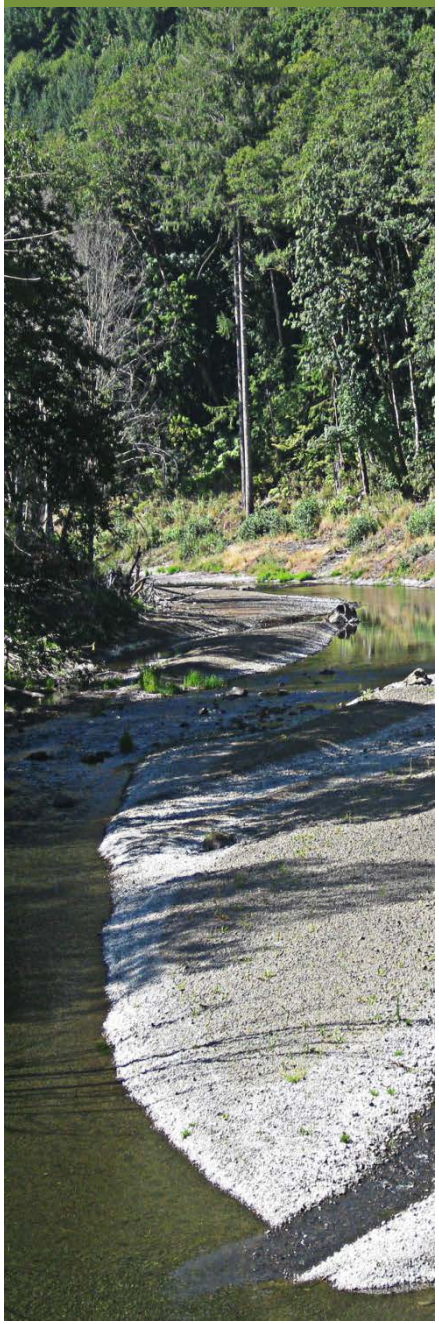
Flooding in the Chehalis

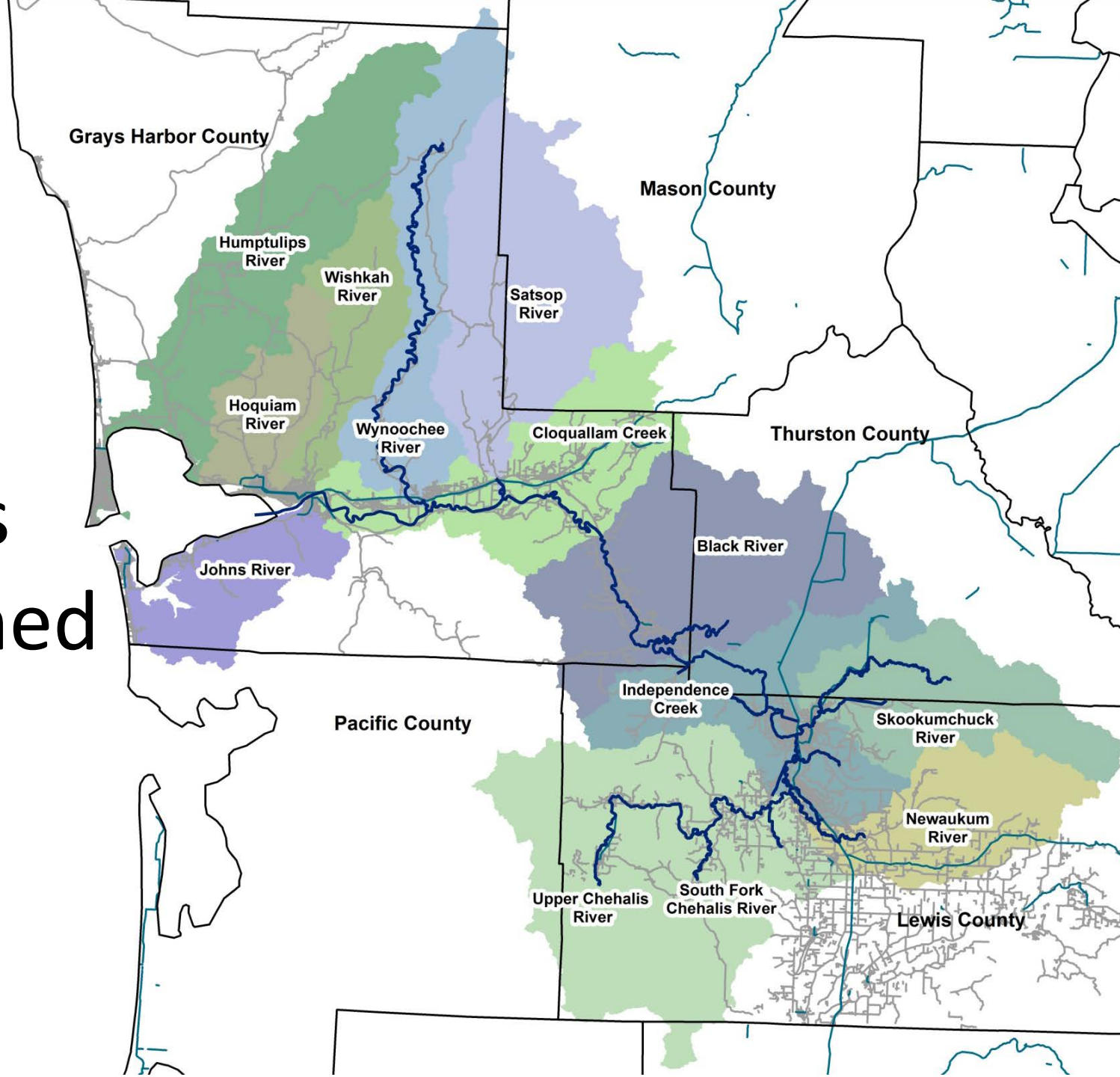
Chehalis Basin Strategy
"Reducing Flood Damage and Enhancing Aquatic Species"
Technical Workshop
LOTT Regional Services Center
May 7-8, 2014



Overview of Flooding

- Flood Events Being Evaluated
- Climate Change
- Hydraulic Model Development
- Structure Survey and Data

Chehalis Watershed



Design Flood Events

Design flood events being simulated for this project:

- Economic analysis based on 10-, 20-, 100-, and 500-year flood events, focused on main stem Chehalis River (at Grand Mound)
- 2-year event also being simulated
- Also simulating historical storms of December 2007, February 1996, and January 2009

Characteristics of Historical Large Floods

December 2007 - Classic atmospheric river (pineapple express) type event with a fairly narrow focus of extreme rainfall. Highest rainfall center concentrated in the Willapa Hills in the Upper Chehalis River Basin (main stem and South Fork). Set records for 24-hour precipitation in the upper basin (heaviest precipitation was actually over about 12 hours or less).

February 1996 - Large frontal storm with very broad rainfall (from north of Seattle to southern Oregon). 24-hour rainfall totals ranged from 10+ year to 100+ year recurrence

January 2009 - Focused primarily in the eastern and northern portions of the basin. Significant rain still fell in the upper Chehalis but flooding of Interstate 5 was caused by high flows on the Newaukum. The January 2009 event also had very high flows in lower basin tributaries (Satsop, Black, etc.).

Chehalis River at Grand Mound

Percent Chance Exceedence	Return Interval	Flow (cfs)
0.2	500	100,300
0.5	200	85,200
1	100	74,700
2	50	64,900
4	25	55,800
10	10	44,600
20	5	36,500
50	2	25,600

