KING COUNTY FLOOD CONTROL DISTRICT

King County

Snoqualmie Fish, Farm, Flood Advisory Committee

Flooding Overview

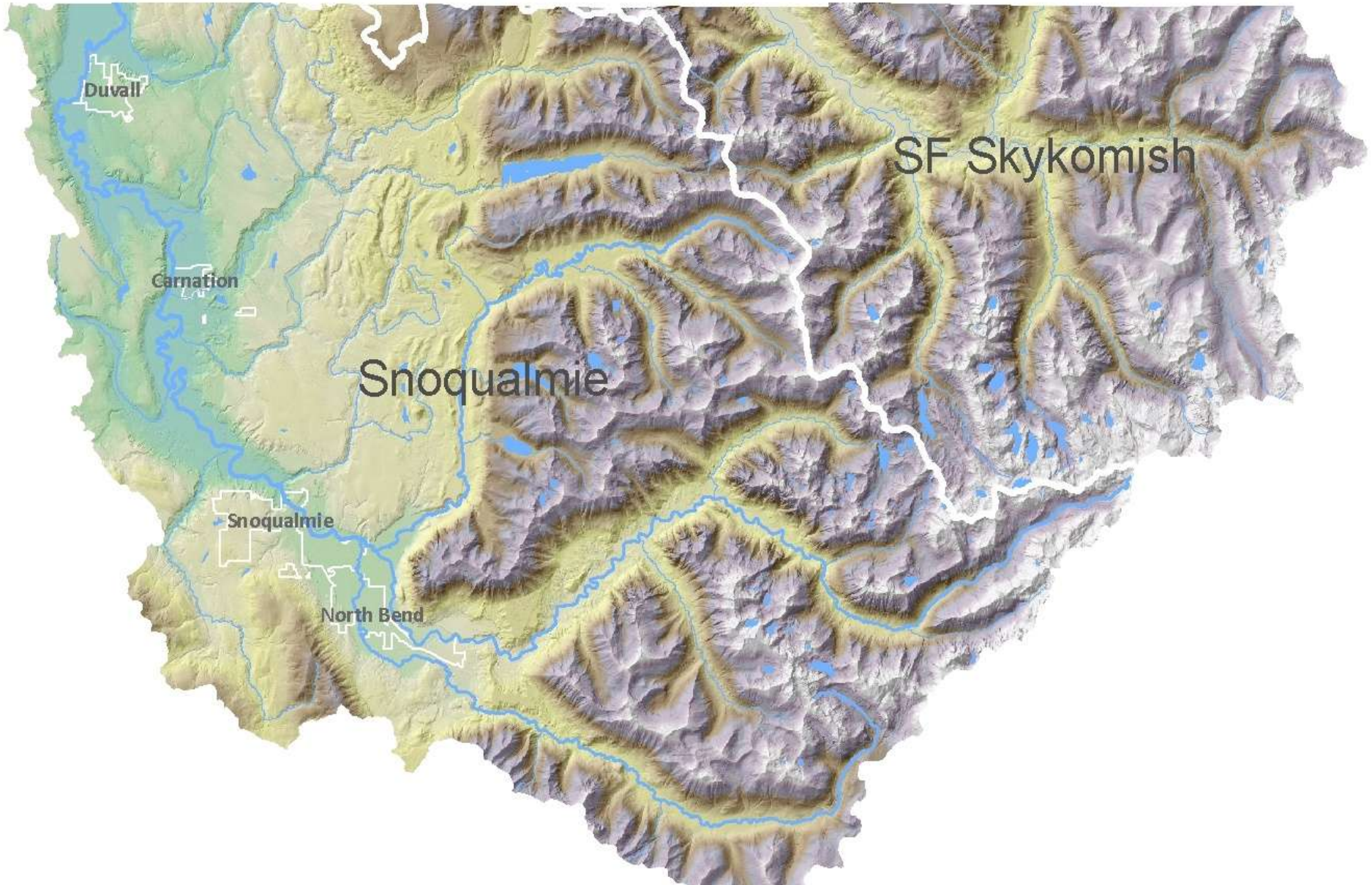
January 8, 2014

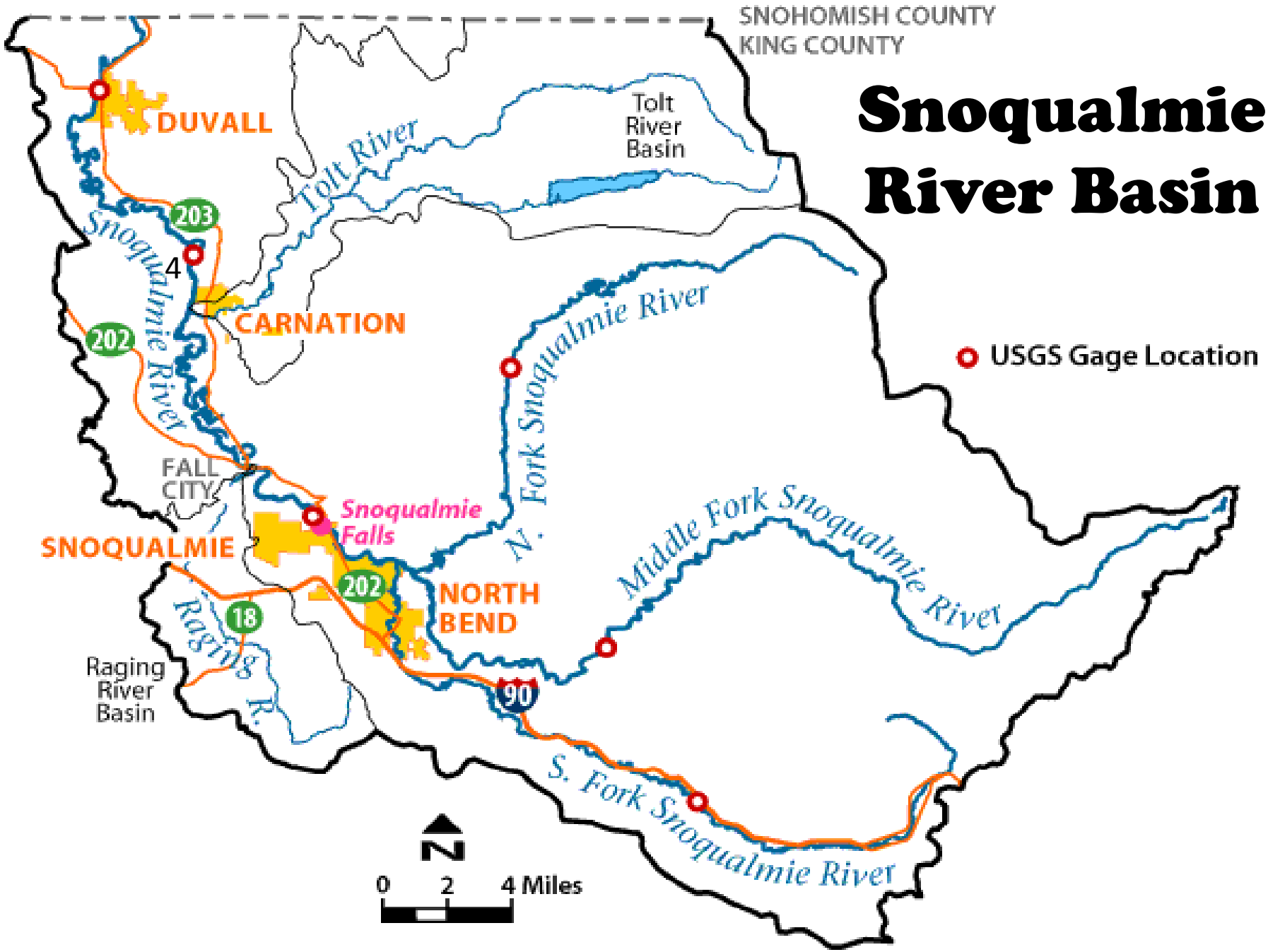
Today's Presentation

- Background: Physical and Policy/Regulatory
- Strategies and Actions to Reduce Flood Risk
- Opportunities and Challenges for Fish/Farm

- This is overview – let us know where questions remain and topics for further discussion

Background: Physical Setting




SNOHOMISH COUNTY
KING COUNTY
Snoqualmie River Basin
DUVALL
Tolt River
Tolt River Basin
203
Snoqualmie River
4
CARNATION
202
N. Fork Snoqualmie River
USGS Gage Location
FALL CITY
Snoqualmie Falls
SNOQUALMIE
202
NORTH BEND
Middle Fork Snoqualmie River
18
Raging R.
Raging River Basin
90
S. Fork Snoqualmie River
N
0 2 4 Miles

