



KING COUNTY
FLOOD CONTROL
DISTRICT



King County

An aerial photograph showing a wide, muddy river that has overflowed its banks, inundating large areas of green fields and forests. A bridge with a large arch structure spans across the river in the middle ground. The water is a turbid, brownish-grey color, and the surrounding land is a mix of green and brown, indicating both vegetation and exposed earth.

King County
Flood Hazard Management Plan Update
Snoqualmie Watershed

December 4, 2012

Tonight's Presentation

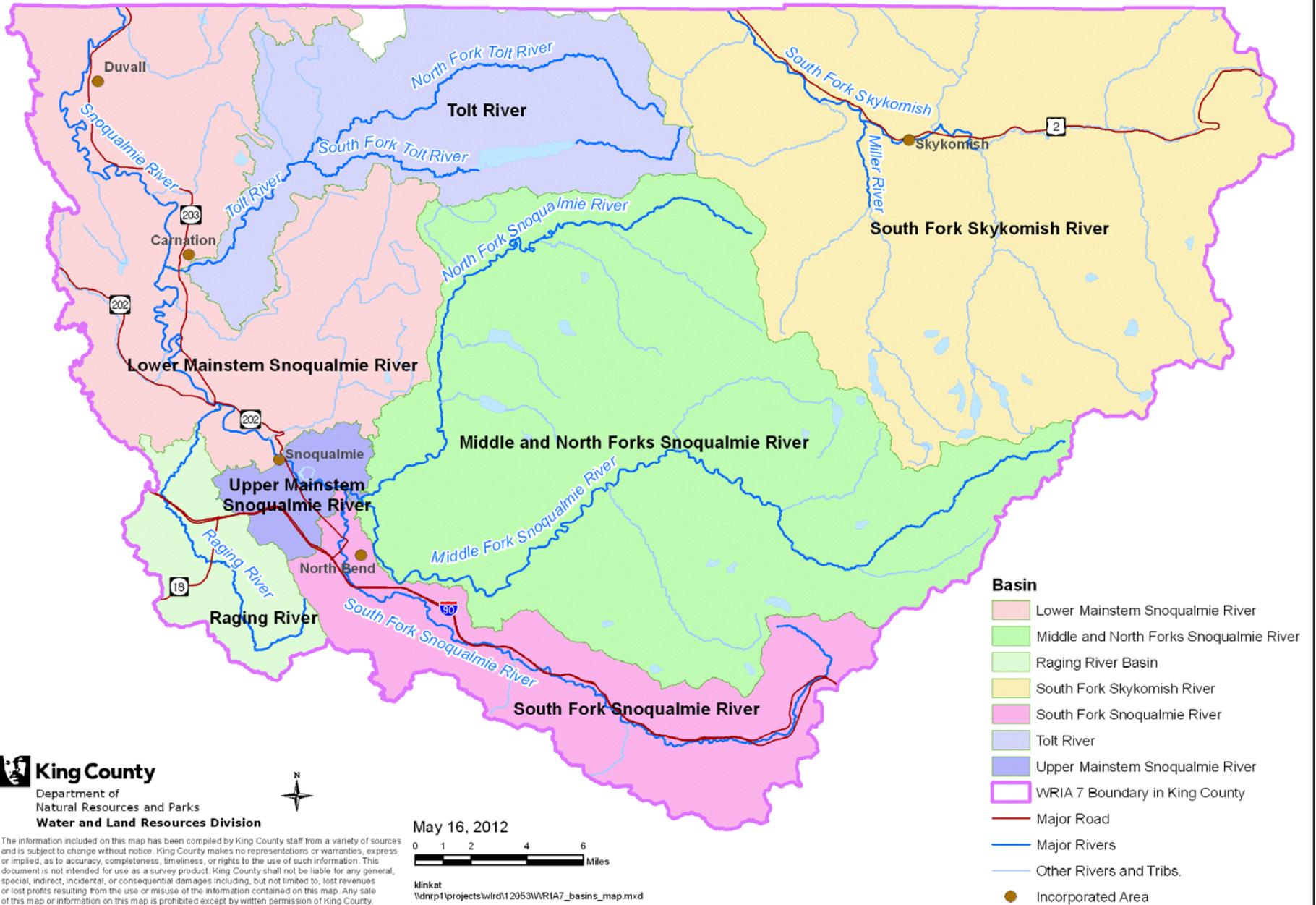
Updating the Snoqualmie Action Plan

- Watershed overview
- Accomplishments since 2006 Plan
- Snapshot of individual basins
 - Six Snoqualmie basin areas
 - Conditions, strategies, and proposed actions
- Stakeholder input

Stakeholder Input

May 16	Snoqualmie Watershed Forum
June 11	Lower Snoqualmie Farmers meeting
June 14	KC Agriculture Commission
June 21	Snoqualmie Basin Technical Committee and invited stakeholders
July 10	Flood Plan Citizens Committee
December/ January	Public meetings Release draft plan

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Snoqualmie Flood Risks



Flood inundation



Channel migration



Bank erosion



Alluvial fan hazards

Building off the 2006 Plan: Snoqualmie Basin Accomplishments

Buyouts

- Over 40 flood buyouts
- All were high risk or recently/frequently flooded structures
- Many were partnerships with salmon interests where priorities overlapped



*Jan. '09 damaged homes near
Fall City; all have since been
purchased*

Snoqualmie Basin Accomplishments