December 2007 – 79,100 cfs

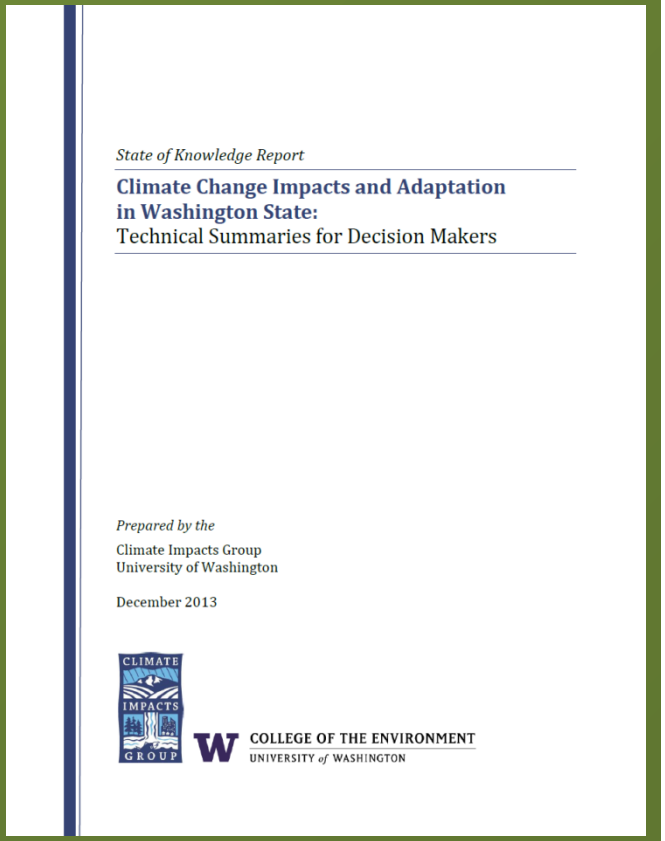
February 1996 – 74,800 cfs

January 2009 – 50,700 cfs

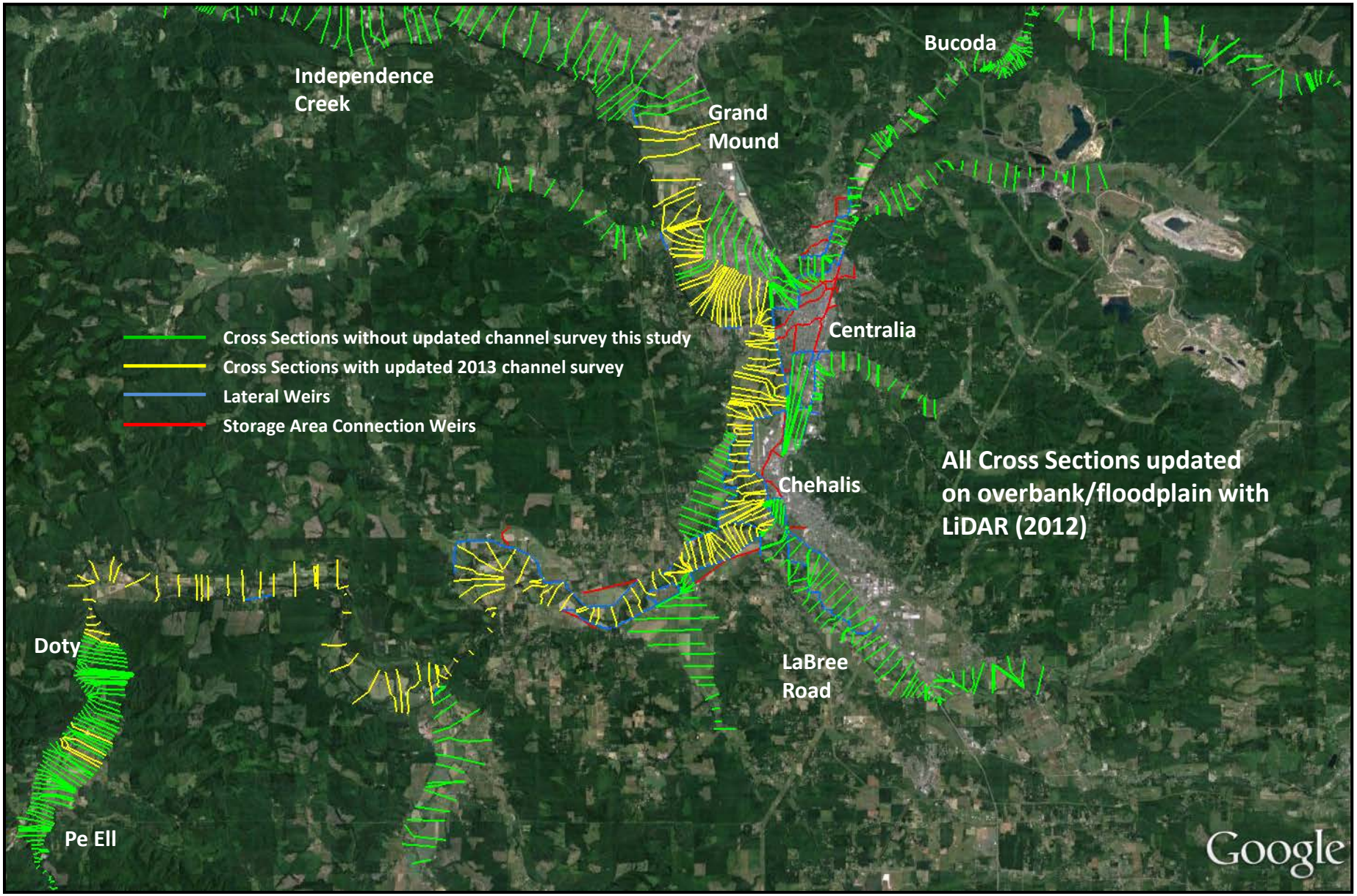
Climate Change Effects on Peak Flows