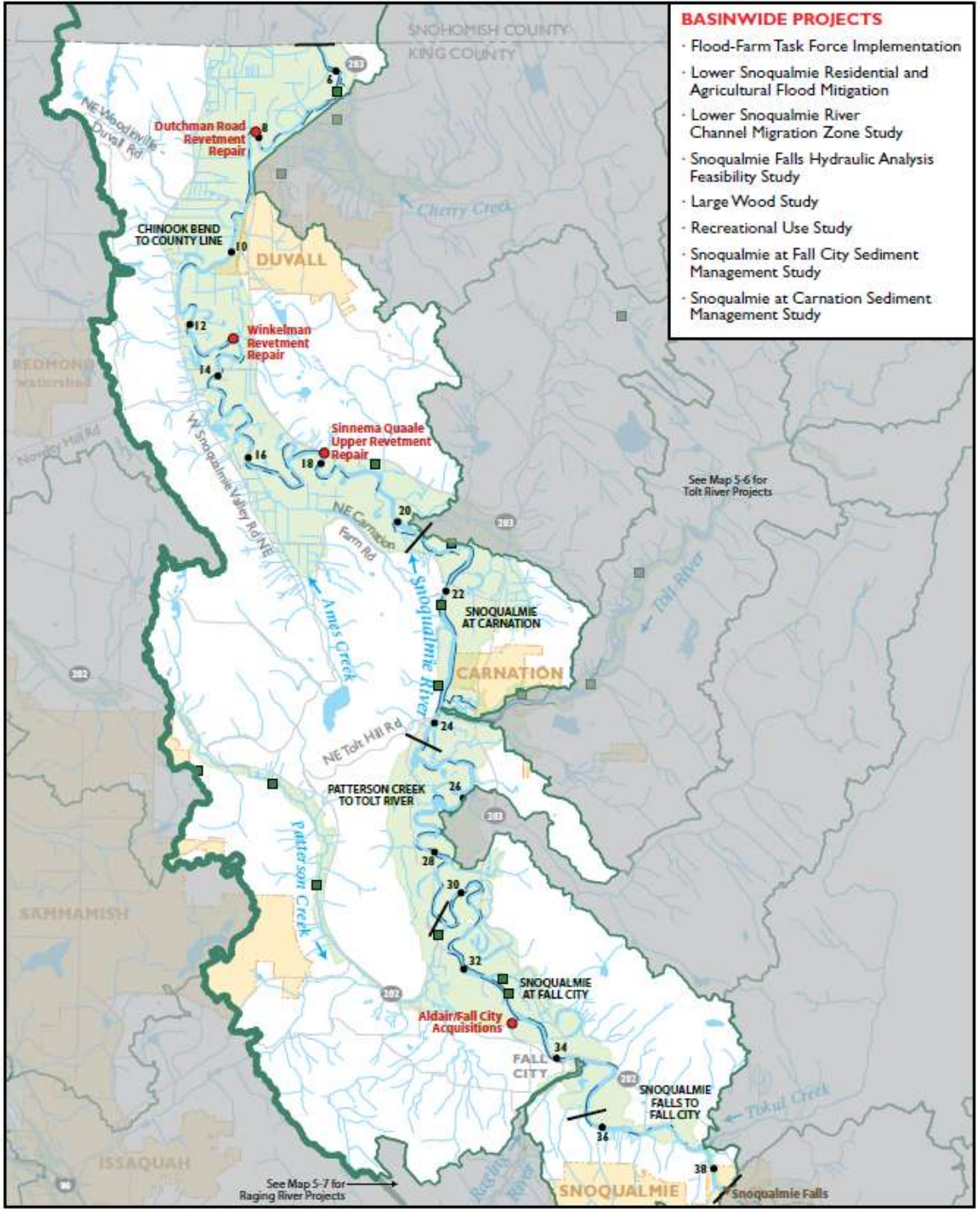
Recent Large Floods

- November 2006
- November 2008
- January 2009

Other large floods:

- 1990, 1995, 1996

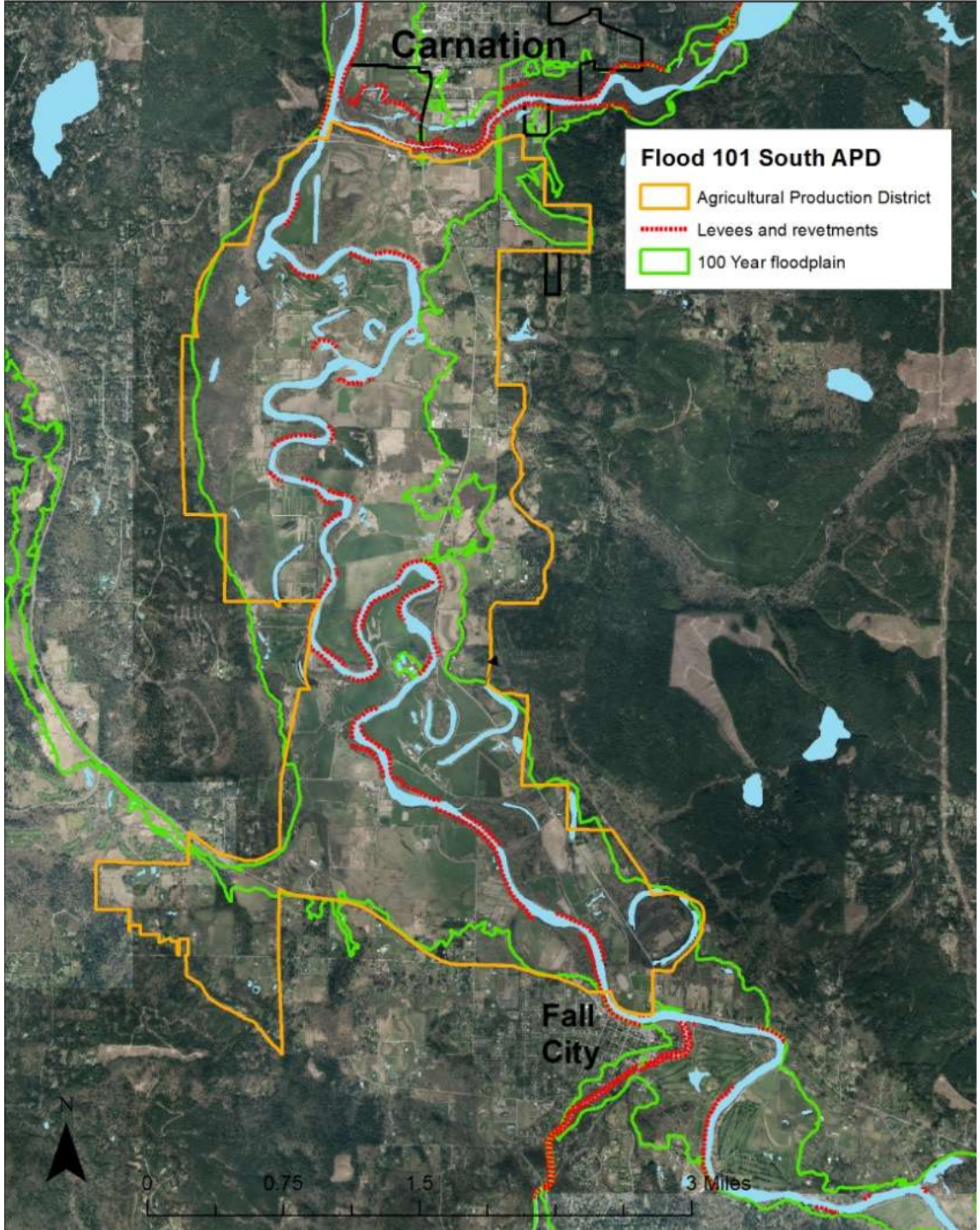
Flood Warning Center open 25 times since 2008



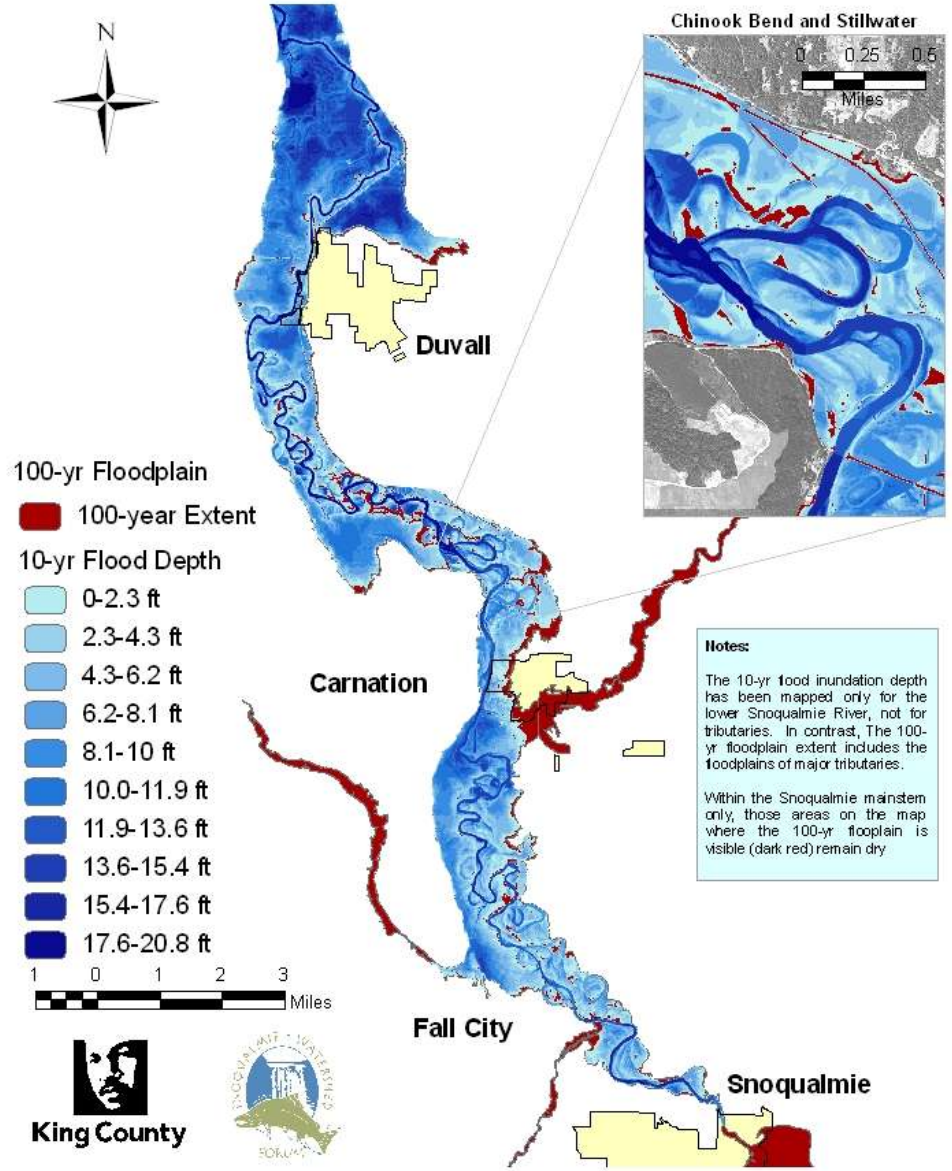
River Segments: alluvial fan vs meander

SAFC segment – erosion damages Jan 2009

Snoqualmie at Carnation (SAC) and *Chinook Bend to Countyline* segments


Carnation
Flood 101 South APD
Agricultural Production District
Levees and revetments
100 Year floodplain
Fall City
N
0
0.75
1.5
3 Miles

Lower Snoqualmie River 10-Year Flood Depth



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Background: Policy and Regulatory

- King County Flood Plan
- King County Flood Control District
- Regulations at federal/state/county level
- National Flood Insurance Program and Community Rating System
- Related policy issues: NMFS Biological Opinion, gravel management

