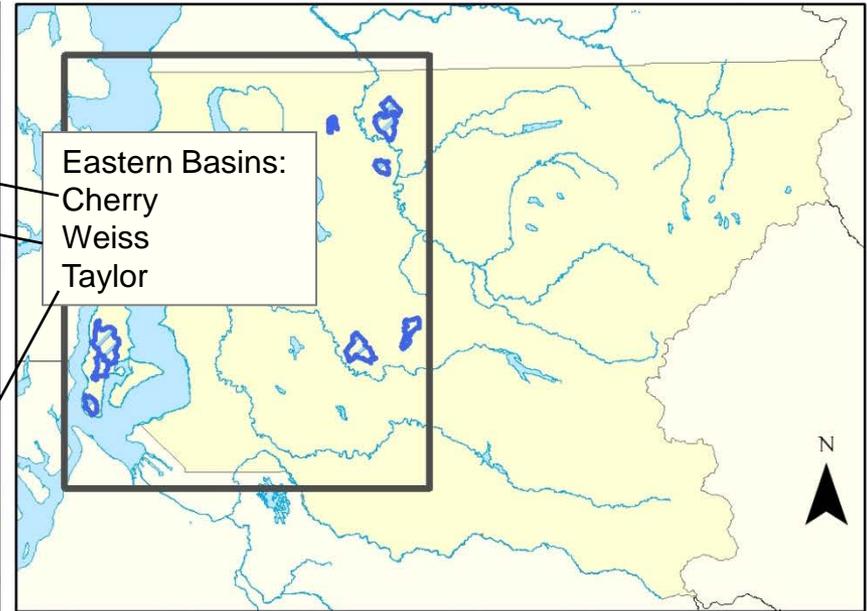
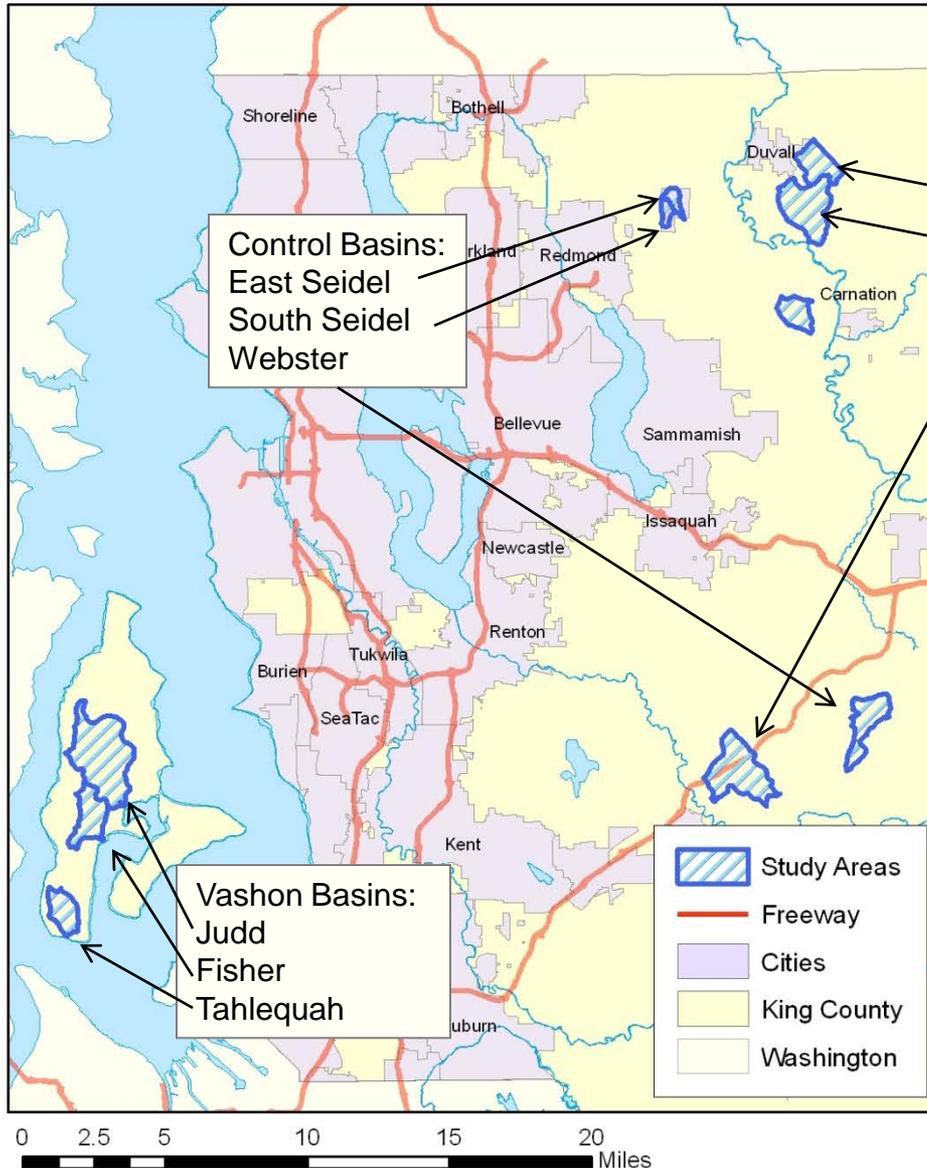