Latest report from the UW Climate Impacts Group (CIG) suggests:

- Rain dominant basins (like the Chehalis) will see increase in 100-year flood of 11% to 26%
- Average increase is 18%
- Does not include projected changes in heavy rainfall
- Hamlet et.al. suggests increase may be 10 – 50% or more (forthcoming paper)



Updated HEC-RAS Hydraulic Model



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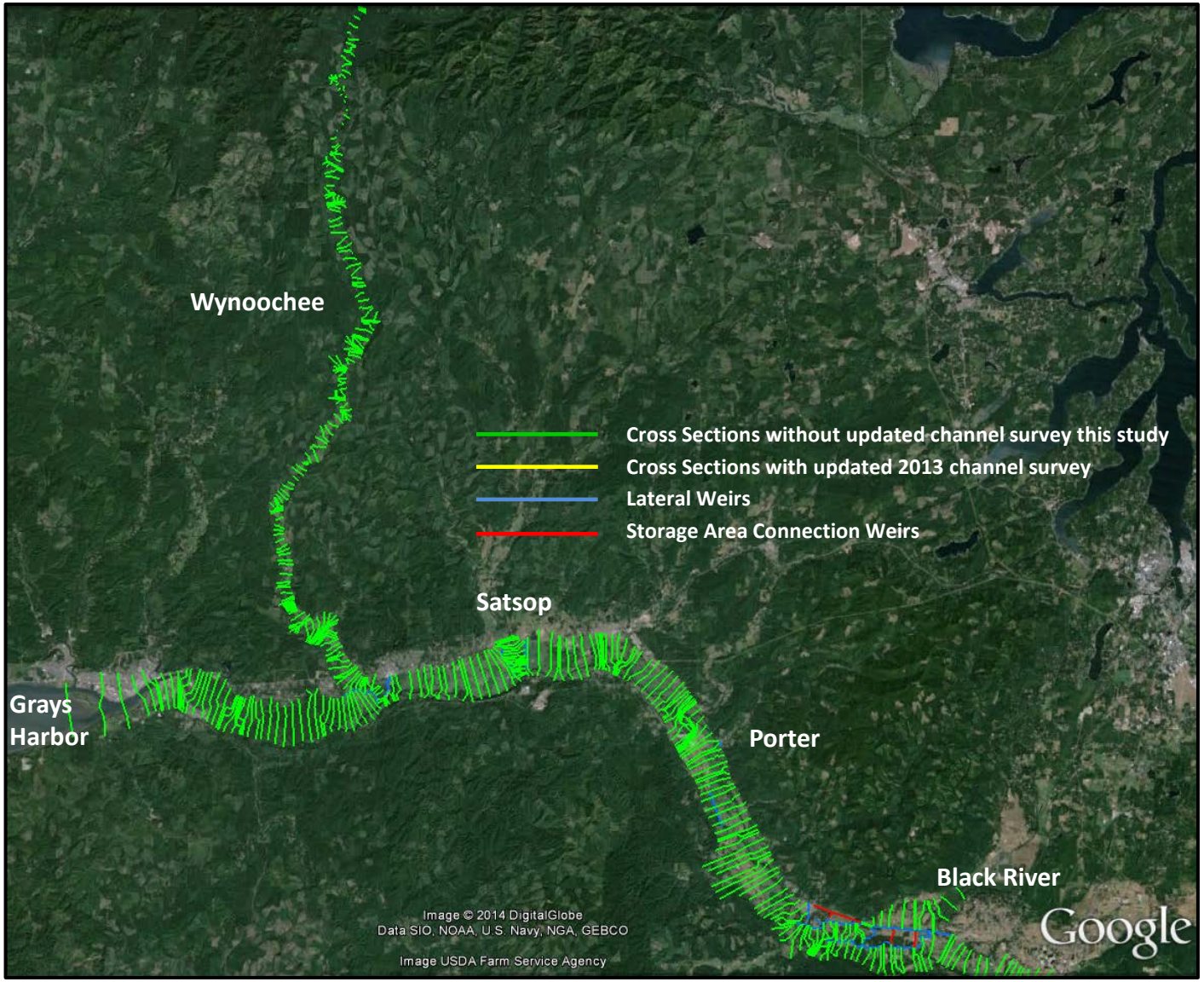