Home Elevations

- 48 homes elevated above flood height
- 45 home elevations in progress (FCD and Snoqualmie)
- Federal and state grants mean minimal costs to homeowner



Snoqualmie Accomplishments: Farm Pads and Barn Elevations

- 25 farm pads since 2008
- 2 barn elevations in 2012 as pilot project



*The Magnochi dairy during Jan.
2009 flood and the farm pad built
the next year*

Snoqualmie Accomplishments: Levee and Revetment Repairs/ Retrofits

- Large flood events 2006, 2008, 2009, 2011
- Damaged facilities required repairs
 - 28 repair projects completed
 - 4 emergency repairs
- 8 major projects (levee retrofits) in pre-design or design



*Mason Thorson
Extension*



*Tolt 1.1
Emergency
Repair*

Looking Forward: Visions and Strategies

- Based on Flood Plan goals
 - Reduce flood risks
 - Improve environment
 - Cost effective and sustainable
- Each subbasin has different challenges, requires different strategies
- Subbasins have multiple segments with unique management concerns
- Plan for entire river corridor and at basin and segment scales



Looking Forward: Visions and Strategies

- Typical approaches include...

Non-structural approaches where feasible

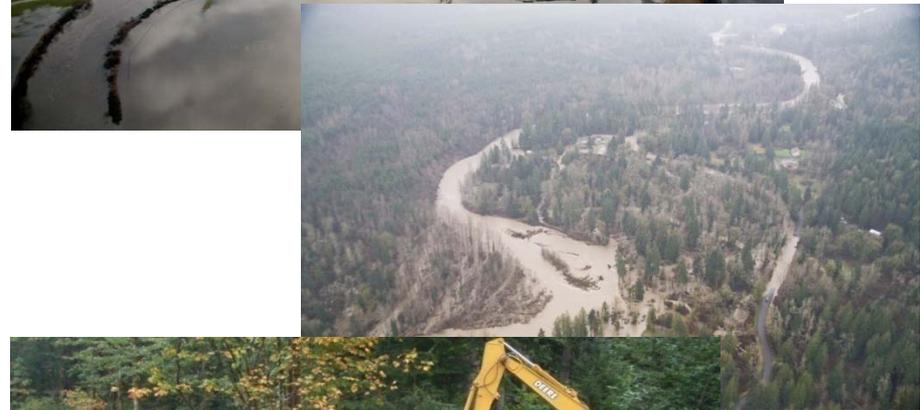
- Buyouts
- Home elevations
- Farm pads

Levees and revetments where significant public safety risk

- Retrofits and relocations
- Repairs when needed

- Allow room for natural river and floodplain processes

Each subbasin has a vision and specific recommended actions



Some Strategies That Aren't Being Pursued

DUE TO...

