Restorative Flood Protection

Historical Landscape Reconstruction and Geomorphic Conditions Assessment

October 4, 2016

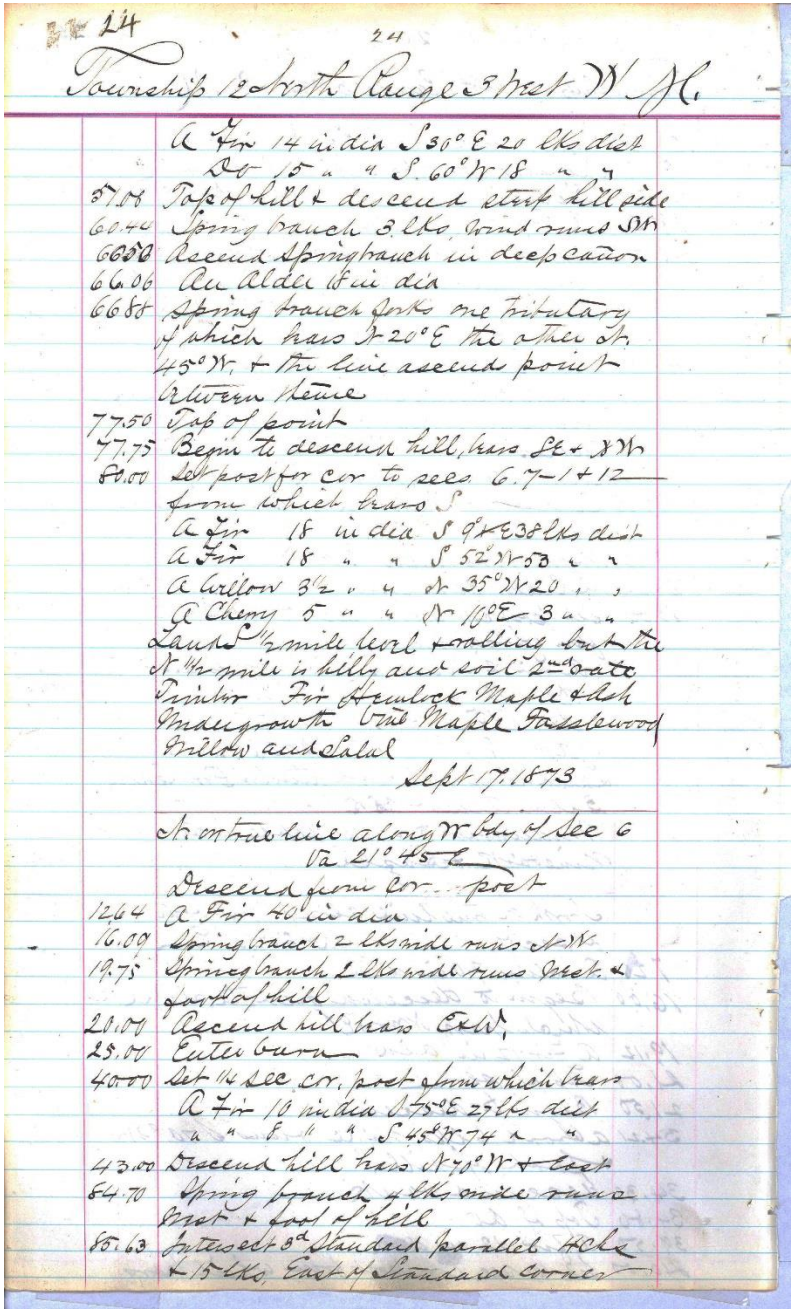
Presentation Overview

- Historical Reconstruction
- Preliminary Assessment Method: High-Level Geomorphic Assessment and Hydraulic Analysis Approach

Historical Reconstruction

The Chehalis Restorative Flood Protection assessment plan consisted of the following elements:

- Delineate an assessment study area where restorative flood protection actions would be evaluated.
- **Research and compile available historical information to develop a reconstruction of what the historical river and floodplain conditions were prior European settlement.**
- **Conduct a screening-level geomorphic assessment to identify areas where restorative flood protection could be effective.**
- Conduct field and literature surveys to characterize the historical and current vegetation characteristics of the assessment area. Develop vegetation community profiles that would be suitable to the restorative flood protection treatment areas.
- Utilize the vegetation characterization and ROVER model to establish proposed-condition channel and floodplain roughness values. These roughness values provided inputs to hydraulic modeling.
- Utilize existing and new hydraulic modeling to estimate the flood storage and attenuation that could be obtained through restorative flood protection actions.