Model Calibration and Validation

Calibration to December 2007:

- Revised Hydrology for Doty & South Fork
- Simulates pre-2007 bridges & Pe Ell logjam

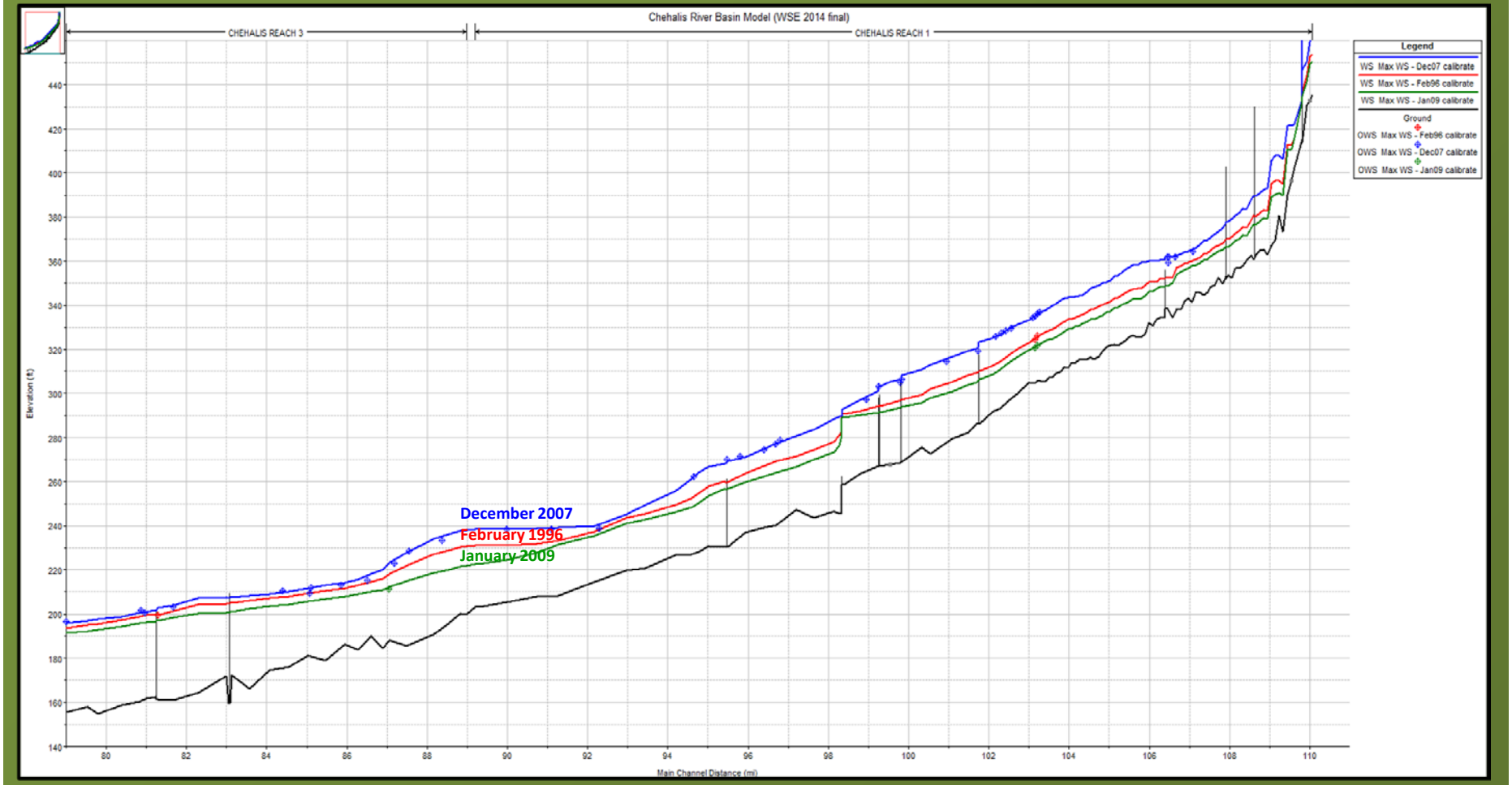
Verify to Floods of 1996 and 2009:

- Less HWM data and smaller events in most areas
- Further refinement of roughness & coefficients