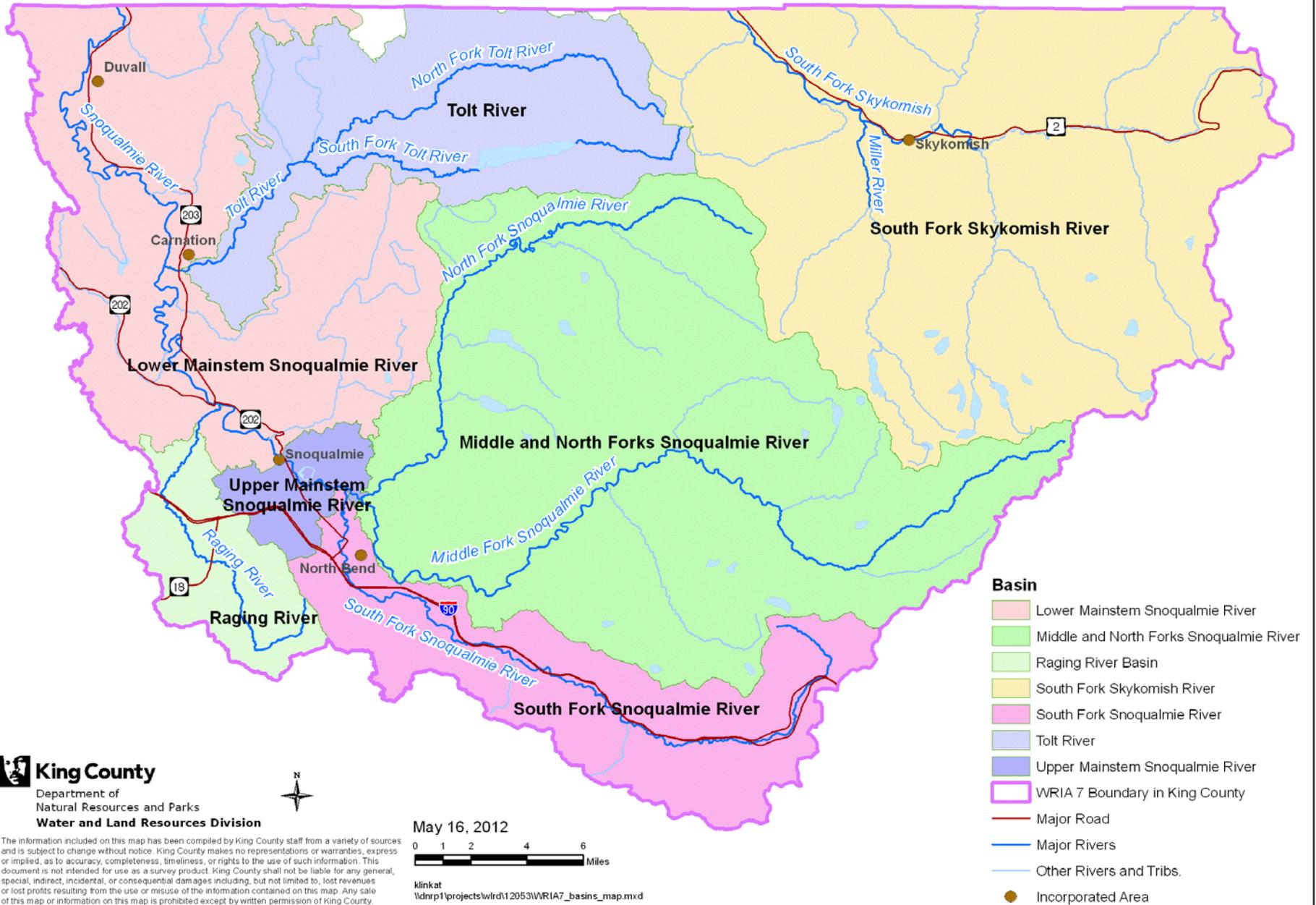
COST, FEASIBILITY, AND ENVIRONMENTAL CONCERNS
INCONSISTENCY WITH FLOOD PLAN GOALS