24

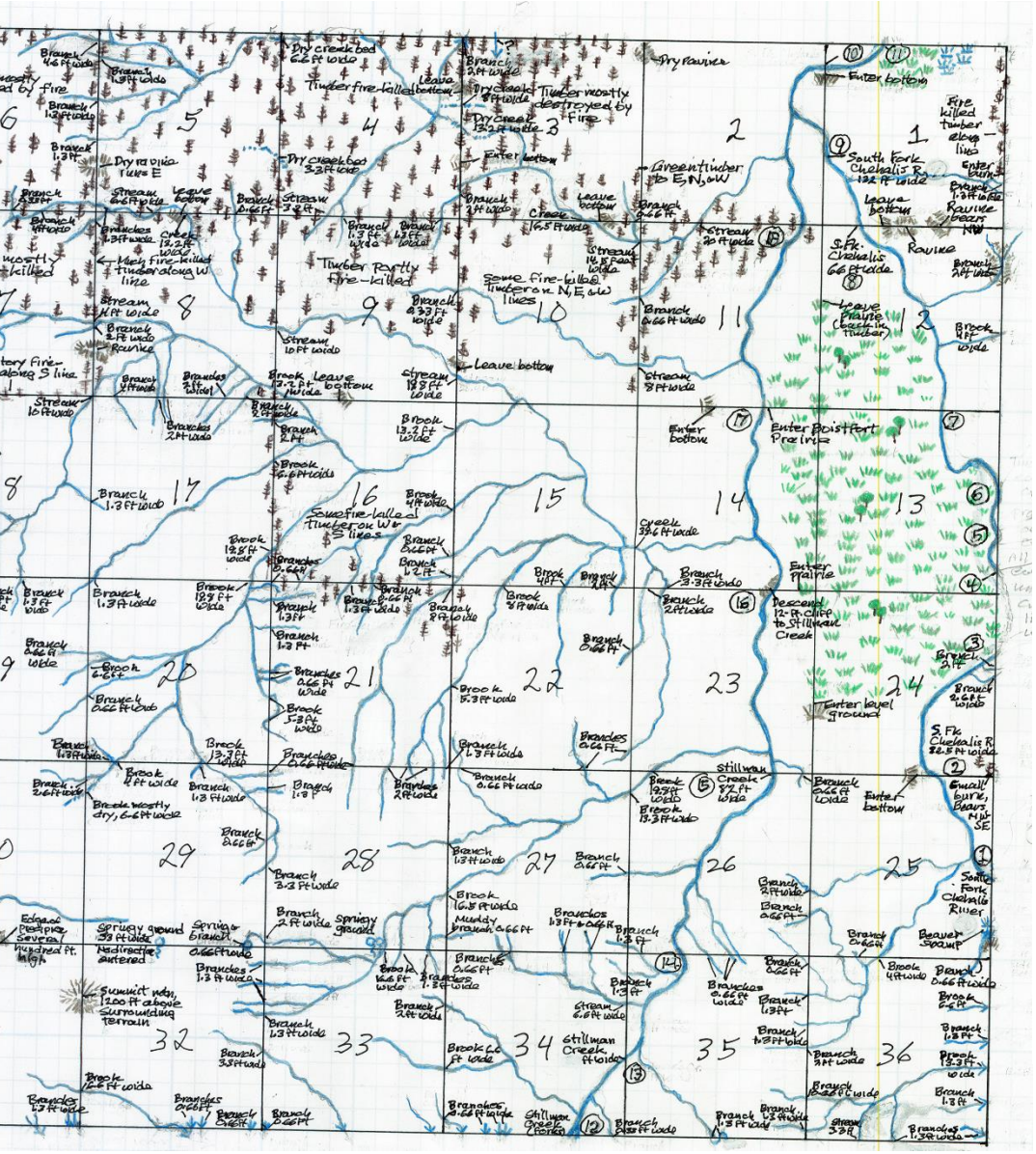
24

Township 12 North Range 3 West W. M.

A Fir 14 in dia S 30° E 20 lks dist
Do 15 " " S. 60° W 18 " "
37.00 Top of hill & descend steep hillside
60.40 Spring branch 3 lks, wind runs SW
66.00 Ascend Spring branch in deep cañon
66.06 An Alder 8 in dia
66.80 Spring branch forks one tributary of which bears N 20° E the other N. 45° W & the line ascends point between these
77.50 Top of point
77.75 Begin to descend hill, bears SE & SW
80.00 Set post for cor to secs 6.7-1 & 12 from which bears S
A Fir 18 in dia S 9° E 38 lks dist
A Fir 18 " " S 52° W 58 " "
A Willow 3½ " " N 35° W 20 " "
A Cherry 5 " " N 16° E 3 " "
Land S ½ mile level & rolling but the N ½ mile is hilly and soil 2nd rate
Timber Fir Hemlock Maple & Ash
Undergrowth Vine Maple Fusselwood Willow and Salal

Sept 17, 1873

N. on true line along W bdy of Sec 6 Va 21° 45' E
Descend from cor. post
12.64 A Fir 40 in dia
16.00 Spring branch 2 lks wide runs NW
19.75 Spring branch 2 lks wide runs West & foot of hill
20.00 Ascend hill bears E & W.
25.00 Enter burn
40.00 Set ¼ sec cor. post from which bears
A Fir 10 in dia S 75° E 25 lks dist
" " 8 " " S 45° W 74 " "
43.00 Descend hill bears N 70° W & East
54.70 Spring branch 4 lks wide runs West & foot of hill
85.63 Intersect 3rd Standard parallel 4 lks & 15 lks, East of Standard Corner