Implications of Land-Cover Change History for Monitoring Ecological Condition in Rural King County

Julia Michalak,
Gino Lucchetti, Ray Timm,
Joshua Latterell and Marina Alberti

Historic Context
for
USEPA – King County
Regulatory Effectiveness Study

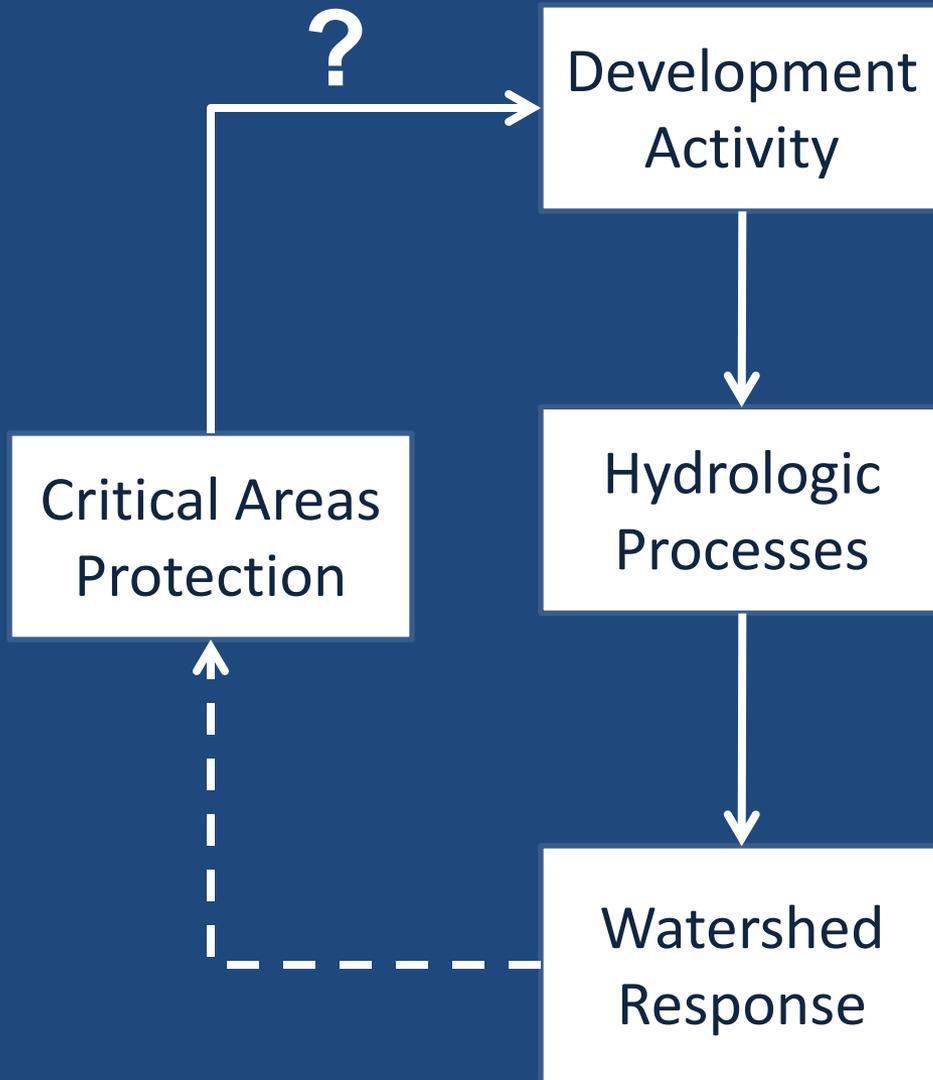
Study Areas



Selection Criteria:

- Small watersheds - 2nd or 3rd order streams (60 to 1260 hectares)
- Common post-glacial geology (Elevation range 44 to 7933 ft)
- Treatment basins: high number of unimproved parcels

Watershed Response



Land-Cover Change:

- Impervious
- Vegetation Change
- Type of Land Use
- Location of Change

Hydrologic Processes:

- Flow
- Water quality

Watershed Response:

- Benthic Macroinvertebrates
- Physical Habitat Characteristics

Developing a Land Cover History for the Study Basins

The Ghost of Land Use Past

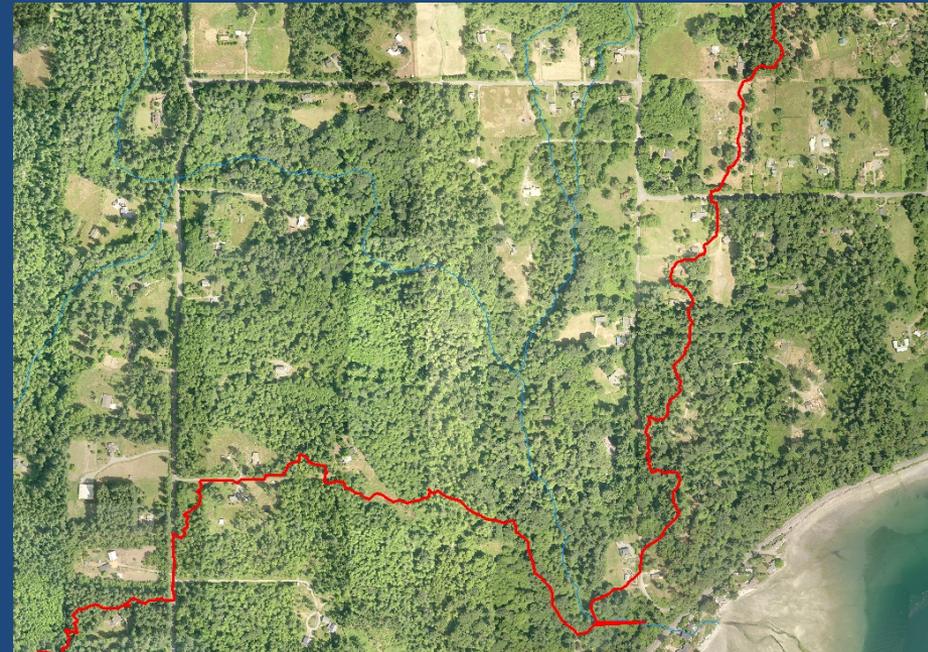
(Harding et al 1998)

- Present day land use/land cover not always indicative of historic conditions
- Explain present day watershed condition
- Explain watershed trajectory over time
- Insights into system recovery

Fisher 1936



Fisher 2007



Study Questions

- Do the watersheds share a common history?
- What are the implications of historic impacts for present day watershed condition?
- Can watersheds recover from significant land-cover impacts?