- New large scale flood storage – dams, reservoirs
- New large scale flood containment levees
- Extensive new bank protection on private property
- Dredging

However... Targeted gravel removal is an option where it makes sense



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Middle & North Forks Snoqualmie: Conditions

- Dynamic alluvial fan
- High channel migration and erosion risks
- Facilities require frequent and costly repairs



Middle and North Forks: Actions

Basin Wide Efforts

- Residential Flood Mitigation Project (elevations and acquisitions)

Middle Fork Specific Efforts

- Corridor Management Project

North Fork Specific Efforts

- Geomorphic Hazards Assessment



South Fork Snoqualmie: Conditions

Levees through North Bend

- Provide 30-year flood protection
- Have geotechnical and seepage problems
- Frequently damaged

Below North Bend

- Dynamic alluvial fan
- High channel migration and erosion risk to developed properties (Circle River Ranch)



South Fork: Actions

Basin Wide Efforts

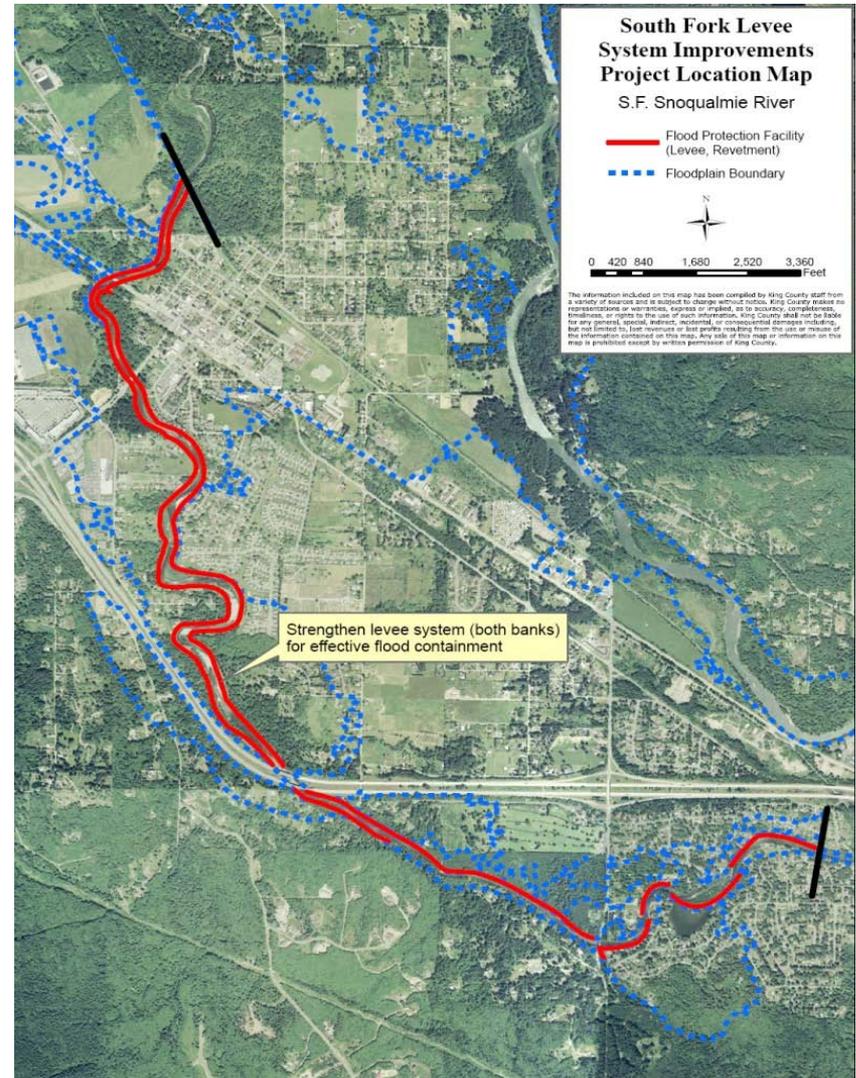
- Residential Flood Mitigation Project (elevations and acquisitions)