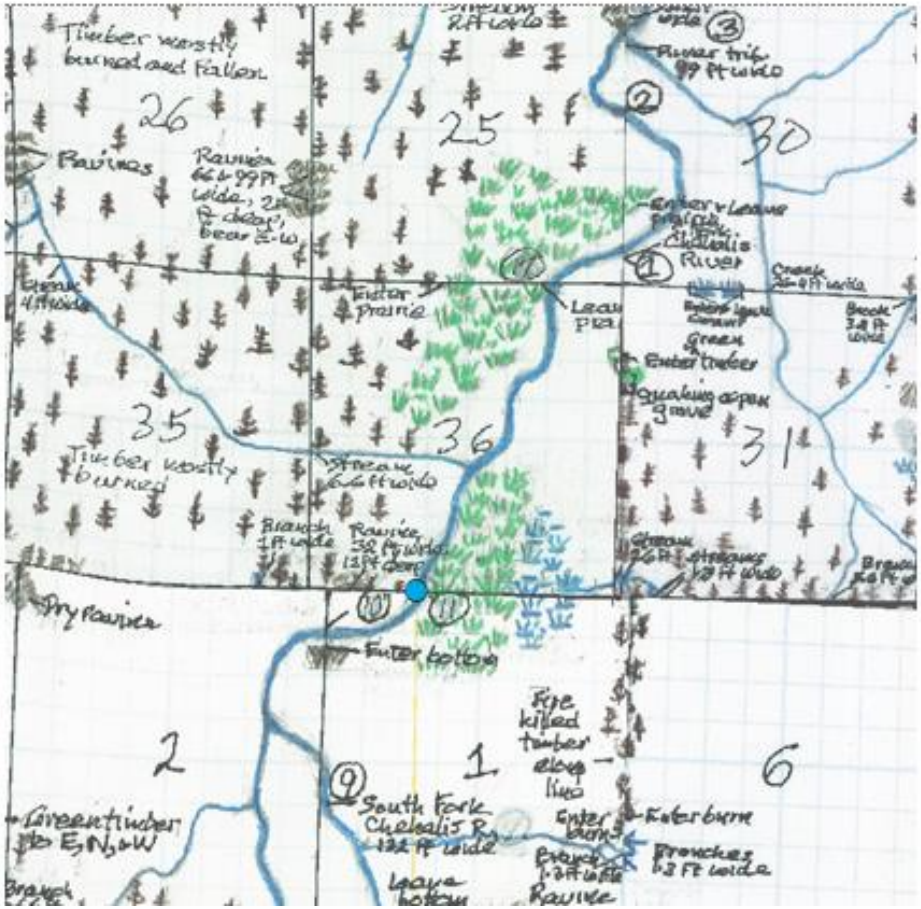


South Fork Chehalis River: The GLO surveyor of 1873 called this stream "Buchanan's Creek" after a settler who had by that time claimed land on the stream. He regarded the confluence of "Buchanan's Creek" with Stillman's Creek (named for another early settler) as the beginning of the South Fork Chehalis. But the "Buchanan's Creek" name did not endure. Survey lines crossed this stream 11 times, but unlike the mainstem Chehalis in T13N R5W and R4W where the surveyor noted such things as water depth, bank height, and stream bottom composition in places, only wetted width measurements were recorded in the field notes for the South Fork.

