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science for a changing world

Floods, Floodplains, Floodplain Forests and Forested Bars

Insights and observations from USGS mapping, field observations, modeling, surveying, and augering on the Willamette River

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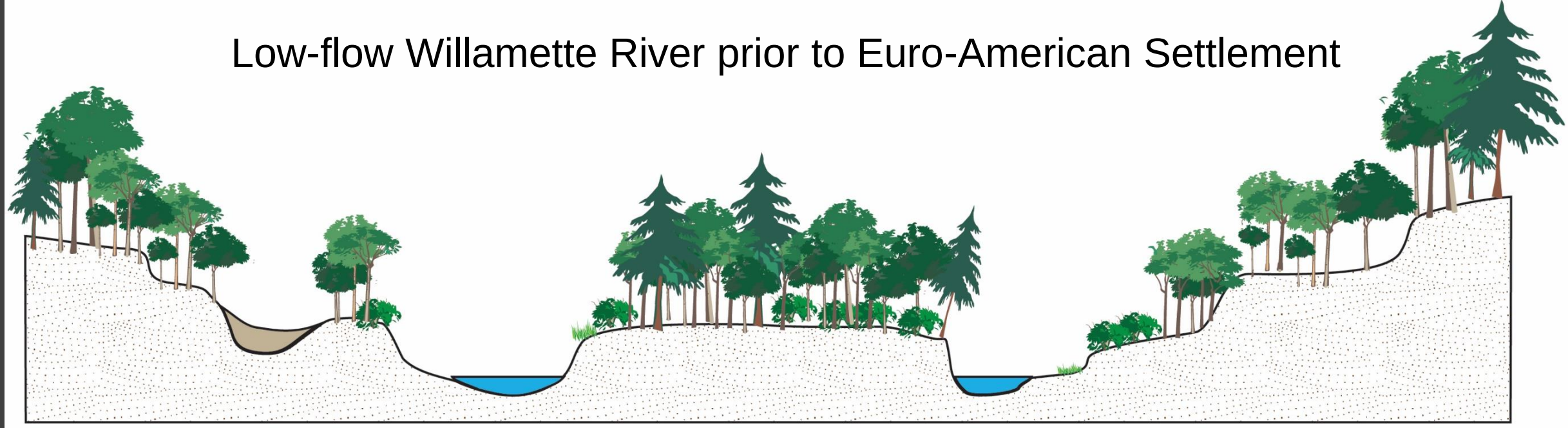
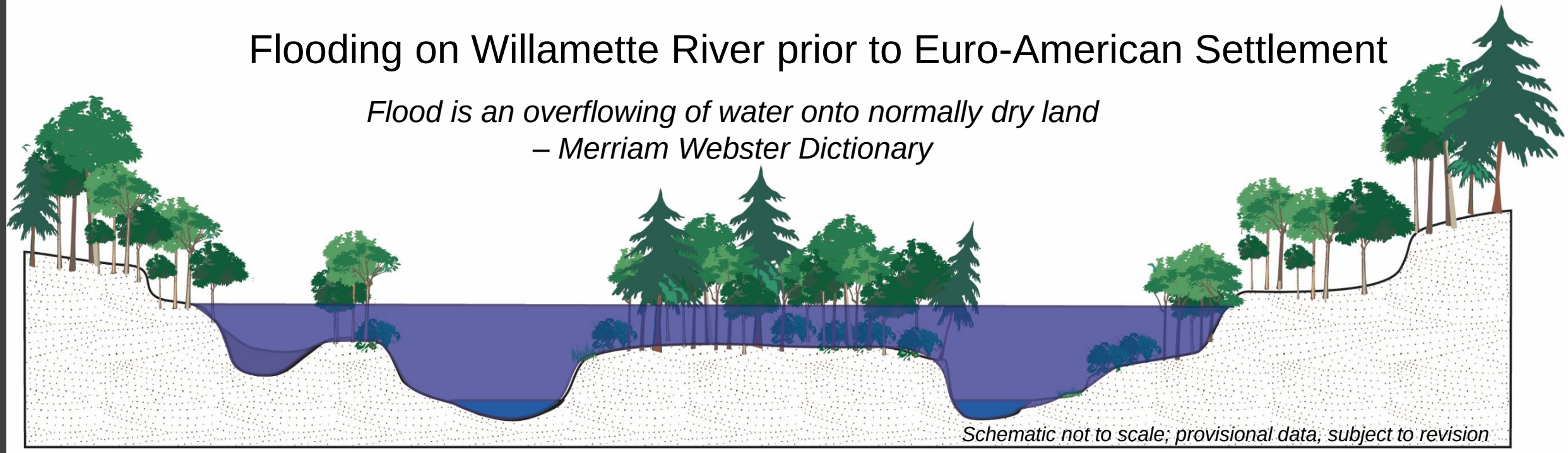
U.S. Department of the Interior
U.S. Geological Survey