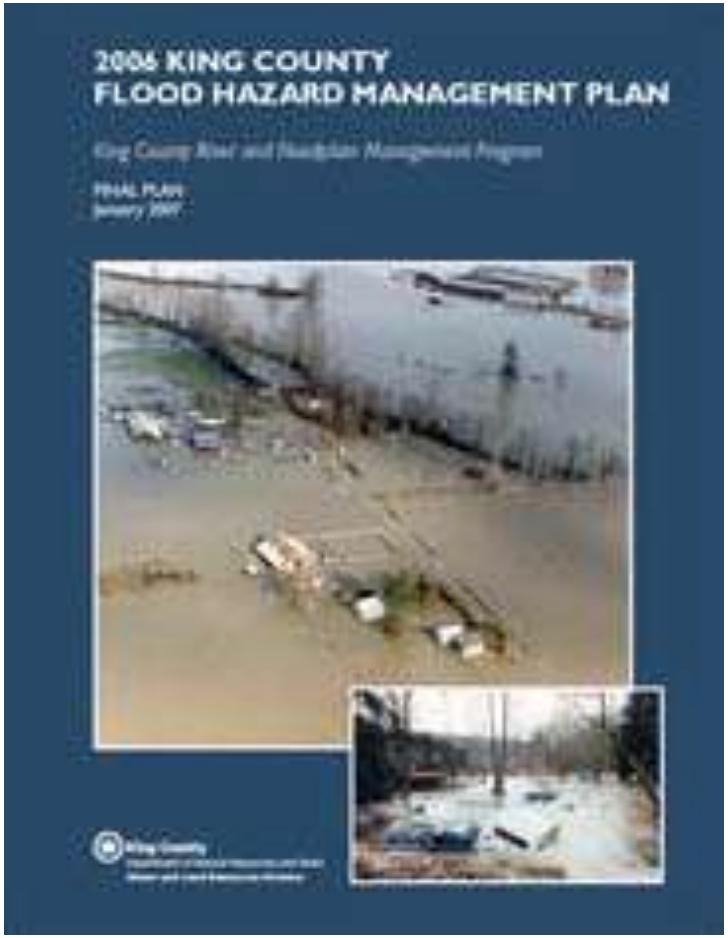
King County Flood Plan

Updates:

- 1993
- 2006
- 2013

Current goals:

1. Reduce flood and channel migration risks
2. Avoid or minimize environmental impacts
3. Reduce long-term costs



Selected Guiding Principles

(2006 Flood Plan, Chapter 1, pages 3-5)

- Primary purpose of Flood Plan is to reduce risks to public safety and financial losses from flooding
- Flooding is a natural process; protecting and working with natural processes will reduce flood risks in less costly manner, while benefiting native fish and wildlife
- Communication with and involvement of landowners and stakeholders is vital to effective flood hazard management

Stakeholder and landowner input on 2013 update - highlights

- Flooding in lower Snoqualmie valley getting worse
- Interest in big picture, cumulative effects
- Many lower valley landowners want study of downstream impacts from Snoqualmie 205
- Some want study of other factors affecting flooding
- Support for multi-objective approaches
- Interest in gravel management – though not all in agreement
- Interest in flood warning/gages

KING COUNTY FLOOD CONTROL DISTRICT

- Established in 2007 to provide regional approach to flood management
- County-wide property levy - 10 fold increase in funding for flood projects
- Annual budget $35 - $40 million
- Members of County Council serve as Board of Supervisors

Floodplain Management

Federal:

- FEMA manages National Flood Insurance Program (NFIP) and Community Rating System (CRS)
- Sets minimum floodplain standards

State:

- Dept. of Ecology is state coordinating agency for floodplain management, and evaluates local programs/regulations for compliance
- Sets additional regulatory standards

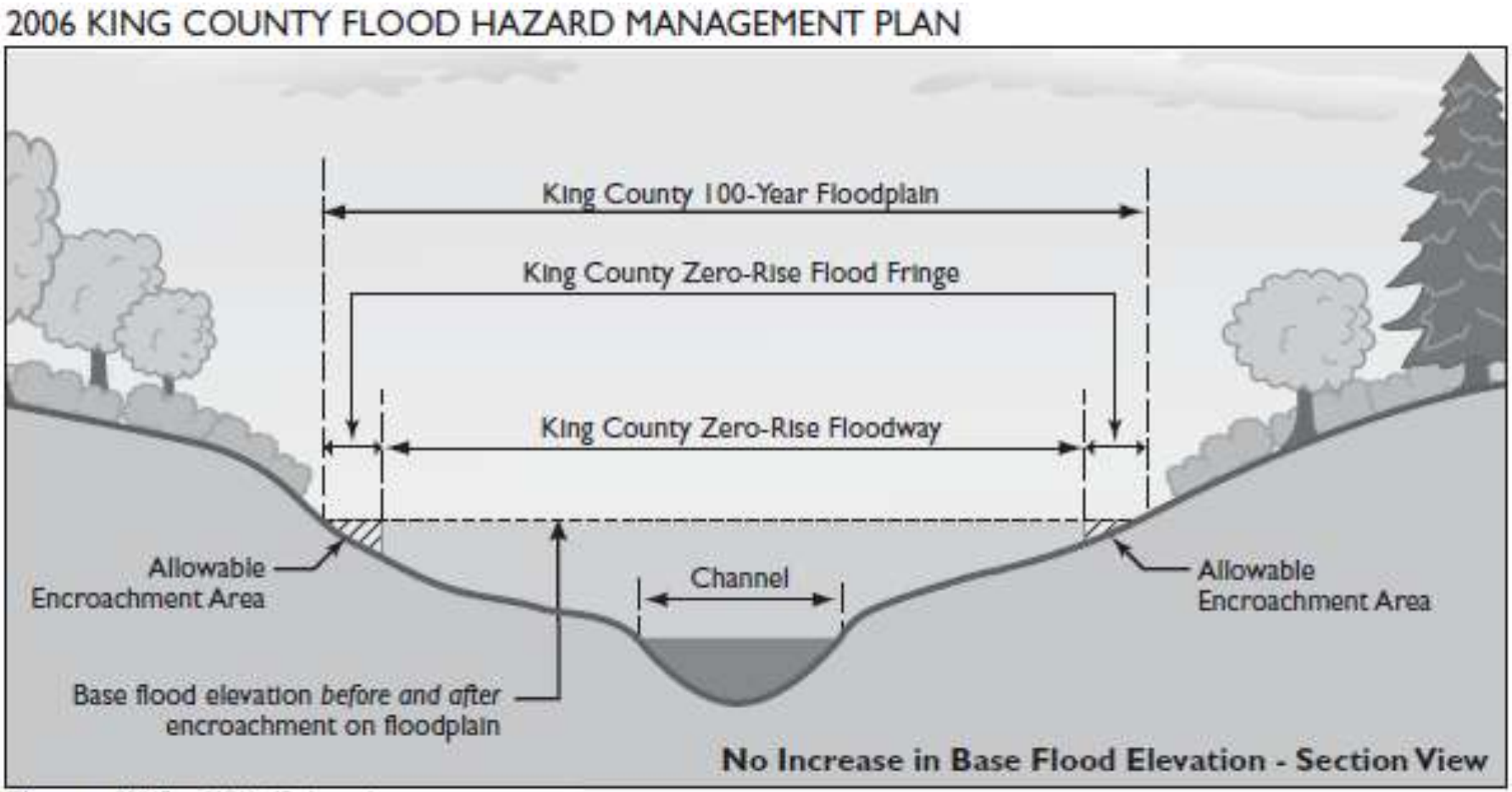
King County:

- Policies, regulations, programmatic/technical assistance

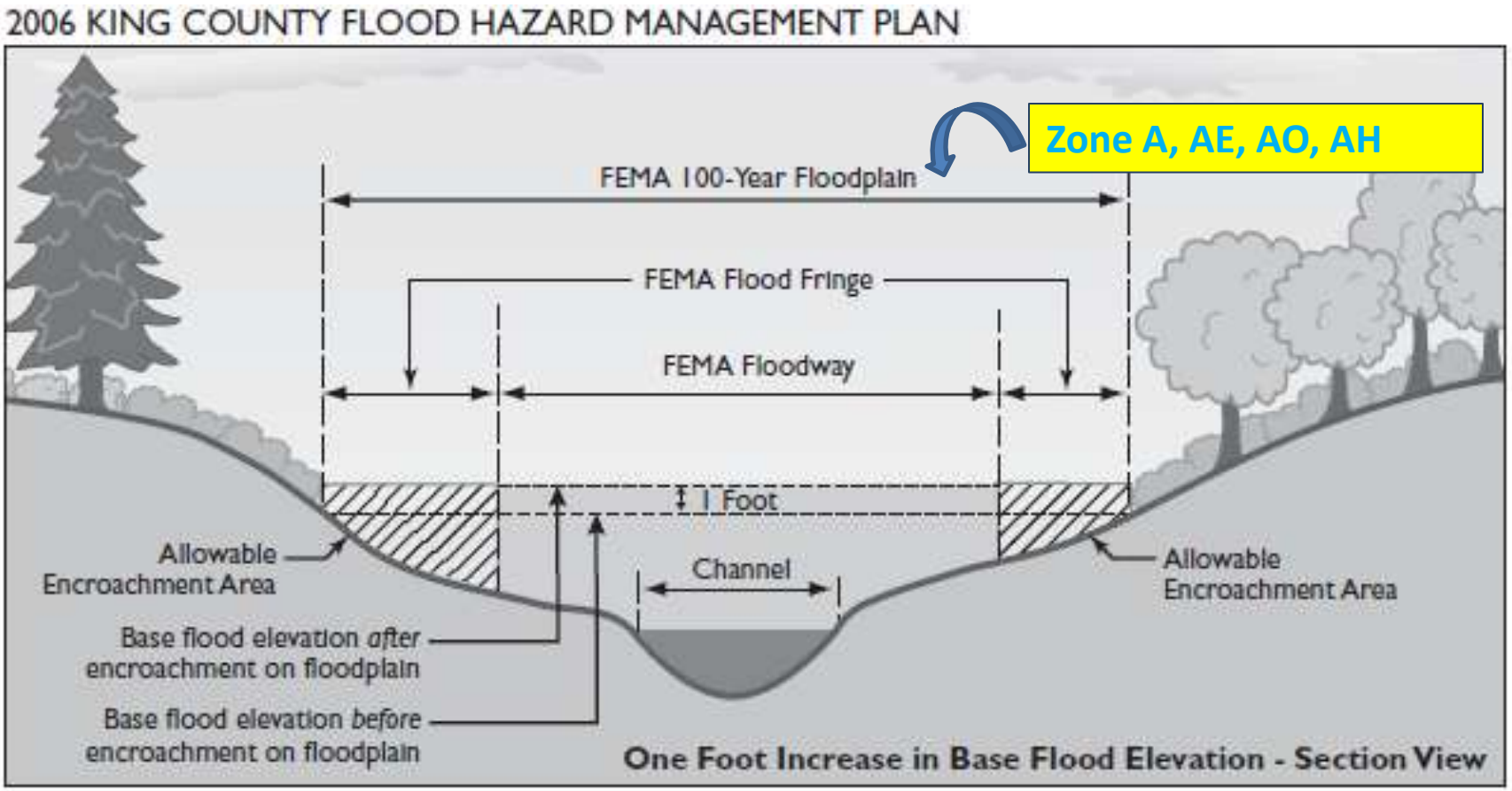
Floodplain Concepts

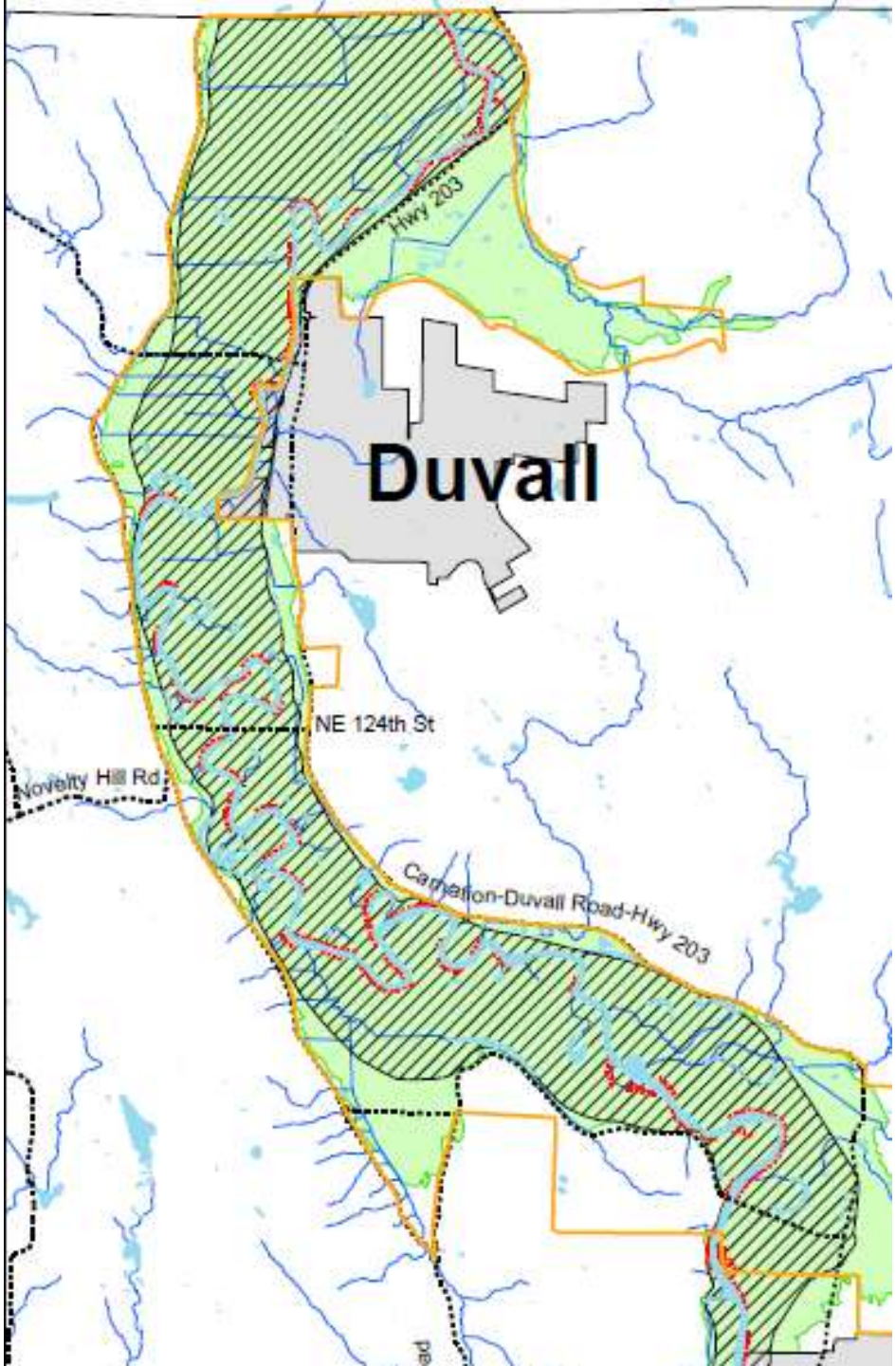
- Floodplain vs floodway vs FEMA floodway
- Base flood, base flood elevation (BFE)
- Compensatory storage – without it… downstream impacts
- Conveyance – without it… upstream impacts (“Zero-rise”)

King County Floodplain and Floodway



FEMA Floodplain and Floodway




Duvall
Hwy 203
NE 124th St
Novelty Hill Rd
Carnation-Duvall Road-Hwy 203

Federal regulations

Minimum standards that state and county regs meet or exceed, including:

- Limit encroachments in floodway that will cause a rise
- Building standards (lowest floor at or above the 100-year flood elevation, foundation openings, etc.)

Washington State Law

- **RCW 86.16.041 prohibits new residential structures in floodways throughout State.**
- **RCW 86.16.041 prohibits substantial improvement of existing residences in floodways, including repair of substantially-damaged house.**
- **Farmhouses exempt: repairs, reconstruction, replacement or improvements to <u>existing</u> farmhouses in floodways on <u>designated agricultural lands</u> are permitted**

King County regs

FILL IN FLOODPLAIN/FLOODWAY

- Comp storage required
- Zero-rise floodway (conveyance)
- Farm pads allowed in floodplain/floodway in APD (wt farm plan)

NEW AG ACCESSORY STRUCTURES:

- Allowed in floodway (zero rise) and floodplain
- Must be 1 ft above BFE or dry floodproofed
- Allowed on top of farm pads – some restrictions

King County regs, con't.

HOUSES:

- No new houses in FEMA floodway (state law)
- Existing farmhouses in floodway can be substantially improved (state law)
- Existing houses in floodplain or floodway can be elevated - must be 3 ft above BFE and have openings in foundation to allow entry/exit of floodwaters

Farm related chronology

- County regulations limit floodplain fill and construction (per federal standards, Growth Management Act, etc)
- Nov. 1990 flood livestock damages lead to exception for critter pad construction
- Nov. 2006 flood leads to Snoqualmie Flood-Farm Task Force Report (Jan 2008) – some regulatory changes and farm pad demo project
- Additional regulatory changes currently under review as part of SMP

Current regulatory changes

- Floodplains are managed under King County Shoreline Master Program (SMP), updates to SMP are reviewed by Dept. of Ecology
- Several flood code changes adopted by KC Council in March 2013:
  - Update farm pad standards, large pads require additional analysis
  - Allowances for minor fill associated with farm access roads, etc. (simple on-line permit for some farm activities)
  - Allow temporary farmworker housing in floodway
- Ecology approval pending - supports most changes, but has concerns about temporary farmworker housing because they consider this new residential structures which are not allowed in floodway.

NFIP and CRS

- National Flood Insurance Program (NFIP) offers insurance to property owners in floodprone areas – previously not available
- Minimum floodplain regulations and floodplain mapping to participate
- Community Rating System (CRS) is incentive program to encourage communities to exceed minimum NFIP requirements and get discount on flood insurance (King Co gets 40% discount)
- 2012 Biggert-Waters Act leading to changes in flood insurance rates to reflect true flood risk and make program more financially stable

National Marine Fisheries Service's (NFMS) Biological Opinion "Bi-Op"

- Required jurisdictions to address impact of floodplain development on ESA listed species and habitat
- King County prepared Programmatic Habitat Assessment to demonstrate that combination of regulations, floodplain management programs, etc met Bi-Op requirements (FEMA approved)

Gravel Removal Policy

(2006 Flood Plan, Chapter 2, pg. 21-22)

King County should remove gravel from rivers for flood hazard management purposes only when:

- Can demonstrate gravel accumulation poses flood risk,
- Hydraulic and geomorphic studies conclude gravel removal has long-term benefit of flood reduction,
- Biologic studies determine it doesn't, with mitigation, result in net loss of ecological function,
- Is part of comprehensive, long-term flood management strategy,
- Is consistent with best available science, 2006 Flood Plan, state and federal regulations (including ESA), and
- Is determined to be best flood risk reduction alternative available

Key Messages: Physical and Policy/Regulatory Background

- Valley floods wall to wall even in smaller floods, so risk is everywhere whether it's more frequent smaller access and drainage impacts or infrequent but large scale damage and devastation
- Flood risk varies by segment in similar way that habitat needs/actions vary by geomorphic setting
- Flood Plan supports approach in valley to restore natural processes, let the river behave more naturally
- Zero rise floodway has (and has had) significant impact on development and fill activities in lower valley
- Floodplains are regulated as part of SMP; therefore Ecology has a review role

Advisory Committee

Flood Experts - What's one take away that's most important to you to highlight? Other representatives take aways if time.

Strategies and Actions to Reduce Flood Risk

- Broad vision and strategy
- Current and recent past actions
- Studies underway
- Actions not currently being considered
- Future planned actions

Lower Snoqualmie: Vision and Strategies

- Work with partners and landowners to balance flood and erosion goals with agriculture and habitat
- Meander segments (outside Tolt and Raging areas):
  - Reduce impacts of flooding on farm operations. Potential actions include house and barn elevations, farm pads

Lower Snoqualmie: Vision and Strategies, con't.

- Alluvial fan segments below Tolt and Raging confluences:
  - Allow more room for natural channel processes
  - Potential actions include large levee setback projects, voluntary acquisitions

Specific Proposed Actions

Basinwide:
- Farm pads,
- Barn elevations (pilot)
- Home elevations

Below Tolt and Raging Fans:
- Fall City area voluntary acquisitions, potential levee setbacks
- Snoqualmie at Carnation monitoring/adaptive mgmt.