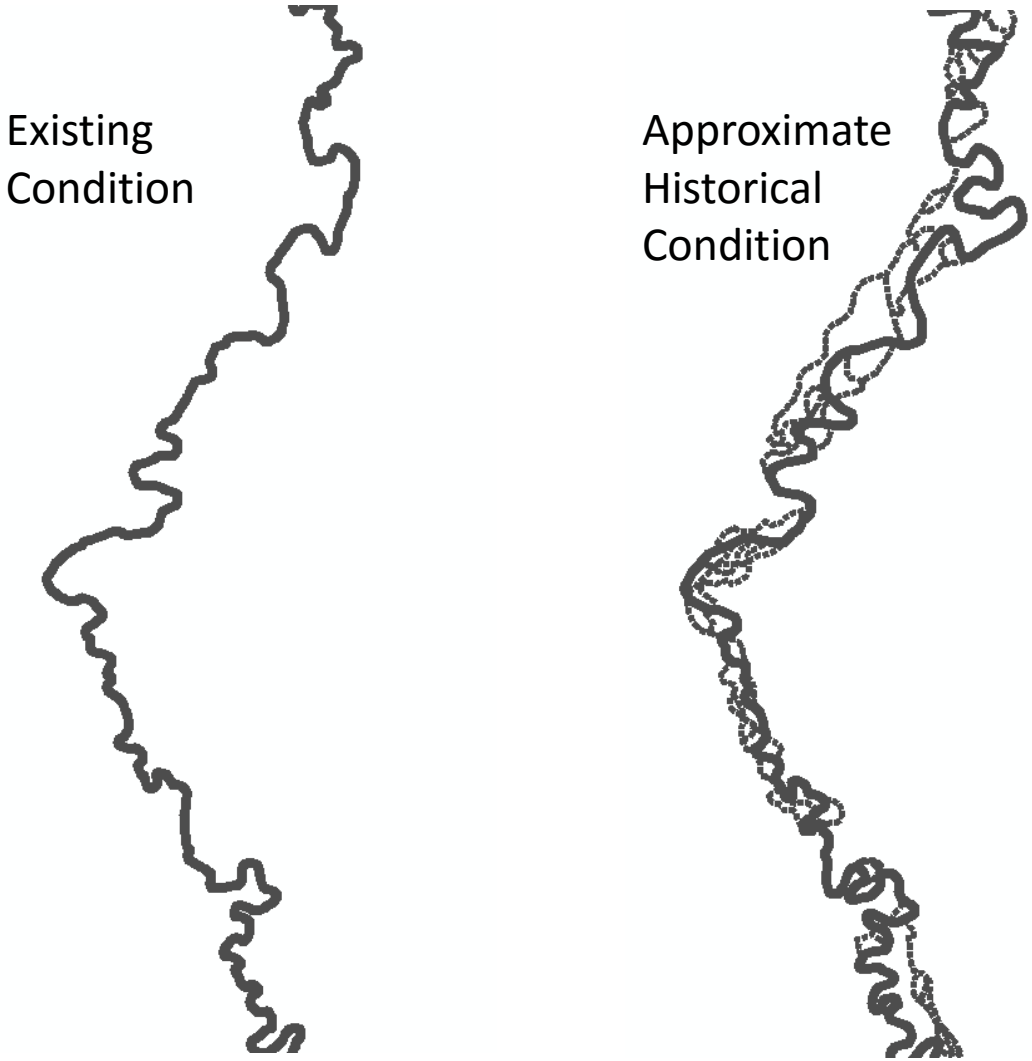
1) The South Fork Chehalis enters the township in section 25, but no measurements were recorded here.
2) Crossing between sections 24 and 25, width 125 links (82.5 feet).
3) Exit township, section 24, width 150 links (99 feet).
4) Re-enter township, width 100 links (66 feet).
5) Stream touches section line, width100 links (66 feet).
6) Crossing between sections 1 and 12, stream runs north along the section line, width 100 links (66 feet).
7) No measurements reported here.
8) Width here 100 links (66 feet).
9) 1st crossing between sections 1 and 2, width 200 links (132 feet).
10) 2nd crossing between secs. 1 & 2, no measurements recorded.
11) Exit township north from section 1, no measurements recorded.

Stillman Creek: Stillman Creek, a major tributary of the South Fork Chehalis and a stream the surveyors portrayed as being about equal in size (average wetted width about 100 links or 66 feet), joins the South Fork within this township and forms the western boundary of Boistfort Prairie as the prairie existed historically. The stream was described as "a rapid stream...well suited for mill purposes." Indeed, by the time of the GLO survey, H. R. Stillman had a sawmill set up on his claim in section 23 that could supply the lumber needs of those who had by this time taken up claims in the area (photo in Dawley 1976). Stillman Creek crossed the GLO section line survey at seven locations, here numbered 12 through 18 in the downstream direction.

12) Stream enters township as two forks, each 50 links (33 feet) wide.
13) Stream 75 links (49 feet) wide.
14) Stream 75 links (49 feet) wide.
15) Stream 125 links (82 feet) wide.
16) Stream 125 links (82 feet) wide.
17) Width not recorded here.
18) Width not recorded here.


Timber mostly burned and fallen
26
25
30
Ravines
Ravine
Enter Prairie
Leave Prairie
Chehalis River
Green Timber
35
36
31
Timber mostly burned
Stream
Branch
Ravine
Dry Ravine
Enter bottom
Fire killed timber along line
2
1
6
South Fork Chehalis R.
Green timber to E, N, & W
Enter burn
Leave bottom
Ravine