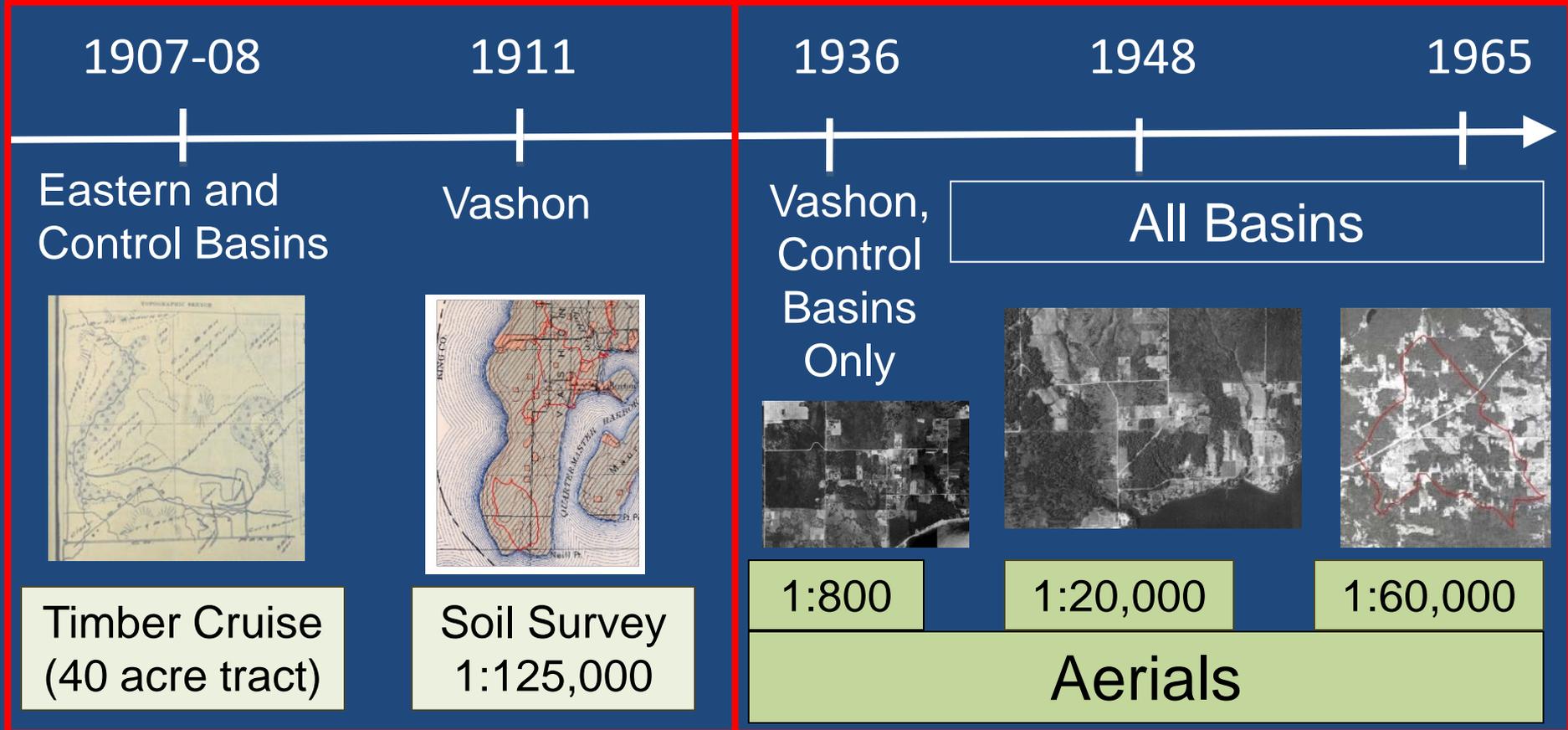
Fisher 1936



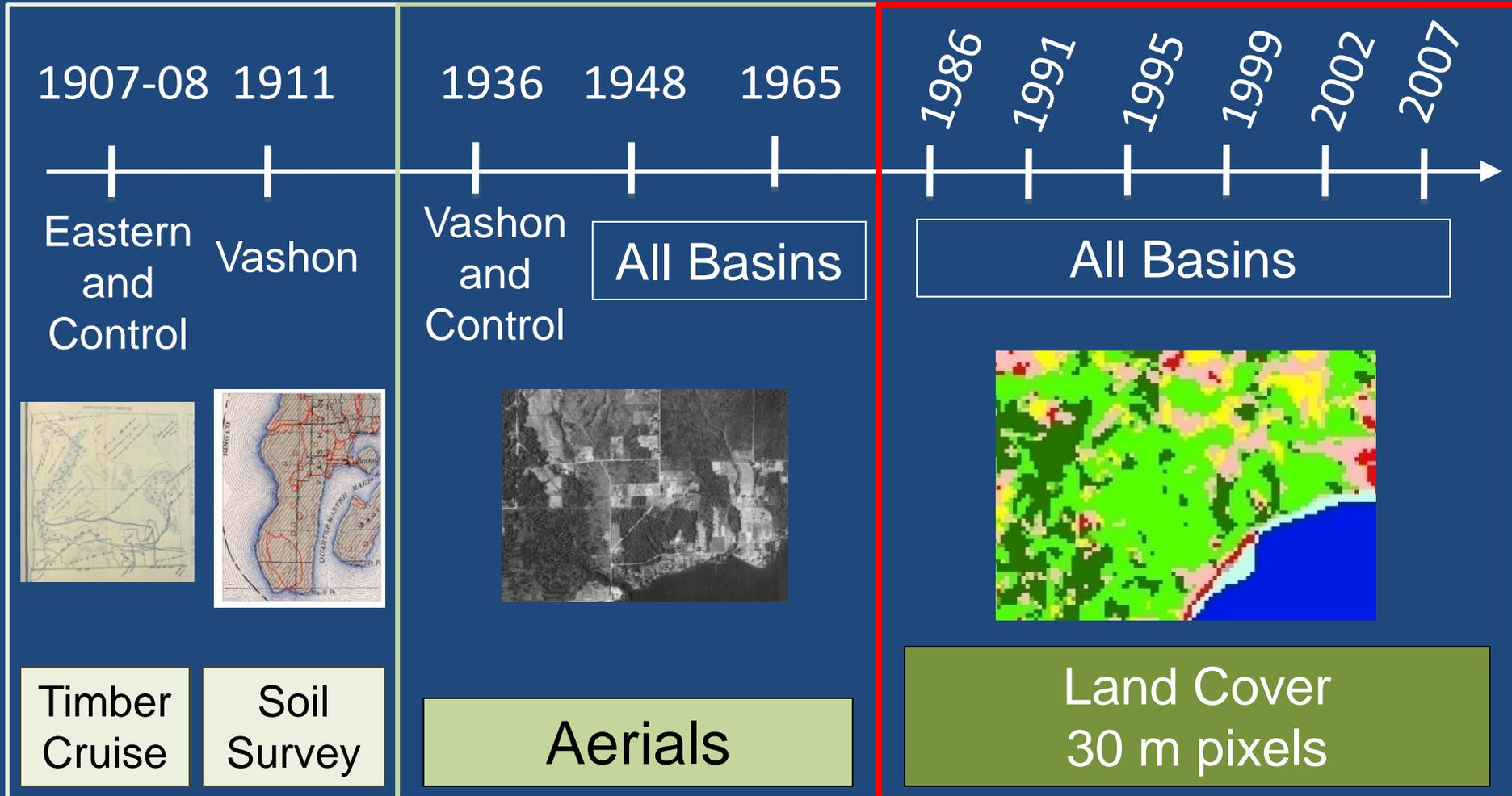
Fisher 2007



Data Timeline



Data Timeline



Methods

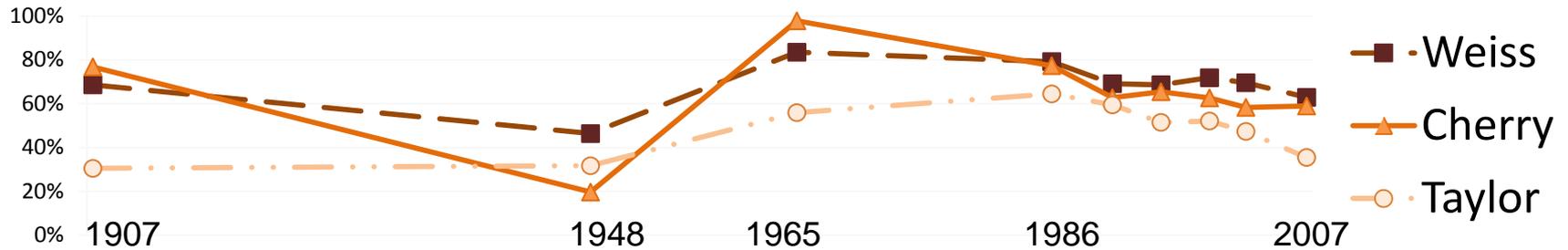
- Maps were scanned and georeferenced – PLSS Section boundaries
- Photos scanned and orthorectified (output 1 meter pixels)
- Land-cover polygons digitized
 - Photos analyzed at 1:10,000 with minimum polygon size of 1 hectare
- Polygons classified using a hierarchical classification system

