Geologic Evolution of the Skagit River Channel Migration Zone



J. Riedel – National Park Service





CMZ defined by:

- 1) Areas within FEMA floodplain of Skagit River (100 and 500 year);
- 2) Areas within meander belt of the Skagit River identified with LiDAR;
- 3) USGS lahar (debris flow) inundation zone;
- 4) All areas mapped by Dragovitch et al. within Kennedy Cr. lahar deposition zone;
- 5) Excluded tributary FEMA floodplains; and
- 6) Excluded high terraces along river above Birdsview, which date to end of last ice age.





The Skagit Basin formed where two mountain ranges overlap.

The Coast Mountains of British Columbia are ~80 million years old.

The Cascade Mountains are less than 35 million years old.





Pacific Crest

North Cascades Crest

Skagit Crest



Pacific Crest

North Cascades Crest

Skagit Crest











Baker alpine valley glacier ca. 27,000 yr BP

- Area = 538km²

 $-\Delta$ ELA =980m

 $-\Delta T = ~7^{\circ}C$

Lower Skagit Valley





Cedar Grove Section





Ovenell Big Boy Section

Ovenell - Big Boy Section





Between 30,000 and ~19,000 years ago, the Skagit likely drained via the Stillaguamish to Puget Sound





Redrawn from Waitt and Thorson (1981)



Before the ice ages, perhaps 3 million years ago, the Skagit likely flowed in two directions.

Since the first ice ages, the Skagit has become the focal point for ice sheet drainage, and carried water from the Fraser and Okanagan Rivers.





Lower Skagit Gorge looking west







Between 19,000 and 15,000 years ago, the Skagit continued to drain via the Stillaguamish to the sea, but was eventually overwhelmed by ice.

Mount Josephine from Skagit valley – photo by Scurlock



Skagit valley looking east over Marblemount (photo by Scurlock)



Advance of the Puget and Okanagan Lobes of the Cordilleran Ice Sheet into lower Skagit valley about 18,000 years ago.





Frontal retreat of the Cordilleran Ice Sheet 13,000-12,000 years ago; note mouth Baker Blocker and Lake Tyee-Grandy Creek is outlet.





Maximum extent of Glacial Lake Baker about 12,000 years ago; surface elevation 1100 ft.

-After retreat of CIS opens southern outlet, lake stands at 825 ft.

-GLB persisted until at least 3,000 years ago due to <u>bedrock</u> at it's outlet.





(photo by Scurlock looking north)









Mount Rainier Kautz Creek 1947 debris flow Dee Moleenaar

Glacier Peak (10,451 ft.)



-Second to MSH in size and frequency of explosive eruptions since ice age; nine ash layers identified.

-Major eruptions ~13,000 and ~6,000 years ago.

-13,000 year old lahar reaches Puget Sound via Stillaguamish, forces Sauk to merge with Skagit.

-6,000 year ago lahar fills Lower Skagit into sea, and forms prominent terraces from Lyman to Burlington.

Mt. Baker (10,775 ft.)



-Present cone built within last 30,000 years, major eruptions 13,000 and 9,500 years ago.

-Mud flow (lahar) to Deming 6800 years ago.

-1843 eruption kills fish.

-0.43 cubic miles of ice is more than all other Cascade volcanoes combined (except MR).



After ~13,000 years ago, the Sauk and Suiattle Rivers joined the Skagit.





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The Skagit River Watershed Divides