Chinook Bend to County Line:
- Large revetment repairs at Sinnema Quaale Upper, Winkelman, and Dutchman Road

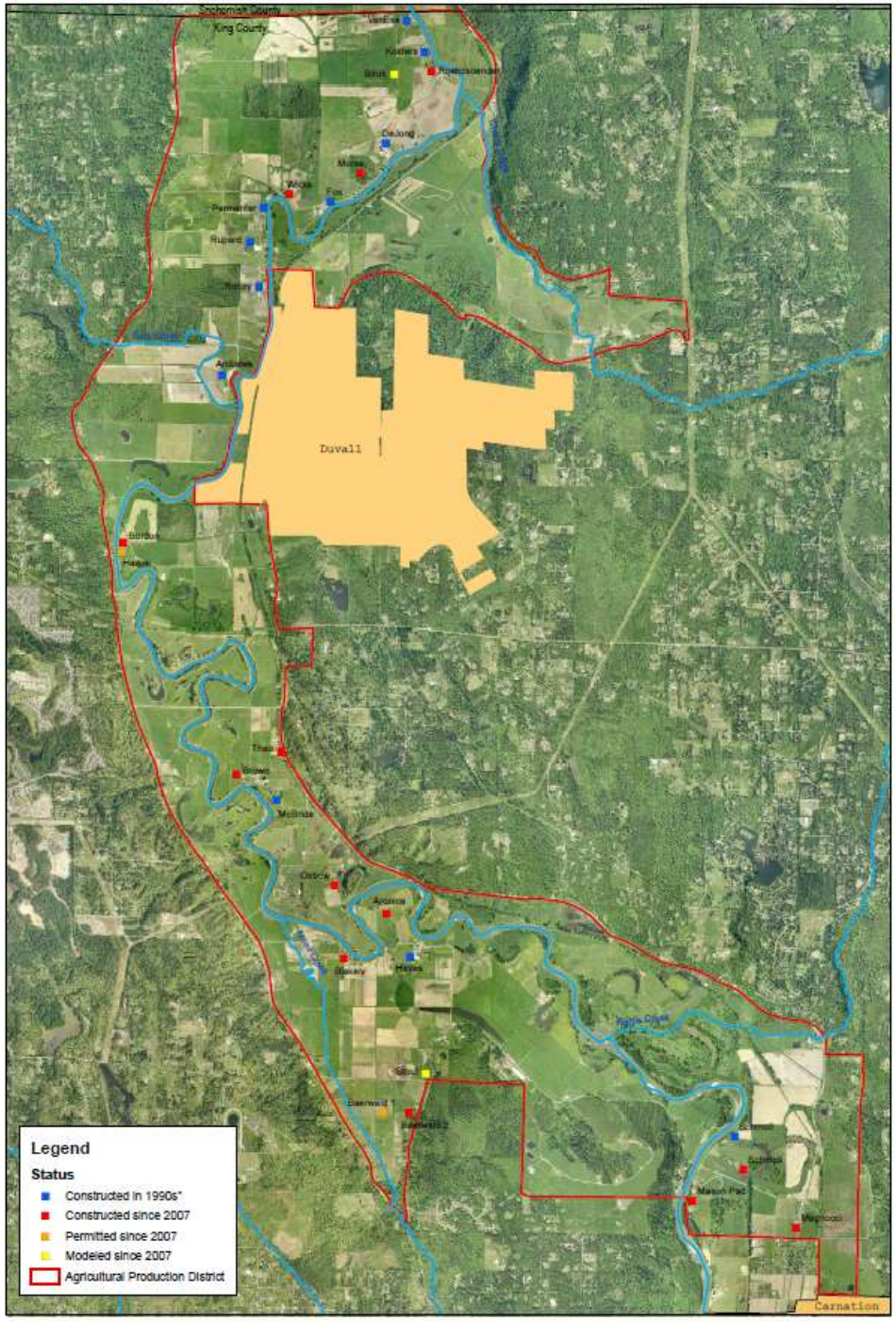
Accomplishments since 2006

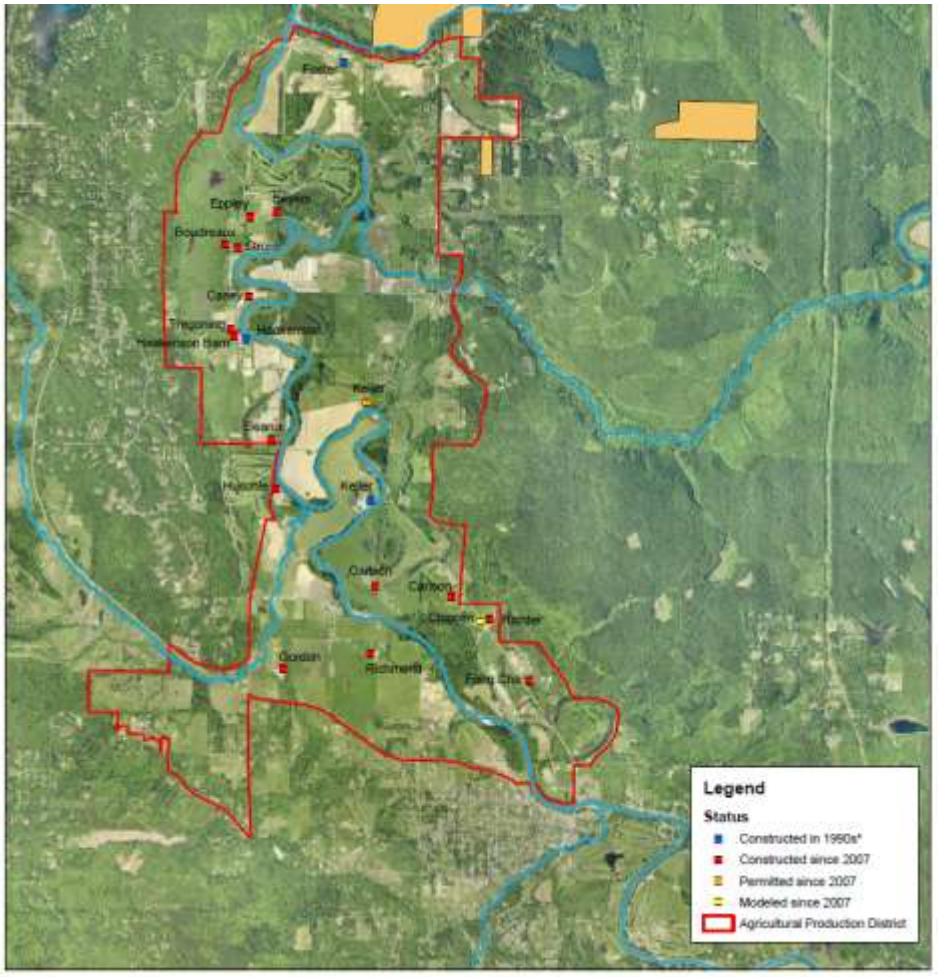
- 25 farm pads constructed
- 2 barn elevations
- 12 farm houses elevated
- 15 residences acquired (10 outside APD)
- 2 levees repaired

The Magnochi dairy farm pad

Beyers Farm House

Farm Pads
Lower Snoqualmie Valley





Examples of “river facilities”

Levees and Revetments

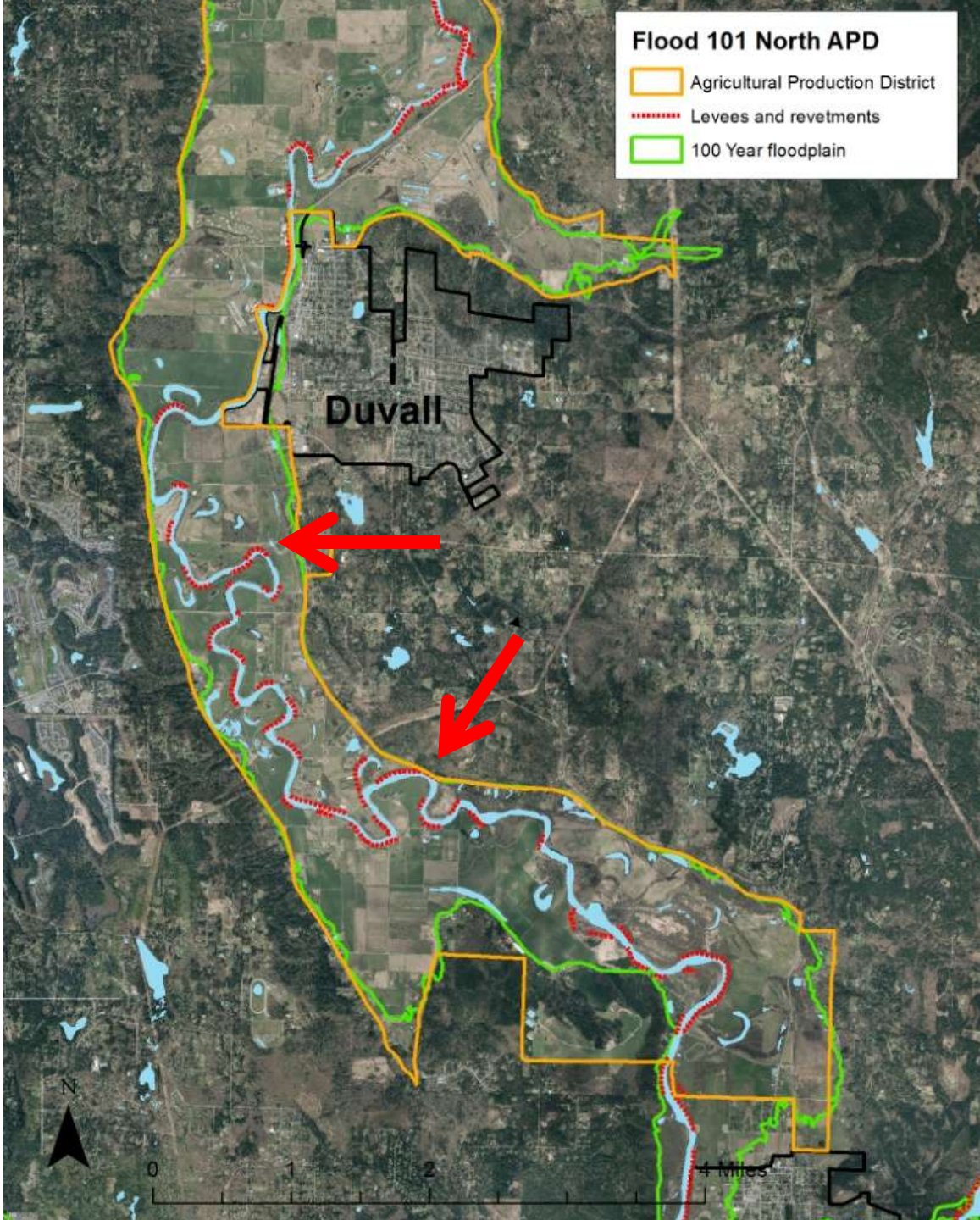
County actions:

- Facility inventory – most on private land
- Monitoring
- Repairs
- Reconstruction
- Levee setbacks

Criteria for repair:

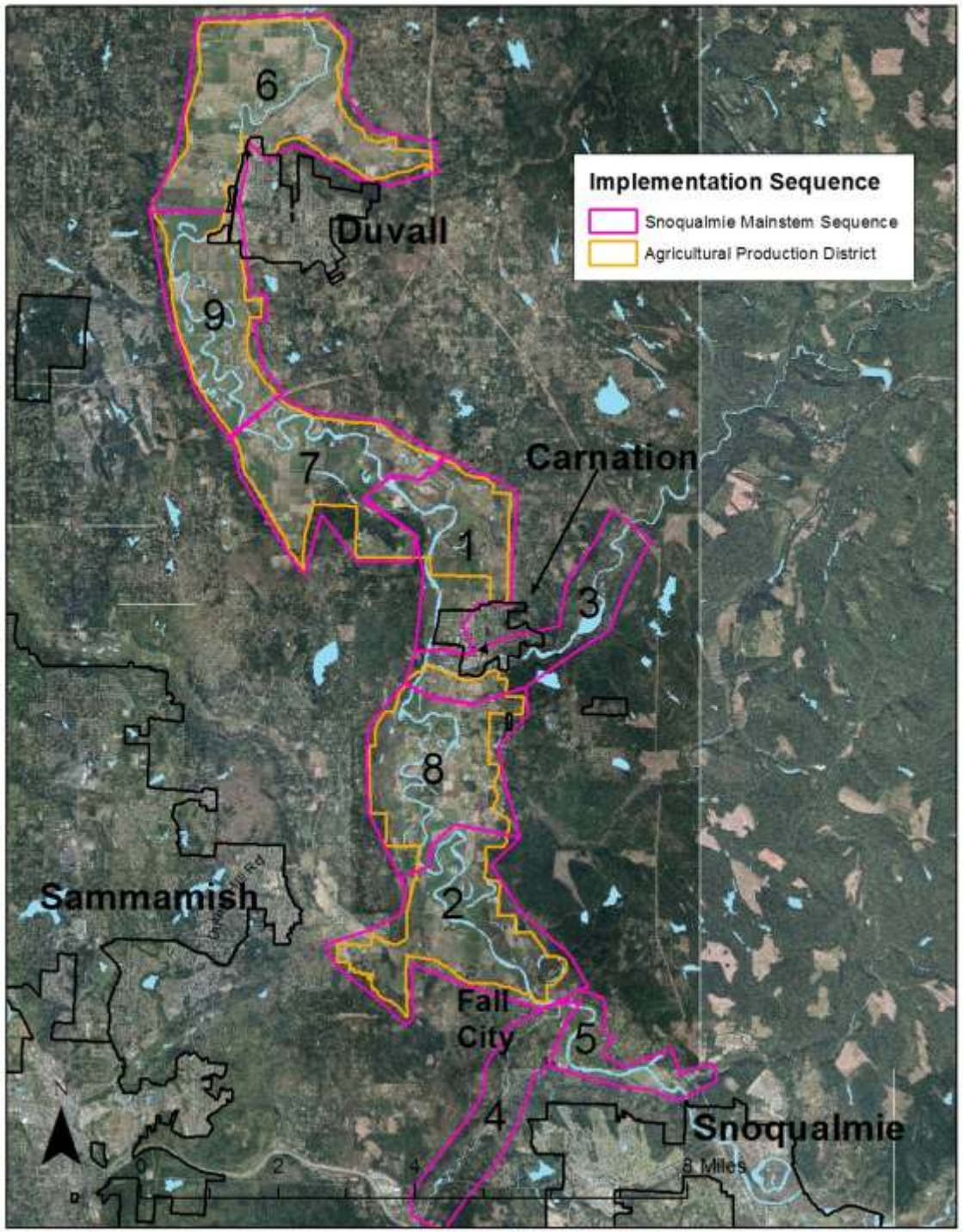
- Easements provide right not obligation to repair
- Priority based on risk to public safety, public infrastructure, impacts to economy
- Less clear re: ag infrastructure and land

Winkelman (Tolt Pipeline) and Sinnema Quaale Upper (car body curve) revetment repairs 2015



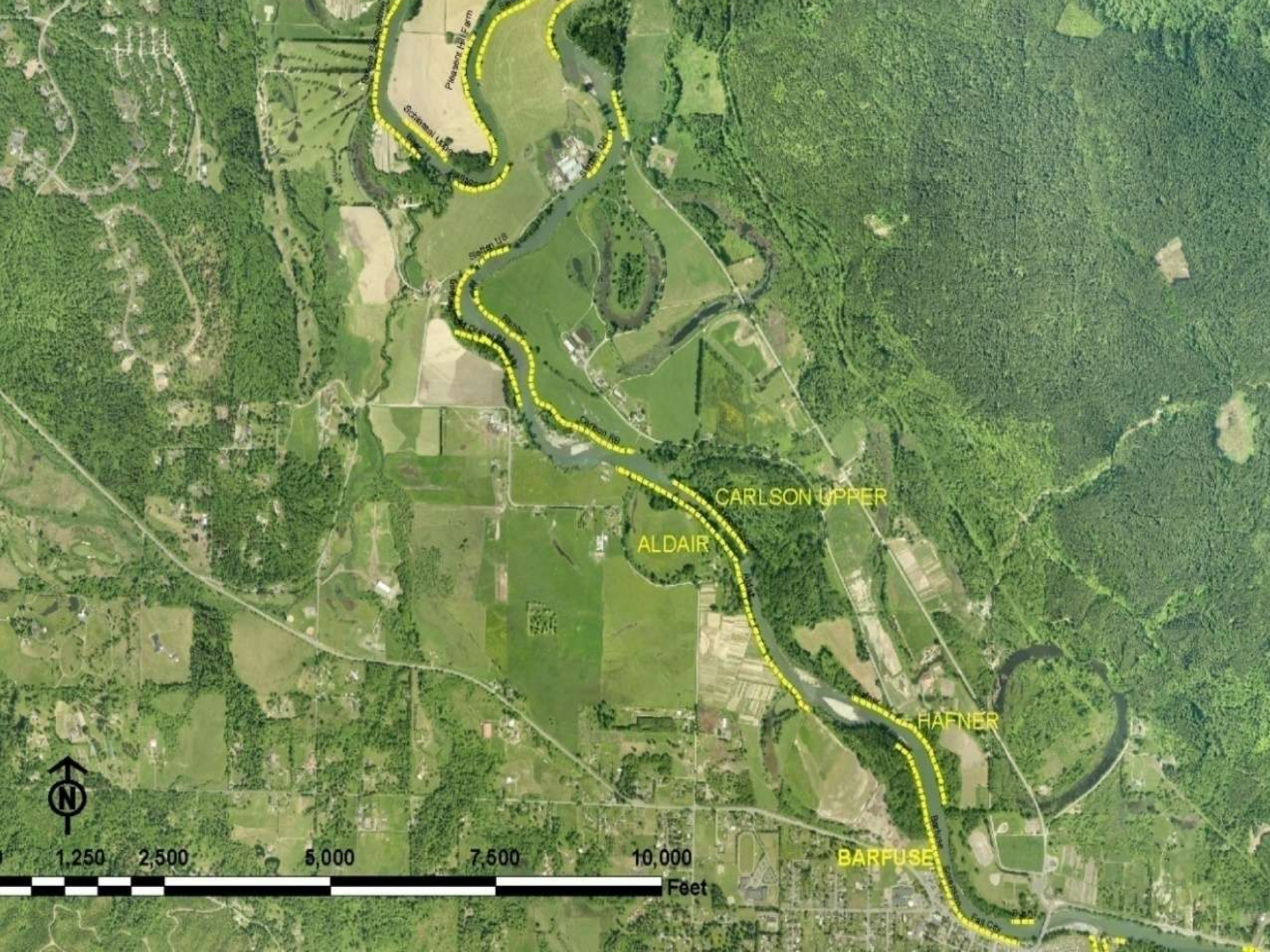
Why levee setbacks for flood?

- Construct levees to new standards – for potential larger floods in future – lower repair costs
- Reduce velocity and erosive forces on facilities
- Allow more room for sediment to drop out so river can shift naturally
- Allow more room for floodwater conveyance – for smaller events



Habitat Restoration Implementation Sequence

For the next 10 years, it is recommended that projects be sequenced across geographic areas of the Snoqualmie


CARLSON UPPER
ALDAIR
HAFNER
BARFUSE
N
1,250
2,500
5,000
7,500
10,000
Feet

Studies underway: Snoq 205 and possible basin study

- 2 parts: hydraulic study of up- and downstream effects of Snoqualmie 205 widening project; basin study of key flooding drivers
- 2014 adopted budget for $200,000
- Convene stakeholders group to oversee study and to connect with the R-650 process

“Basin” Study: Possible Approach

Develop list of highest priority questions to address:

- Development and forest clearing impacts
- Role of direct discharges
- Potential for decentralized flood storage
- Climate change
- What else?

Consultant support:

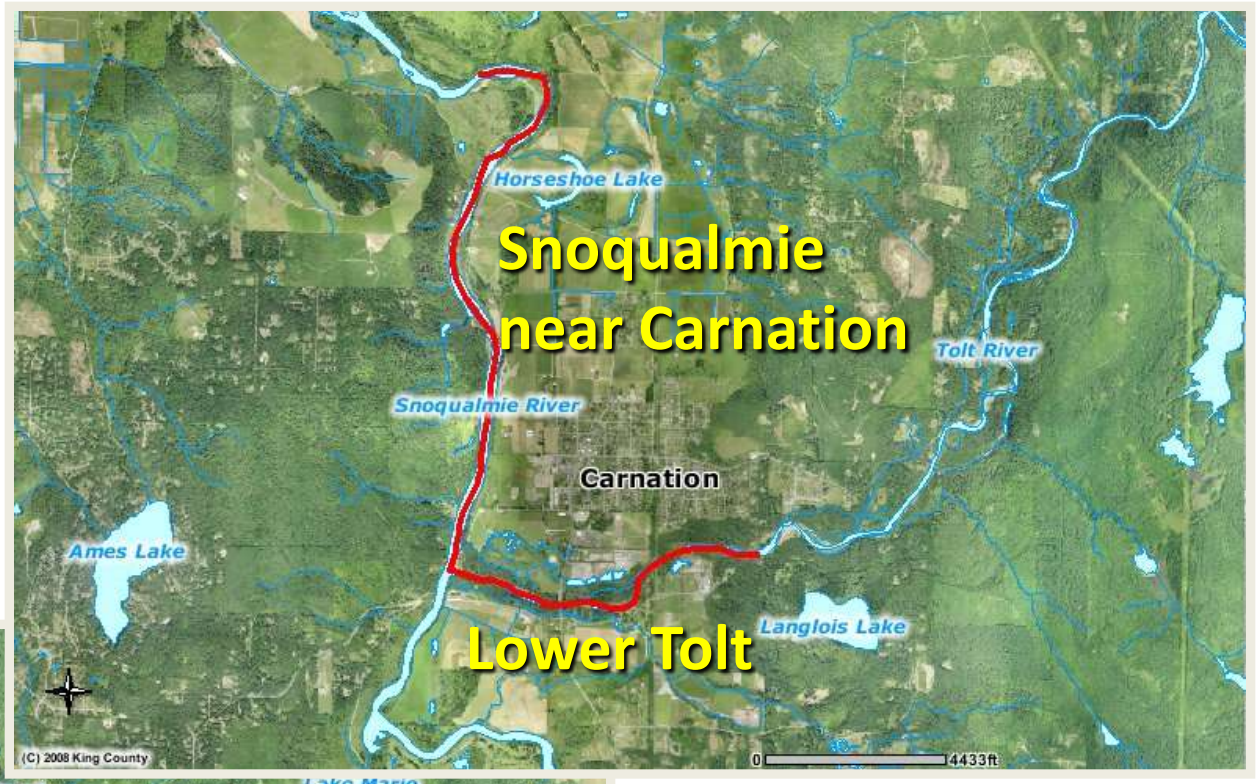
- Research priority questions: what is known based on available info?
- What would it take to more fully answer questions?
- Budget, time frame, scope options for review by stakeholder