Results

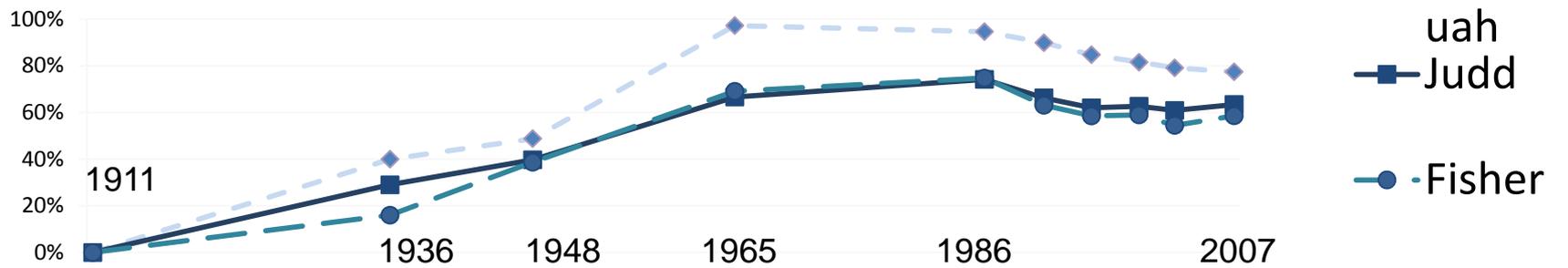
Forest Cover Change
Land Cover Composition
Recent History