Mapping Historical Channel Features from the Alluvial Landscape

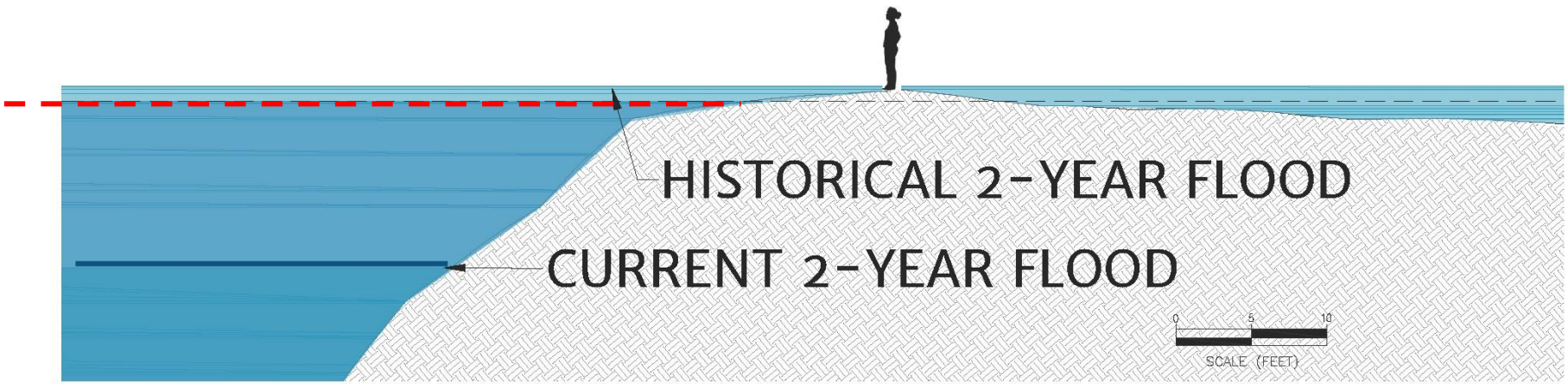


Channel Network Comparison Historical versus Current

BASIN	HISTORICAL CONDITIONS	CURRENT CONDITIONS		CURRENT: HISTORICAL
	CHANNEL LENGTH (MILES)	MAIN CHANNEL LENGTH (MILES)	SECONDARY CHANNEL LENGTH (MILES)	CHANNEL LENGTH (%)
South Fork Chehalis	51.14	20.17	0.15	40%
South Fork Newaukum	49.27	20.55	0.78	43%
North Fork Newaukum	34.09	11.00	0.00	32%
Bunker Creek	15.82	10.58	0.00	67%
Elk Creek	16.25	7.41	0.00	46%
Main Stem Chehalis	95.32	34.95	1.09	38%
RFP Treatment Area	261.89	104.66	2.02	41%

Geomorphic Conditions Assessment

The Chehalis watershed has lost much of its natural flood storage



CHEHALIS RIVER MILE 97.49.

CURRENT 100-YEAR FLOOD

67.00 Is bottom land of Chehalis river, this bottom
Is subject to inundation from 3 to 5 feet in depth
In the winter season

Landscape changes adversely impact hydrologic and geomorphic processes…

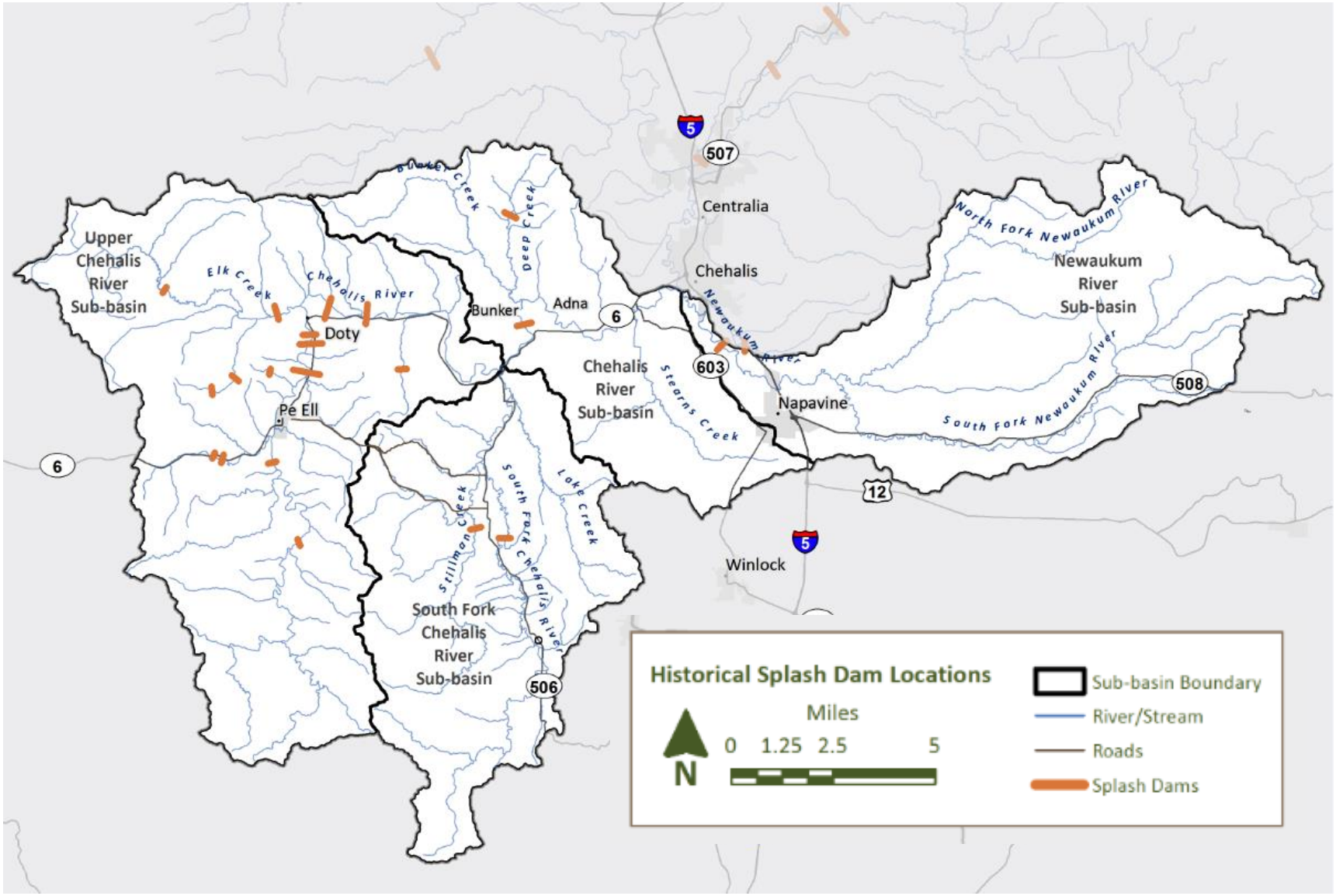
Photo: Lewis County Genealogical Society