Second phase to conduct targeted studies (tradeoff of funding study vs funding on the ground projects)

Studies underway – Sediment Management

- Characterize existing conditions – ongoing sediment monitoring (data collection in Lower Snoqualmie began 2004 – see map)
- Hydraulic modeling to analyze impact of sediment aggradation on flood water surface elevations – by end 2014
- Could look at gravel removal scenarios (would need to be part of broader corridor approach)


Snoqualmie
near Fall City
Rutherford Slough
Lake Marie
Lower Raging
Snoqualmie River
Raging River
Snoqualmie
(C) 2008 King County
0
4433ft


Horseshoe Lake
Snoqualmie
near Carnation
Tolt River
Snoqualmie River
Carnation
Ames Lake
Langlois Lake
Lower Tolt
(C) 2008 King County
0
4433ft

Strategies not in Flood Plan

- Construction of flood control dam(s) and continuous, containment levees
- Extensive home buyouts because it is the APD and new houses cannot be built; nature of flooding is deep but in most places it is not high velocity and erosive (compared to Tolt R.)

Future: Climate change

What information is available?

- 2010 King County – *Climate Change Impacts on River Flooding*
- 2013 *Federal Advisory Committee Draft Climate Assessment* and 2013 *Climate Change in the Northwest*
- Many other studies, though most not specific to flooding impacts
- Analyses look at existing gage data and available future climate modeling

What do we know?

- Clear impacts to low flows, snowpack, water supply
- Less clear flood impacts in Snoqualmie and similar basins (upward trends, but statistically weak)
- Huge range of predictions for future, though most show varying levels of peak flow increases
- **Bottom line: Peak flows may increase. Smaller flood events may increase in frequency. River bank erosion may increase.**

Climate change, con't

What are we doing to address this uncertainty?

- Planning for a broad range of flows, up to and including 500-year
- Designing facilities with freeboard, increased factors of safety, adaptive management, facilities that can be retrofit if needed, etc.
- Home elevations to 3 ft above BFE
- Developing consistent approaches and messages
- Continuing to study

2018 Flood Plan Update

Develop river corridor plans to:

- Establish desired floodplain management outcomes and levels of service appropriate to each river system
- Develop alternative approaches to reach these outcomes and compare based on cost/benefit and impacts to public safety and environment
- Determine what outcomes can be achieved by different levels of investment

Key messages: strategies/actions

- Since flooding is not controlled in valley, primary risk mitigation actions are to make individual residents and farms safer (non-structural actions)
- Biggest potential change could be the scale at which these non-structural actions are taken and needs assessment will help to quantify the need and priorities
- Where levee setbacks are constructed, they reduce long term costs and improve sediment storage and flood conveyance. But they don't contain floods any more or less than the facilities they replace

Advisory Committee

All committee members – What is the biggest takeaway, question, concern/challenge or what is most important to you about what we have covered so far today?

BREAK

Challenges/Opportunities related to Fish and Farm Goals

- Highlight challenges/opportunities
- Example 1: limits of floodplain capacity
- Example 2: levee setback projects
- Advisory Committee small group discussion/report out

Challenges/Opportunities – Farm

Potential challenges:

- Frequent small flood impacts to fields and access, vs large infrequent floods impacts to whole infrastructure
- Floodplain regulations limit fill in floodplain
- No new houses in floodway (temp farm worker housing?)
- Bank and field erosion – and deposition of debris, silt on fields

Potential opportunities:

- Farm pads and elevated platforms
- Structure elevations – homes, barns
- Technical and financial assistance for other ways to make farms safer
- Flood fencing

Challenges/Opportunities - Fish

Potential challenges:

- Scour from flows redirected by facilities
- Bank hardening and river containment by facilities including large repairs (rock jobs)
- Recreation safety/wood management protocols that can lead to wood removal
- Gravel dredging

Potential opportunities:

- Acquisitions
- Levee and revetment setbacks to expand channel capacity and sediment storage and restore habitat
- Shared funding for acquisitions and setback projects that meet multiple (flood / fish) objectives
- NMFS Biological Opinion

Challenges/Opportunities: Example 1

- Zero rise floodway, limits to fill, constrained reaches, farm pads, alternatives to fill

Issue of limited floodplain capacity

- County does annual modeling for cumulative impacts to up- and downstream neighbors
- Learning there are at least 3 areas in valley more sensitive to fill (see maps)
- Possible explanations include: width of floodplain, number of fill prisms being placed in close proximity, roads
- Working closely with landowners to make adjustments or come up with alternatives
- Increases importance of seeking practical alternatives to fill and county's appropriate role in supporting that

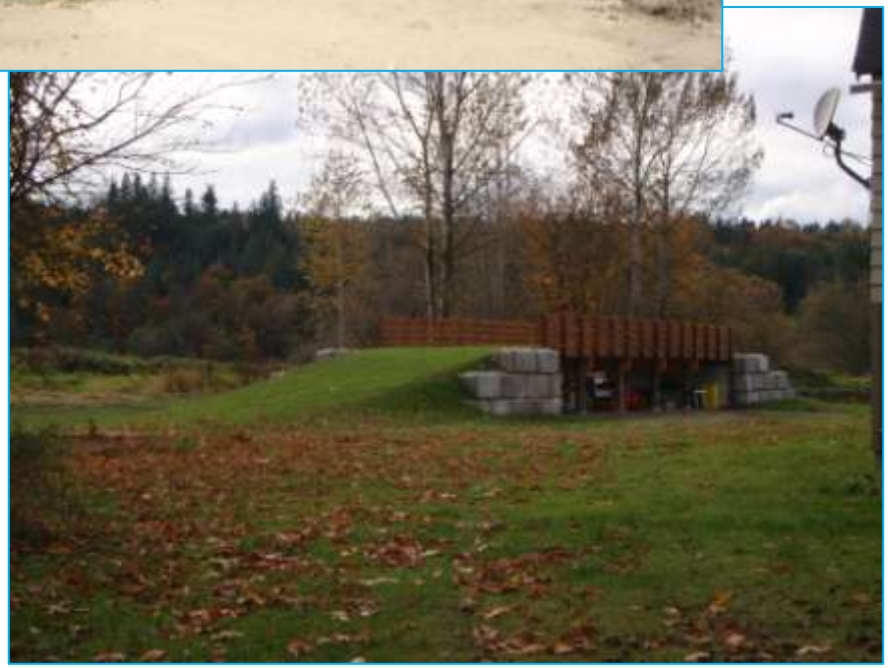
Reach of limited capacity

Reach of limited capacity

Reach of limited capacity

Options: elevated platform

- Pilot project constructed 2012
- Significant county cost share
- Learned re: cost, permitting, technical issues



Options: agricultural structure elevations

- Lift barn, then rebuild foundation with flow through vents
- Avoids fill
- Water flows under barn
- Challenges include: geotech, access, cost