Change in % Forest Cover 1907 to 2007

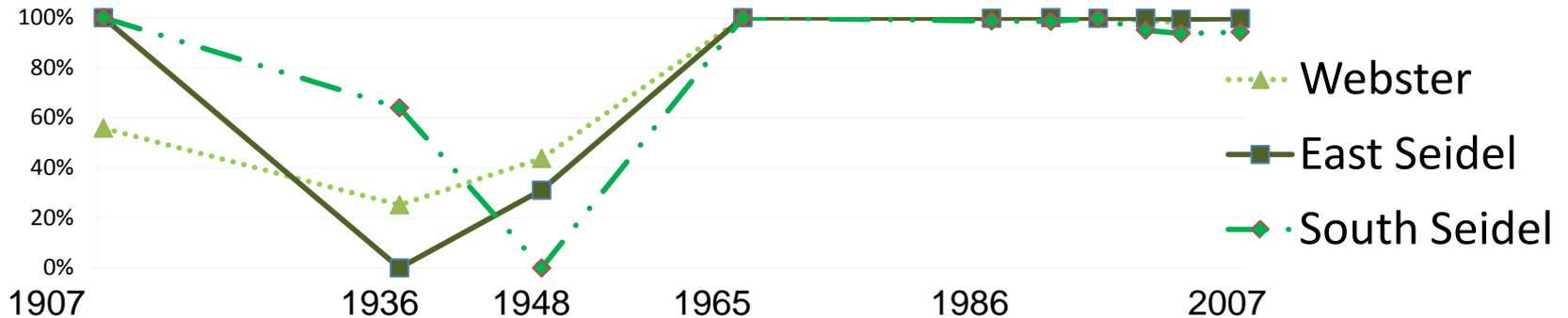
Eastern Basins



Vashon Basins

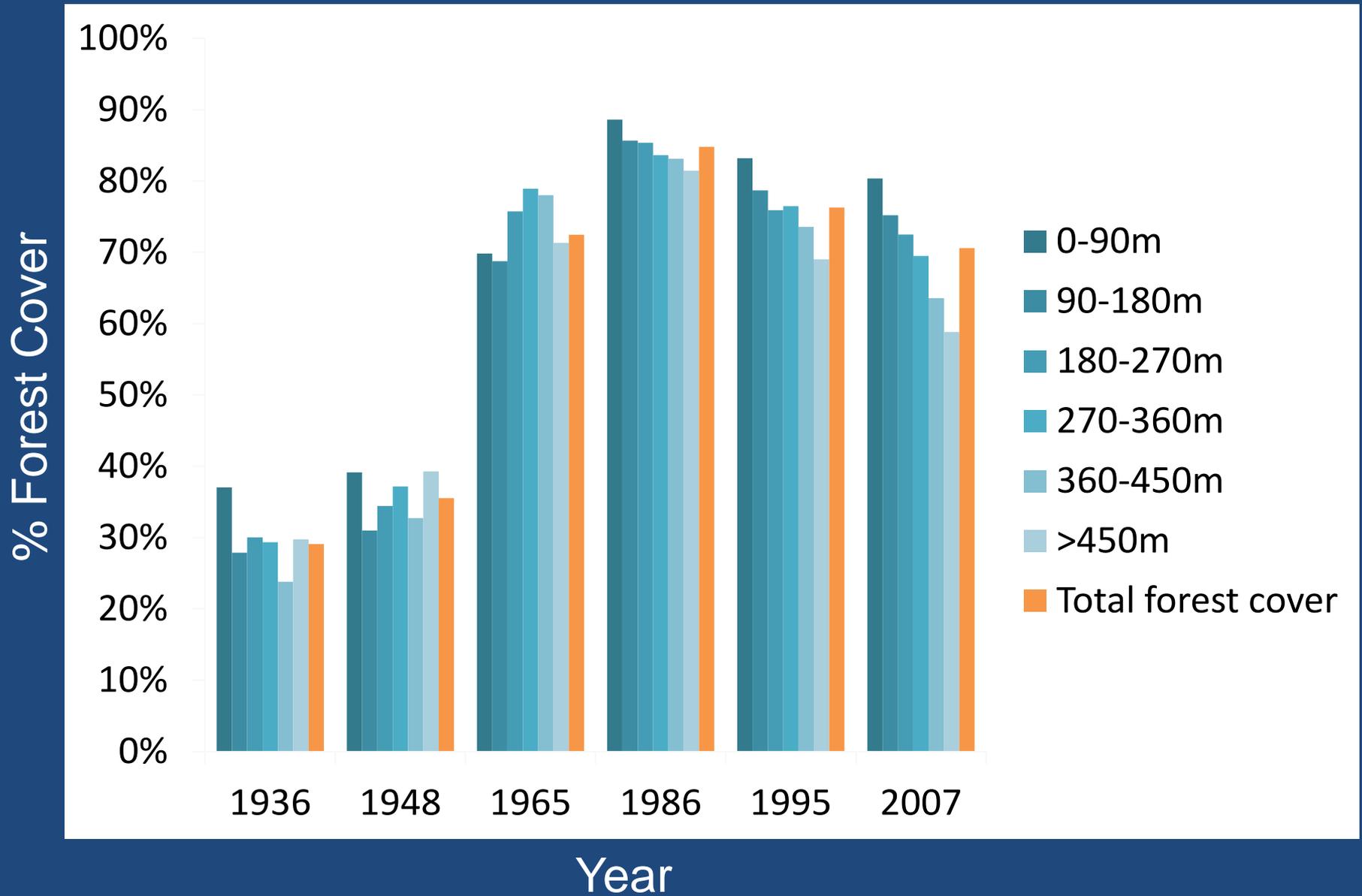


Control Basins



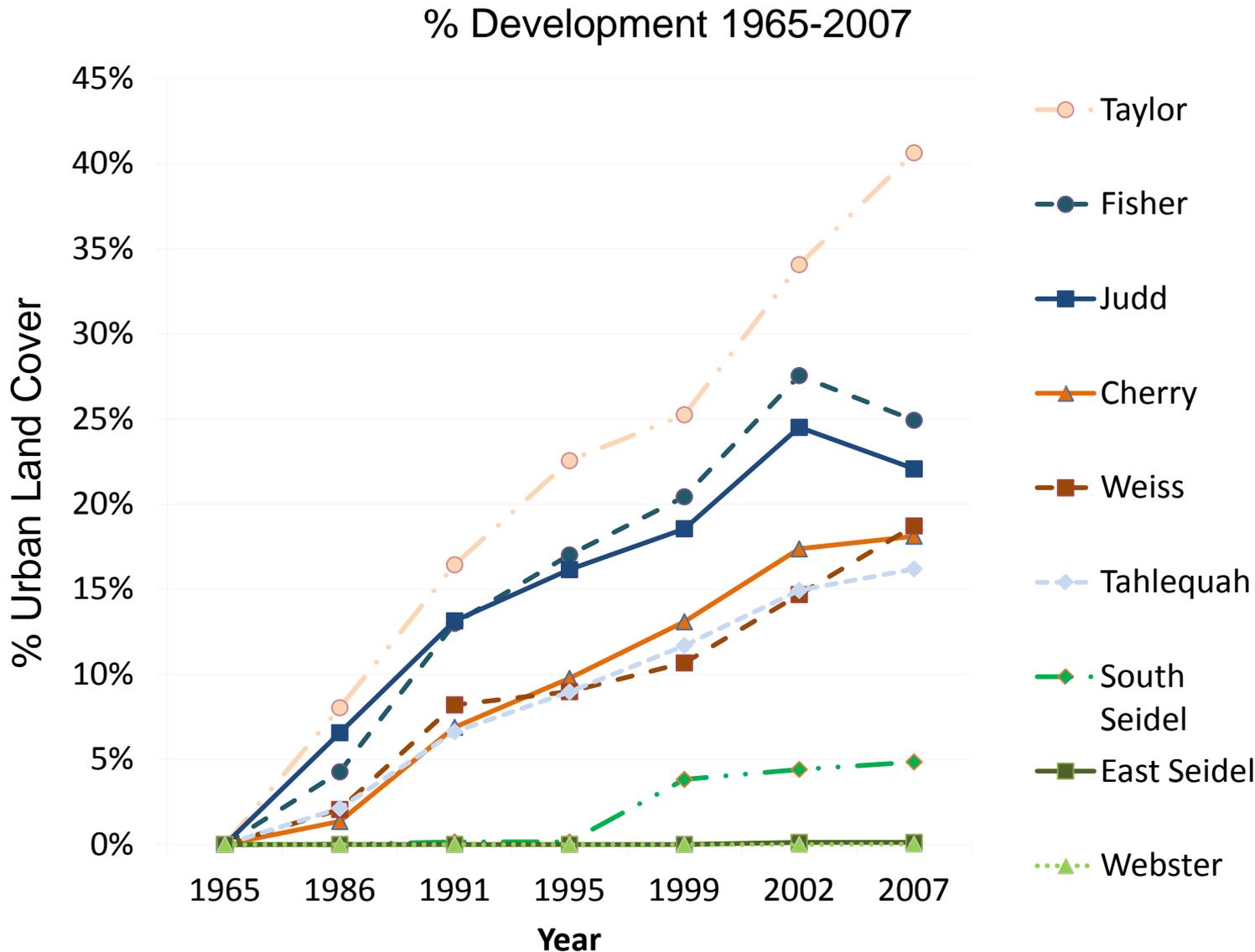
% Forest

Percent Forest by Distance from Stream Channel



Recent Development History

**BIBI
Score:**



40

42

38

44

30

30

32

48

40

Data Source: UERL Land Cover

Conclusions

Qualitative Conclusions

Management Implications

Qualitative Conclusions

- Do the watersheds share a common history?
 - Yes, but...
 - What is the relative importance of the type, extent, duration, pattern, and time since impact?
- What are the implications of historic impacts for present day watershed condition?
 - Historic and present day land cover are not independent
 - Altered forest stand conditions
 - Woody Debris, Stream Bed Heterogeneity, and BIBI
- Can watersheds recover from significant land-cover impacts?
 - All have good to excellent BIBI scores

Implications for Management

- Watersheds are recovering from historic impacts and experiencing present-day impacts
- We know little of the relative importance of the type, extent, duration, and time since impact
- Questions
 - Do certain land cover changes permanently alter the trajectory of a watershed?
 - Are there time lags in watershed response?
 - What are the long term implications of our land use decisions today?

Data Sources and Acknowledgements

- **Critical Areas Monitoring Effectiveness Team**

Gino Lucchetti, King County Project Manager

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- **UW: Dr. Marina Alberti, Dr. Christian Torgersen**

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- Janette Gomes - King County Archive
- Phil Stairs - Washington State Archive – Puget Sound Branch
- Paul McCombs - King County Department of Development and Environmental Services
- Dr. Tom Minichillo - King County Road Services
- Rob Ryan - Natural Resources Conservation Service
- Ken Rausher – King County GIS



King County

[Project Website:](http://www.kingcounty.gov/environment/data-and-trends/monitoring-data/critical-areas.aspx)

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