Clearcuts and recent landslides in Willapa hills
Photo: LightHawk

Legacy of Splash Dams

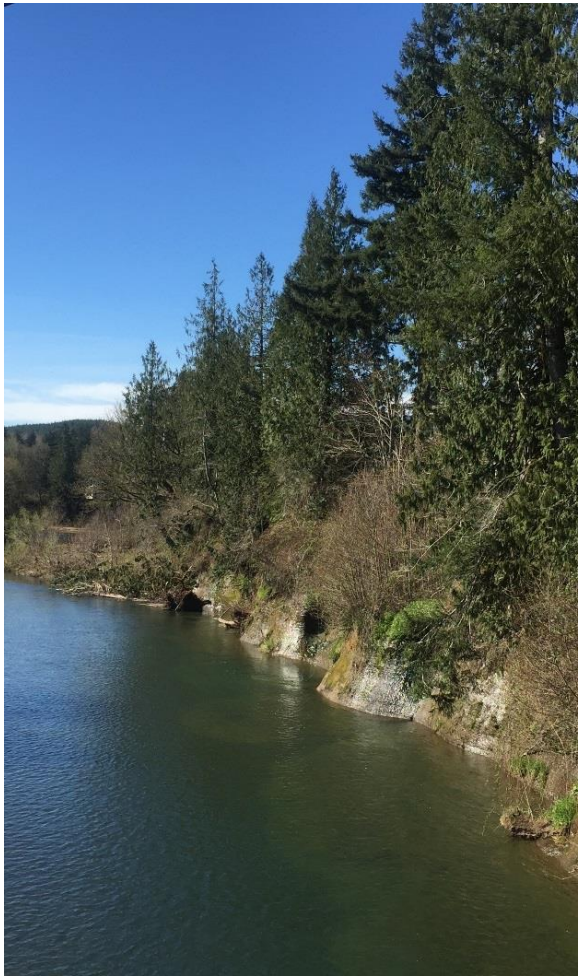
The Middle Fork Coquille River, Oregon, was splash dammed from 1923-1941 and scoured to bedrock. Photograph source Port of Coquille 1929

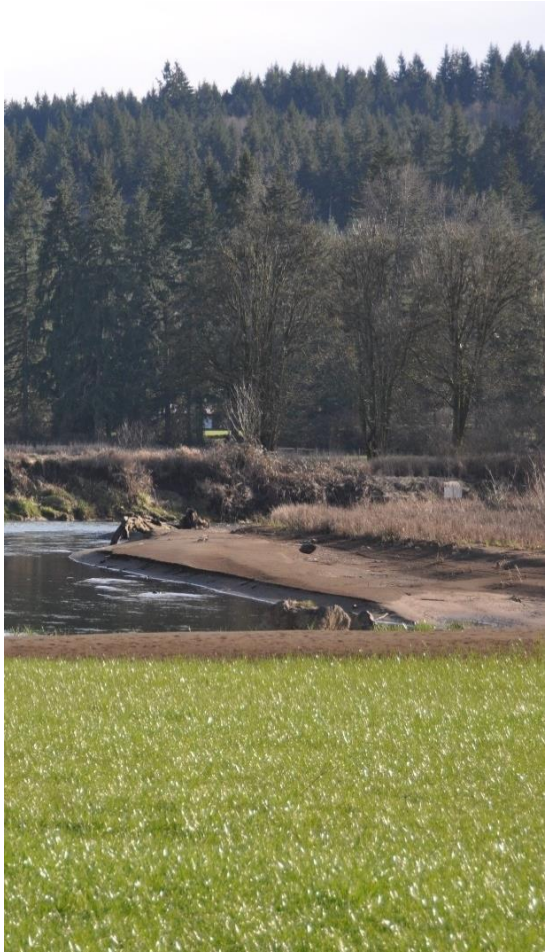
Figure from Miller (2010)