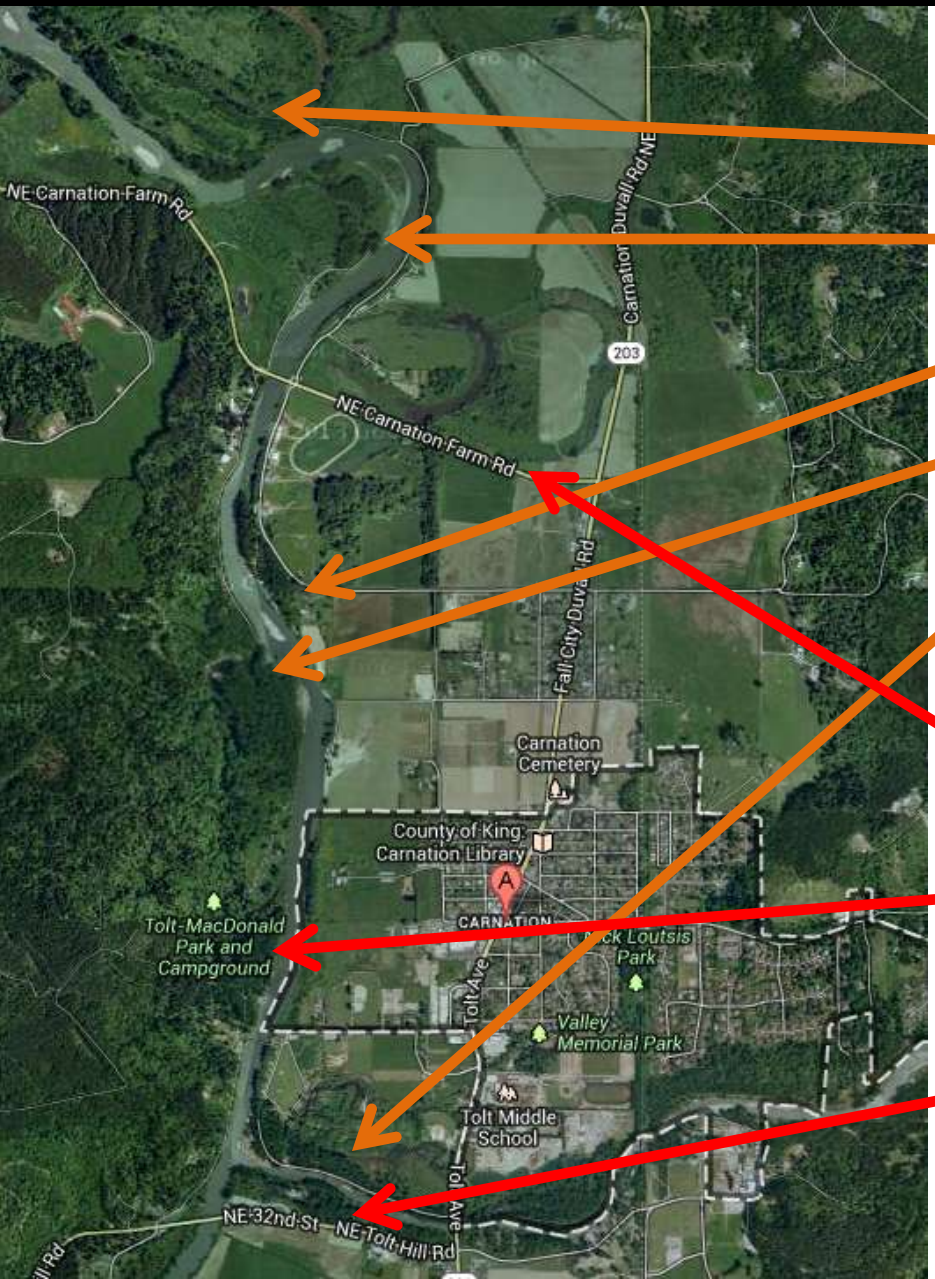
Pilot Barn Elevation Project

Constrained reach option: construct elevated platform off existing pad for expansion of ag operation

Challenges/Opportunities: Example 2

- Levee setback projects – benefits for flood and fish, benefits and impacts for farms

Opportunities Large projects



Stillwater

Chinook Bend

McElhoe-Pearson

Gilead

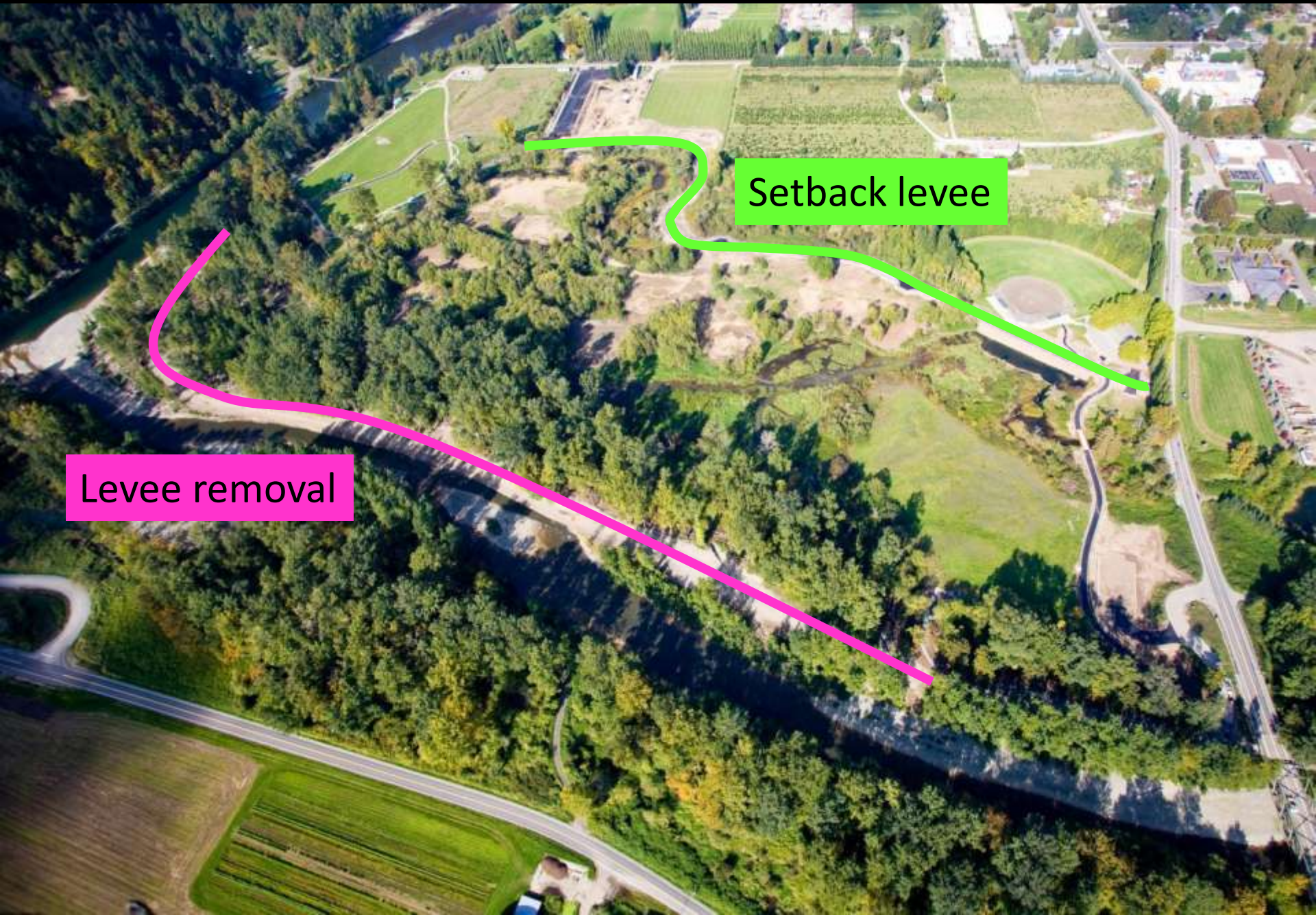
Lower Tolt

Put Road on Trestle

Remove failed revetment (left bank)

Remove/setback left bank Tolt Levee

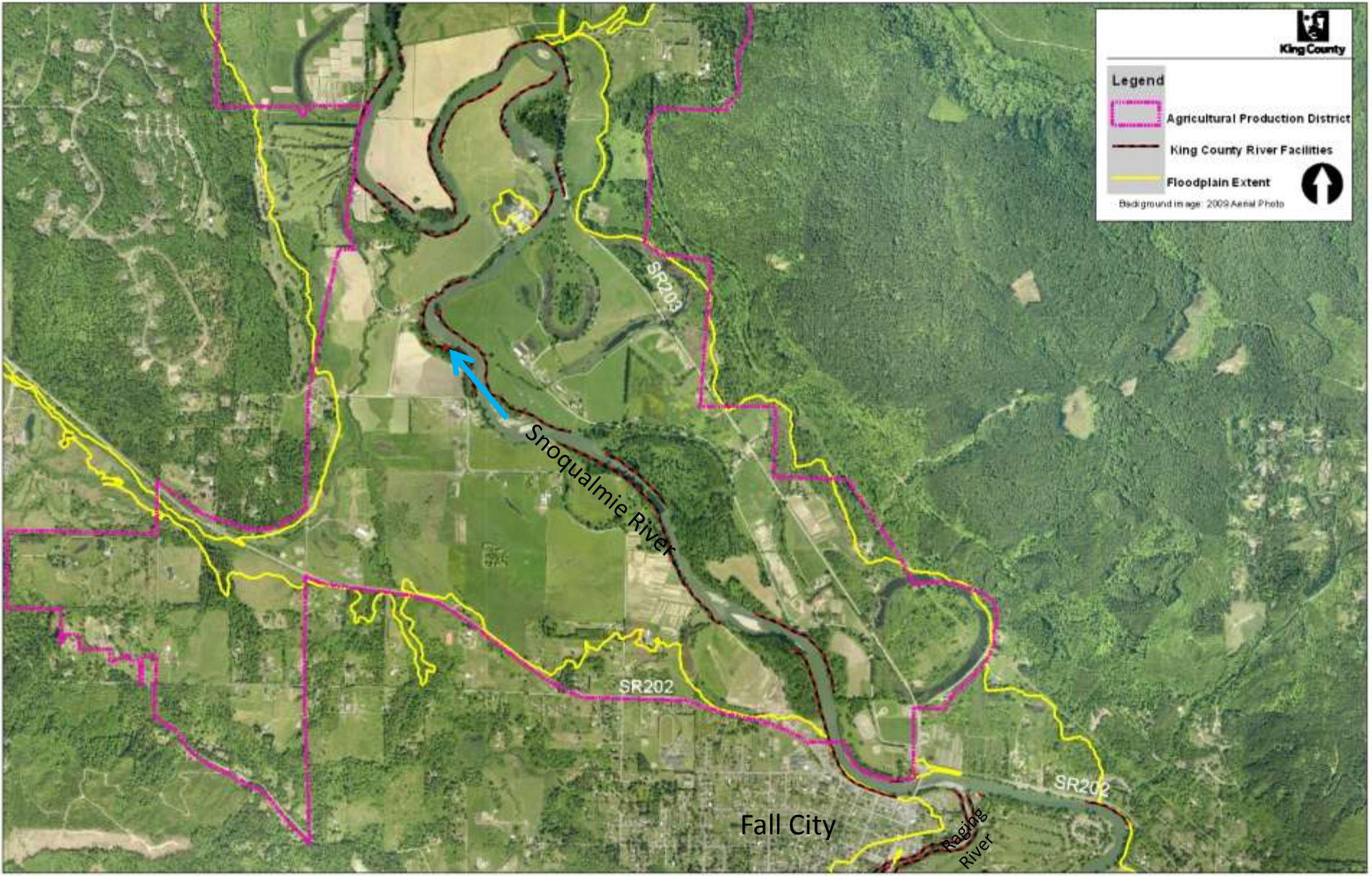
Lower Tolt Floodplain Reconnection Project



Snoqualmie at Fall City Feasibility Study

- 4 potential levee setback projects in APD
- Potential impacts on agricultural lands
- Opportunity to reduce flood and erosion risks, restore salmon habitat, and make farmers better off (SE 19th Way)

Snoqualmie at Fall City Reach



Potential Impacts/Benefits to Ag

- Impacts
  - Land taken out of production
- Benefits
  - Replace with modern flood facility
  - Store sediment in the project reach which reduces sediment transport downstream
  - Reduce rate of erosion of Richmond's property on left bank
  - Provide fill for Farm Pads

Advisory Committee

During small group discussion, consider areas where:

- you need additional information,
- we already may have common ground,
- ideas for possible solutions,
- you have suggestions or additions to the challenges or opportunities list
- you have a priority area to focus our work on even if it is unclear how to move it forward