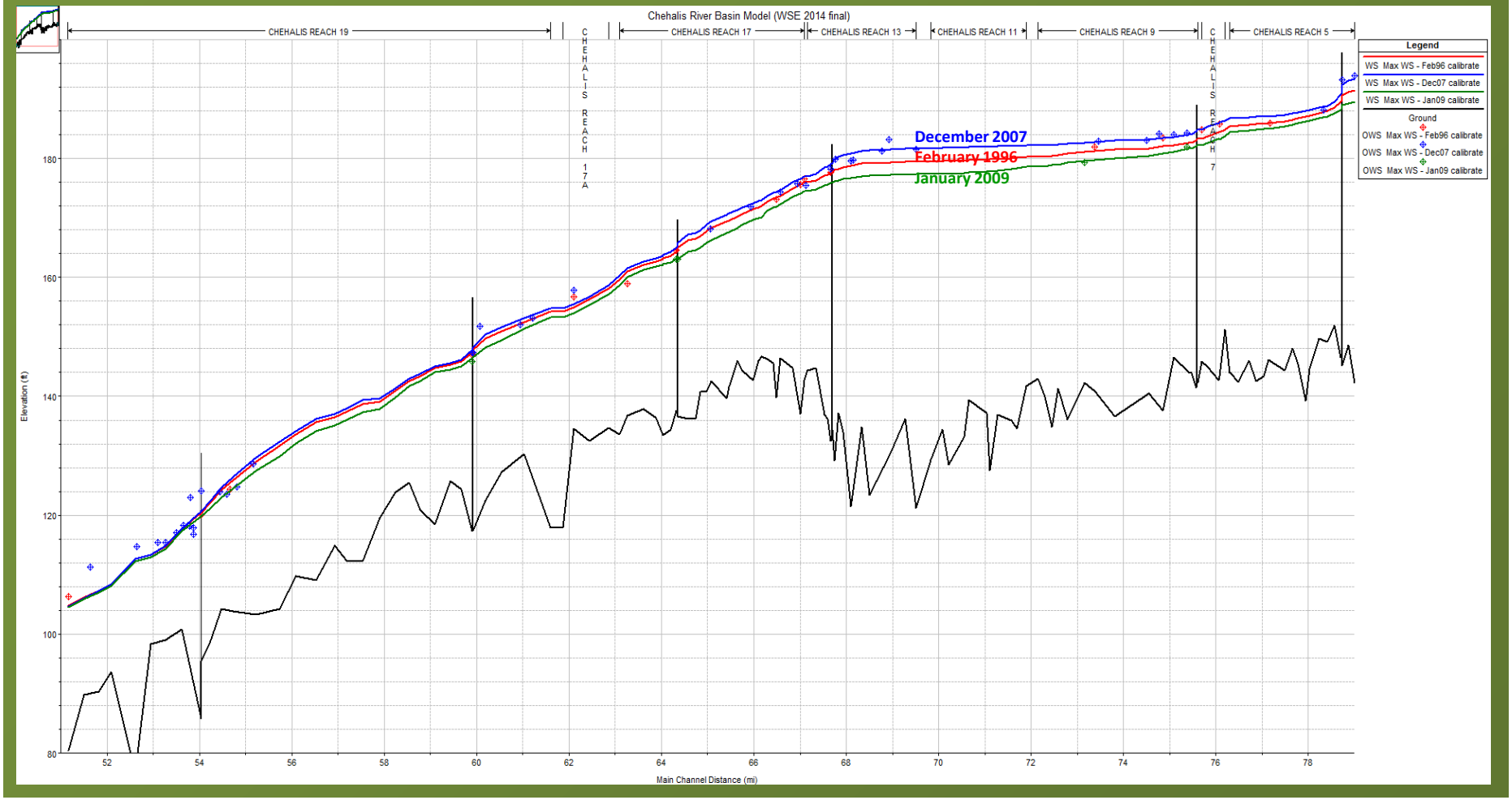
Results:

- 250 HWMs, reasonably good mimicry in most areas
- Ave difference -0.2 ft, >75% within one foot
- Comparable to previous modeling or improved

Water Surface Profiles, above Stearns Creek



Water Surface Profiles, Stearns Cr. to Black River



Model Development Summary

Refined Model

- Chehalis mainstem updated using new topographic data, also revised reach lengths, ineffective areas, etc.
- Updated floodplain (LiDAR) data for tributaries
- Updated Storage Areas and connections

Calibration & Verification

- Manning's & weir coefficient adjustments
- Flow roughness factors

Design Events

- Baseline (current conditions geometry and flows)
- Dozens of scenarios (Dam, I-5, Small Projects, Climate Change, etc.)

Structure Survey and Data Development

Improved Flood Damage Estimates

- Previous analyses relied on parcel boundaries and depth of water on ground
- Current analyses use actual structure locations and depth of water in buildings
- Allow specific statements about potential impacts and benefits of alternatives on particular structures