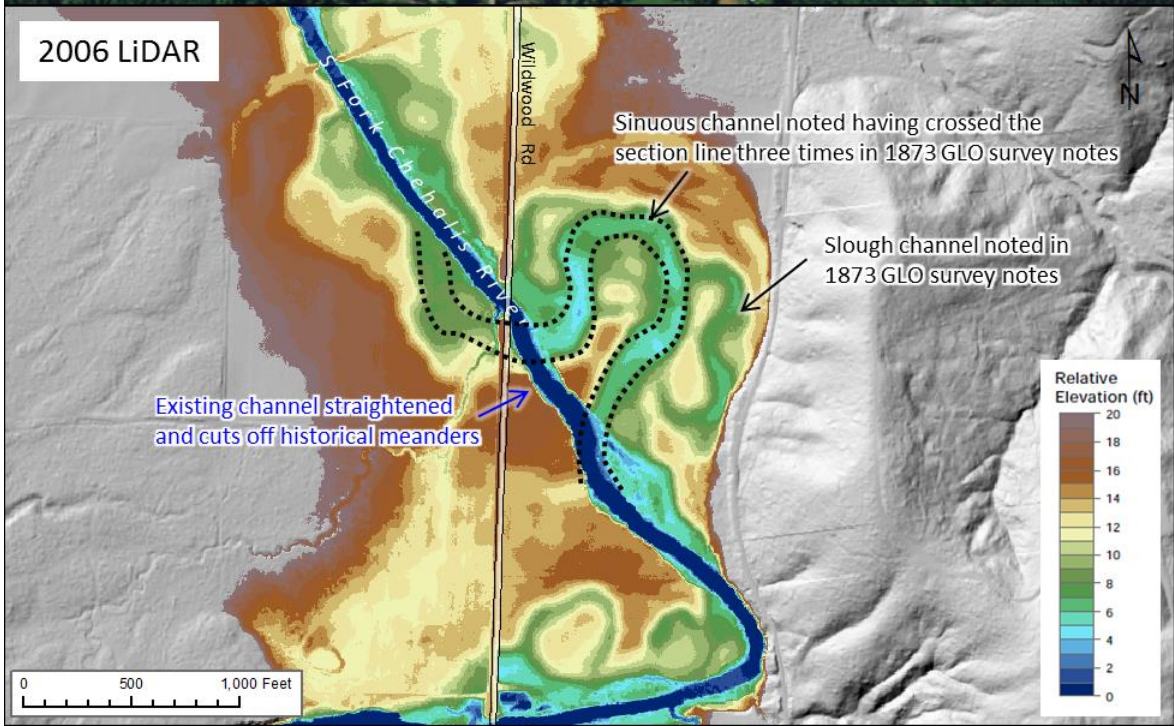
Modified from Wendler and Deschamps (1955).

Splash dams along with historic increase in magnitude and frequency of sediment transport events, and channelization have isolated much of upper tributaries from their floodplains.





Straighter Channels Increase Channel Slope and Water Velocity Thereby Increasing Incision and Downstream Flooding