Leveed Segment

- South Fork Levee Improvement Project
- North Bend Area Residential Flood Mitigation

Snoqualmie Valley Trail to Confluence segment

- Circle River Ranch Alternatives Analysis



Upper Snoqualmie: Conditions

- Broad deep floodplain
- More than 300 homes and businesses inundated
- Infrastructure also at risk
- Highest number of flood damage claims in Washington State



Upper Snoqualmie: Actions

Basin Wide Efforts

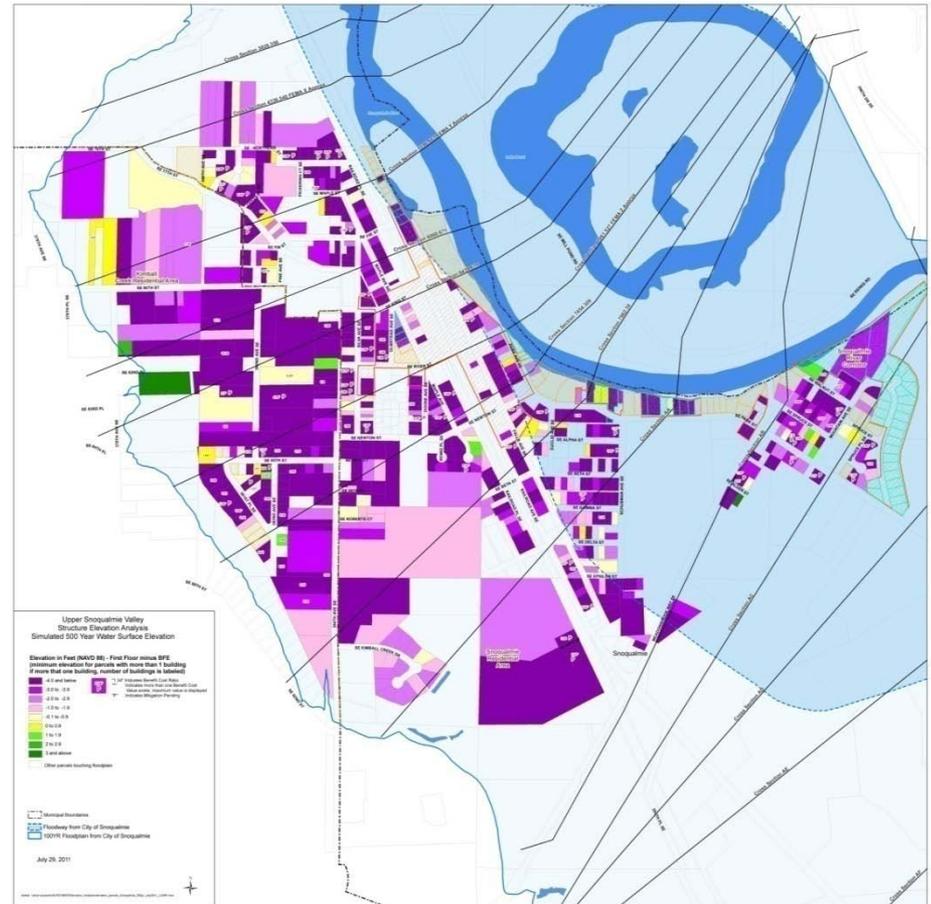
- Residential Flood Mitigation Project (elevations and acquisitions)