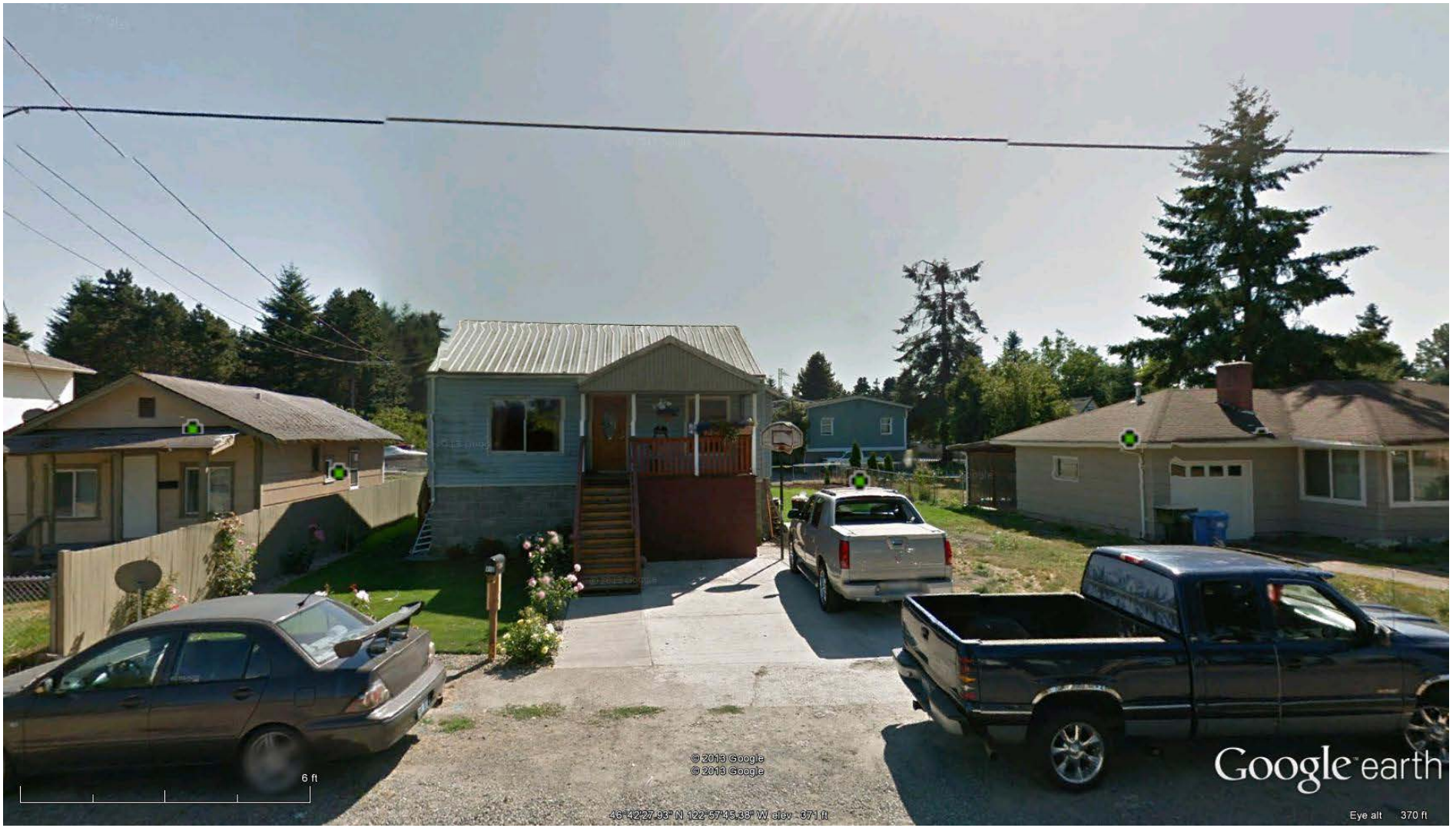
Parcels with Structures

Actual Structure Delineations

Additional Information Developed

- Height of finished floor above ground
  - 178 structures field surveyed
  - 2804 structures estimated using Google Street View
  - 2630 structures estimated using statistical averages
- Type of Structure (MOB, RES, COMM, AGR)
- Estimated value of structures using assessor data
- Area and perimeter of structures estimated

Google Street View finished floor data



Structure Survey Results

9,087 Structures Evaluated

Type of Structure	Lewis County	Thurston County	Grays Harbor County	Totals
Mobile Homes	363	98	0	461
Residential Structures	5,348	201	405	5,954
Commercial	1,567	34	470	2,071
Agricultural	10	161	430	601
Totals	7,288	494	1,305	9,087

5,512 “of significant value” structures; 3,575 others not assigned a value

Total Assessed Value $607 Million

Questions