile dikes along Howard-Cottonwood island; major maintenance repairs planned in next few years
Heavy shoaling encroaching into Columbia nav channel from Cowlitz, dredged most recently in 2020 and 2021
VICINITY MAP
LEGEND
NOTES:
THE EXISTING PROJECT
COLUMBIA AND LOWER WILLAMETTE RIVERS
BELOW VANCOUVER, WASH. AND PORTLAND, OREG.
COLUMBIA RIVER
LOWER DOBELBOWER BAR
26 April 2021
CL_18_LDB_20210426_CS

LOWER COLUMBIA RIVER CHANNEL & DREDGED MATERIAL MAINTENANCE PLAN

- Plan how to maintain the 43-ft channel downstream of Vancouver, WA for the next 20 years
- Corps and Ports of Longview, Kalama, Woodland, Vancouver, WA & Portland, OR are working together
- The Plan will be integrated with an Environmental Impact Statement (EIS)
- 2021: Corps and Ports continuing to develop the Draft Integrated Plan and EIS

www.nwp.usace.army.mil/lcrchannelmaintenance/

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SECTION 408 - THE AUTHORITY

Authorized in Section 14 of the River and Harbors Act of 1899 (33 USC 408)

- Provides that the Secretary of the Army may, on recommendation of the Chief of Engineers, **grant permission for the alteration of a public work so long as that alteration** is not injurious to the public interest and will not impair the usefulness of the work.

Implementation Guidance:

- Engineering Circular (EC) 1165-2-220, Issued 10 Sept 2018

SECTION 408 – WHAT IS IT?

It is….

1) …a required permission process for any modification to a federally authorized project.

2) …the authority and the criteria by which the Corps evaluates and approves the proposed modification to a federally authorized project.

3) …a process that must be complete (evaluated and approved) prior to construction.

4) …not part of the Corps' Regulatory Section 10 and 404 permitting program, BUT a Regulatory permit CANNOT be issued until Section 408 approval is granted. This includes Nationwide Permit verifications.

-HOWEVER-

Section 408 and the Regulatory Program are "Synched" which means that applicants will get one decision letter from the Corps for both the 408 Permission and Reg Permit (if one is required).

If Section 408 project and Section 10 Permit project are IDENTICAL in scope, project will be reviewed in Regulatory and Regulatory will issue the permit.

COMMON REQUIRED DOCUMENTS FOR 408 REVIEW

Type of Common Required Documents

- Technical Analysis (Geotech, Structural, etc) and Detailed Design Documents (at least 60%, sometimes 90%)
- Hydrologic and Hydraulics System Performance Analysis.
- Environmental Compliance (REC for Small 408 or EA or EIS for Large 408).
- Cultural Resources Compliance documents (Section 106).
- Real Estate Information (Title, easements, etc.).
- Independent External Peer Review (IEPR) Type II (Multi-phase 408s) for Safety Assurance Requirements.
- Operation and Maintenance manual.

Portland District Lead for Agency Technical Review (ATR)

- Each discipline reviews the complete application and makes a “Yes” or “No” decision based on application documents.
- No conditions or mitigation is done with Section 408 permissions.

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OVERVIEW OF PROGRAMS/AUTHORITIES

Continuing Authority Program (CAP) : CAP is a suite of authorities which enable USACE to partner with a non-federal sponsor to address issues of limited complexity. Projects are typically small, and the challenges are obvious and understood. Projects are cost-shared with a non-federal sponsor.

Planning Assistance to States and Tribes (PAS) : PAS is intended to provide planning and other technical assistance regarding issues related to water resources related problems. No site-specific designs or construction is authorized under PAS. Projects are cost-shared with a non-federal sponsor.

Interagency and International Services (IIS) : IIS utilizes several authorities which enable USACE to partner with other federal agencies, state and local governments, and in certain circumstances private organizations. Projects are at the expense of the requesting organization.

Floodplain Management Services (FPMS) : The FPMS objectives are to foster public understanding of options for dealing with flood hazards and to promote prudent use and management of the Nation's floodplains. Technical services and planning guidance under the FPMS Program are provided to State, regional, Tribal, and local governments without charge, within program funding limits.

Specifically Authorized: This would come from either a Senate Resolution (Environment and Public Works Committee) or House Resolution (Transportation and Infrastructure Committee) or language in a Water Resources Development Act (WRDA) usually passed by Congress and signed by the President every 2 years. Projects are cost-shared with a non-federal sponsor.

CAP PROGRAM OVERVIEW

AUTHORITY	PROJECT PURPOSE
Section 14	Emergency stream bank and shoreline protection for public facilities, such as roads, bridges, hospitals, schools, and water & sewage treatment plants, that are in imminent danger of failing.
Section 103	Protection of public and private properties and facilities against damages caused by storm driven waves and currents by the construction of revetments, groins, and jetties, and may also include periodic sand replenishment.
Section 107	Improvements to navigation including dredging of channels and widening of turning basins.
Section 111	Prevention or mitigation of erosion damages to public or privately owned shores along the coastline when the damages are a result of a Federal navigation project.
Section 204	Regional Sediment Management and beneficial uses of dredged material from new or existing Federal projects for ecosystem restoration, FRM or HSDR purpose.
Section 205	Local protection from flooding by non-structural measures such as flood warning systems, or flood proofing; or by structural flood damage reduction features such as levees, diversion channels, or impoundments.
Section 206	Aquatic ecosystem restoration.
Section 208	Local protection from flooding by channel clearing and excavation, with limited embankment construction by use of materials from the clearing operation only.
Section 1135	Modifications of USACE constructed water resources projects to improve the quality of the environment. Also, restoration projects at locations where an existing Corps project contributed to the degradation.

GENERAL PROJECT DEVELOPMENT PROCESS

1 - Letter of Intent From Non-federal Sponsor(s)
2 - Federal Interest Determination
3 – Feasibility Cost-share Agreement (50-50)
4 – Integrated Feasibility Report and NEPA Compliance
5 – Design Agreement (Specifically Authorized; not needed for CAP)
6 – Project Partnership Agreement
7 – Project Is Turned Over to Non-federal Sponsor for O&M (Exception-Navigation)


Questions?