Reinig Segment

- Reinig Road Revetment

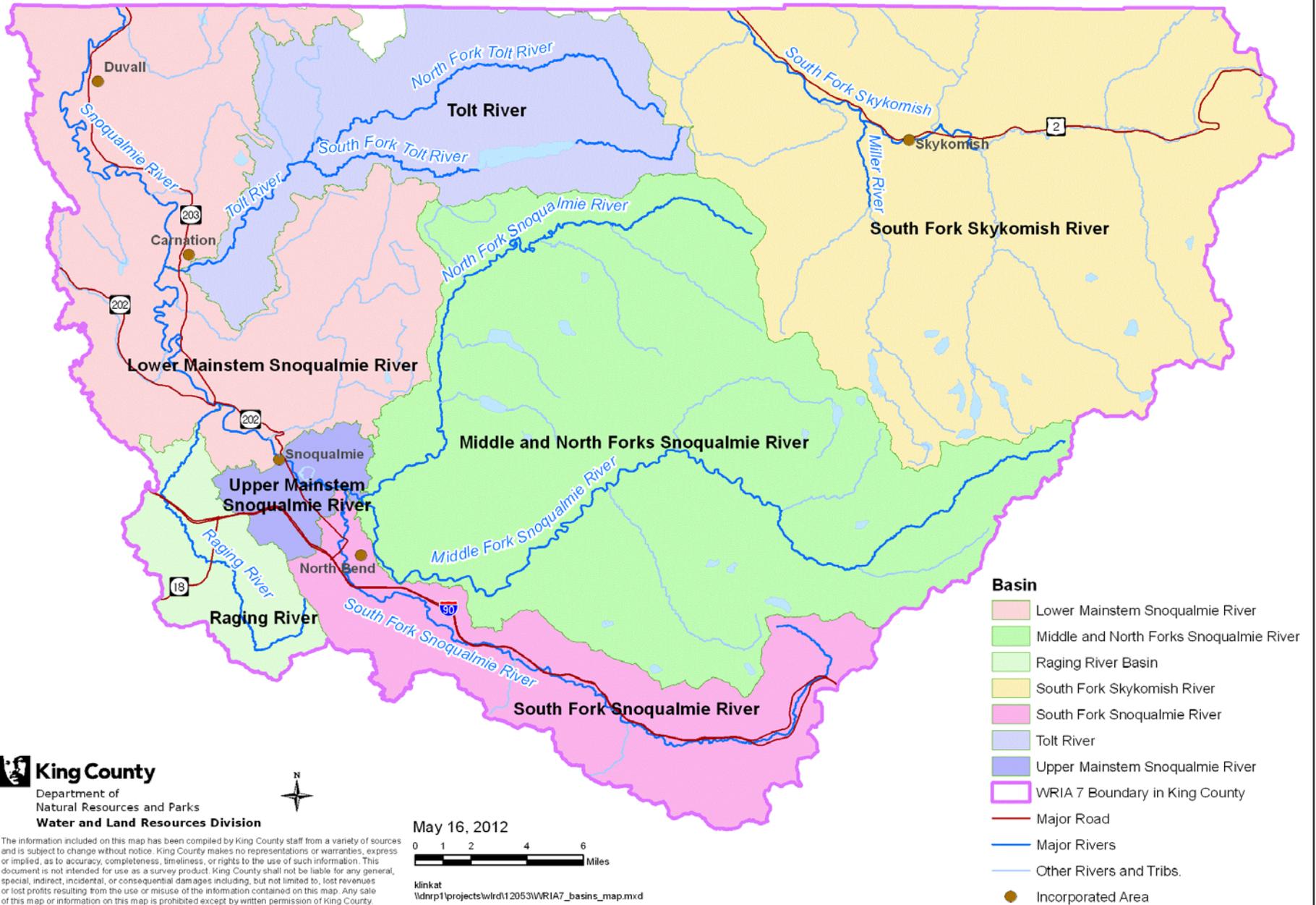
Snoqualmie Valley Trail to Kimball Creek Segment