Loss of Floodplain Wetlands and Forest
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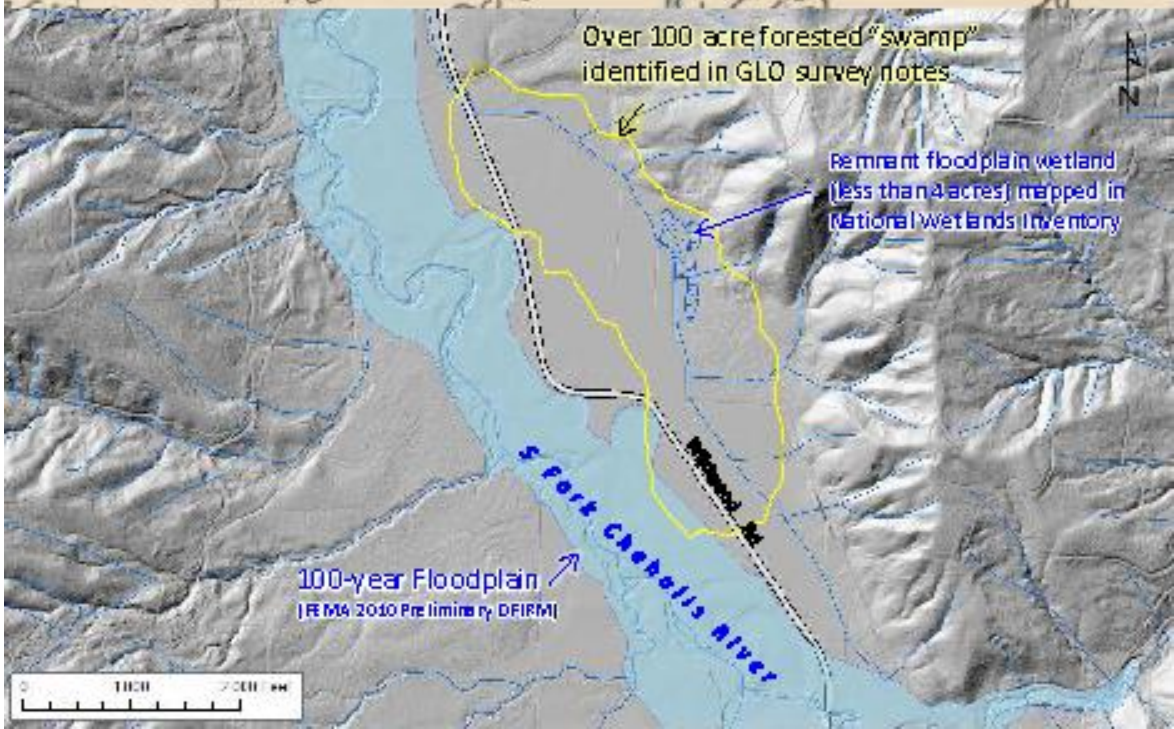
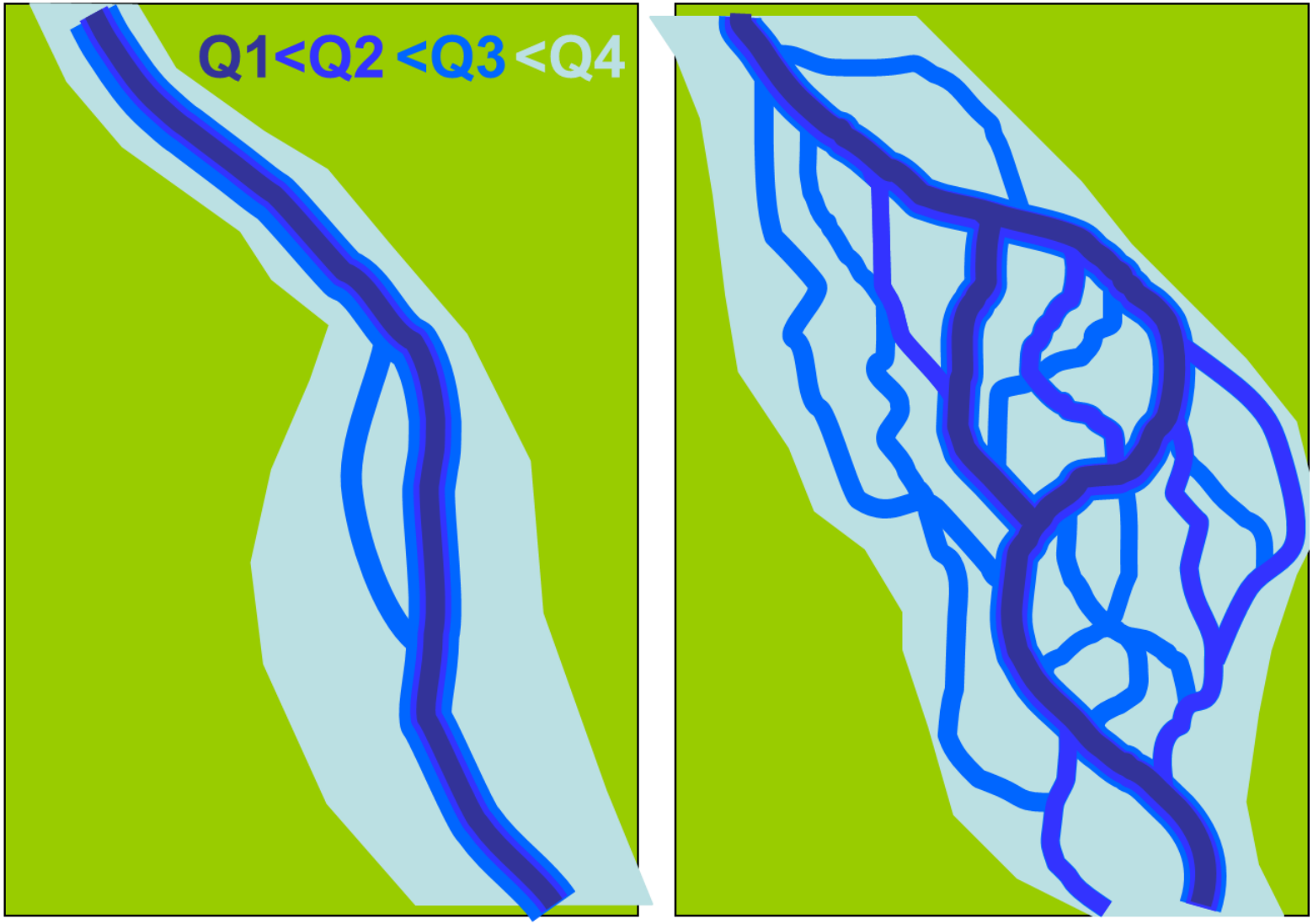
Loss of Flood Water Storage Capacity

South Fork Chehalis River Example Showing Loss of 100-acre Floodplain Wetland





Levee constrained or incised river **Unconstrained river**

Thank you.