- Record Office Alternatives Analysis
- Mill Pond Feasibility & Technical Analysis



500 Year Flood

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Lower Snoqualmie: Conditions

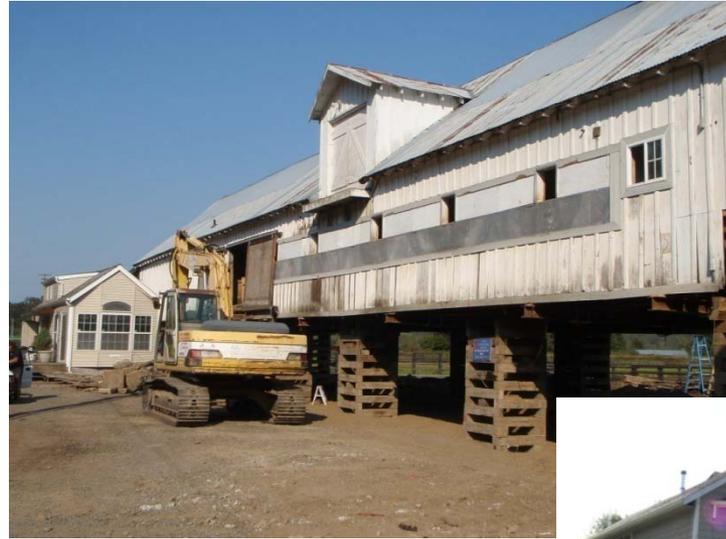
- Deep, broad floodplain; levees do not limit flooding
- Homes and farms impacted
- Agricultural Production District
- Important salmon habitat
- Near Tolt and Raging confluences
 - Steeper gradient, more gravel
 - Increased risks of channel migration, fast/erosive flows
- Other areas
 - Less channel migration
 - Deep flood inundation



Lower Snoqualmie: Actions

Basinwide:

- Farm pads, barn elevations
- Home elevations
- Potential hydraulic study of Snoqualmie 205 impacts



Below Tolt and Raging Fans:

- Fall City area acquisitions, potential levee setbacks
- Snoqualmie at Carnation monitoring/adaptive mgmt.



Chinook Bend to County Line:

- Large revetment retrofits at Sinnema Quaale Upper, Winkelman, and Dutchman Road



Raging River: Conditions

- Narrow, steep tributary
- Very high channel migration rates
- Toe of slope along Preston-Fall City Road at risk
- Near Fall City, levees limit channel migration and inundation
- Important salmon habitat



Damaged home along Raging

Raging River: Actions

Basinwide:

- Buyouts to remove homes from high risk locations

Upstream of Fall City :

- Alpine Mobile Manor neighborhood acquisitions
- Abandoned bridge abutment and revetment removal at Waring property
- Repairs to facilities along Preston-Fall City Road

Fall City:

- Fall City Levee Setback Feasibility Study



Same view, house purchased and demolished

Tolt River: Conditions

- Steep, dynamic river, high sediment load
- High channel migration risk; homes can be undermined and cut off
- Much of lower 2 miles leveed (except in Tolt-MacDonald Park)
- City of Carnation located on alluvial fan
- Important salmon habitat



Tolt River: Actions

Basinwide:

- Tolt River Corridor Action Plan

Upstream of Carnation:

- San Souci acquisitions
- Tolt Natural Area acquisitions

Carnation:

- Lower Tolt R. acquisition
- Levee setbacks at Frew levee and Tolt 1.1



Stakeholders – What have we heard?

- Diverse input from many stakeholders, not always agreement
- Highlights/ somewhat common themes:
 - Flooding in lower Snoqualmie valley getting worse
 - Many lower valley landowners want a study of downstream impacts from Snoqualmie 205
 - Support for multi-objective approaches
 - Interest in big picture, cumulative effects
 - Interest in gravel management – though not all in agreement
 - Several new projects proposed
- Input – including tonight's – being considered for public review draft

Snoqualmie Watershed Approach



Questions? Comments?

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