Low-flow Willamette River prior to Euro-American Settlement



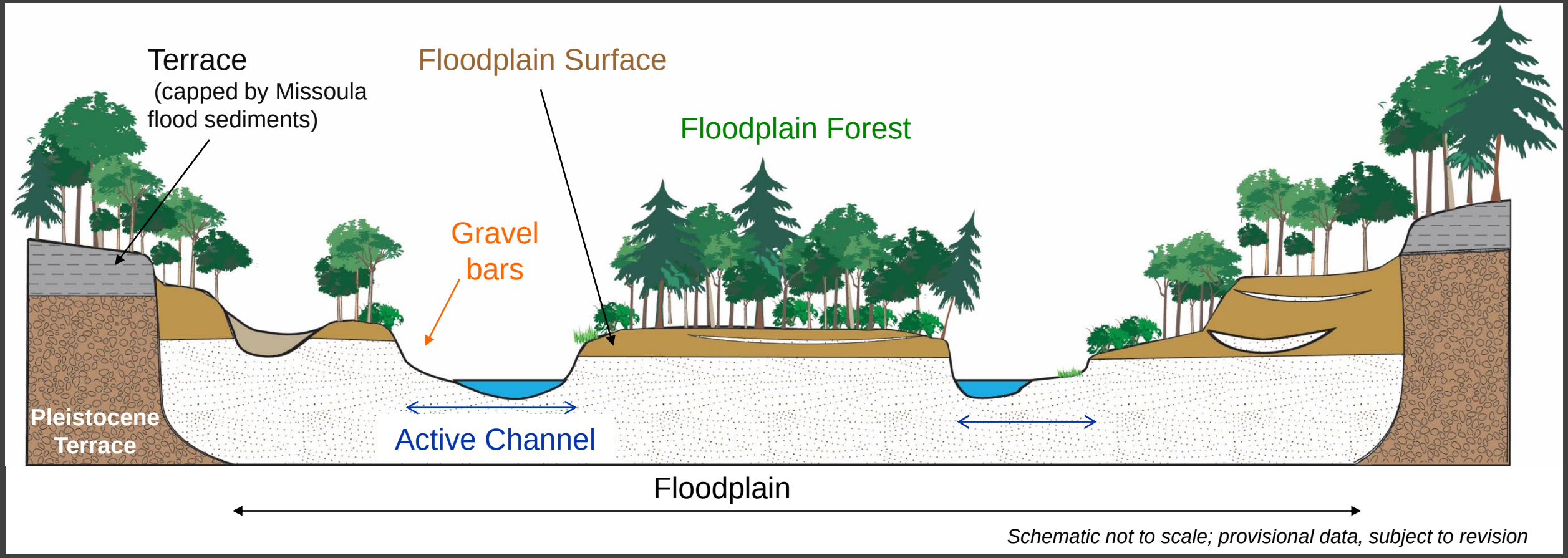
Flooding on Willamette River prior to Euro-American Settlement

Flood is an overflowing of water onto normally dry land
– Merriam Webster Dictionary



Schematic not to scale; provisional data, subject to revision

Generalized Willamette River Floodplain Transect



Schematic not to scale; provisional data, subject to revision

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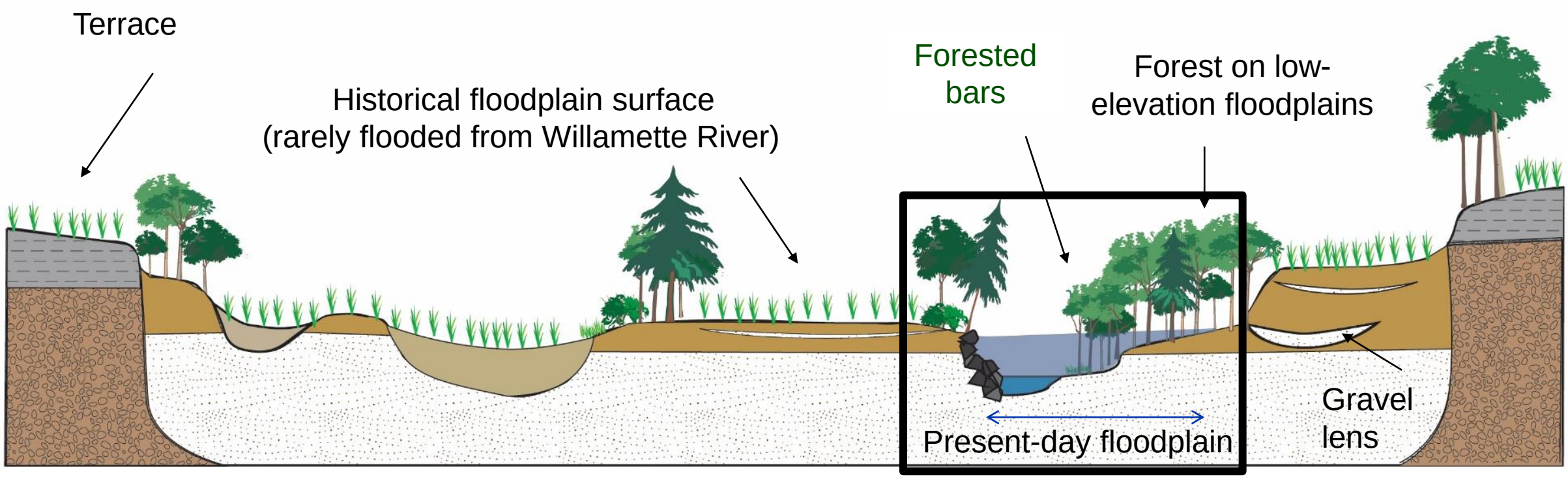
Present-Day Willamette River Floodplain



Schematic not to scale; provisional data, subject to revision

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Forest(?) on Former Floodplain

Example from Upper Willamette River near Marshall Island

Is forest a 'Floodplain Forest' if it doesn't get flooded?

When do a cluster of trees become a forest?

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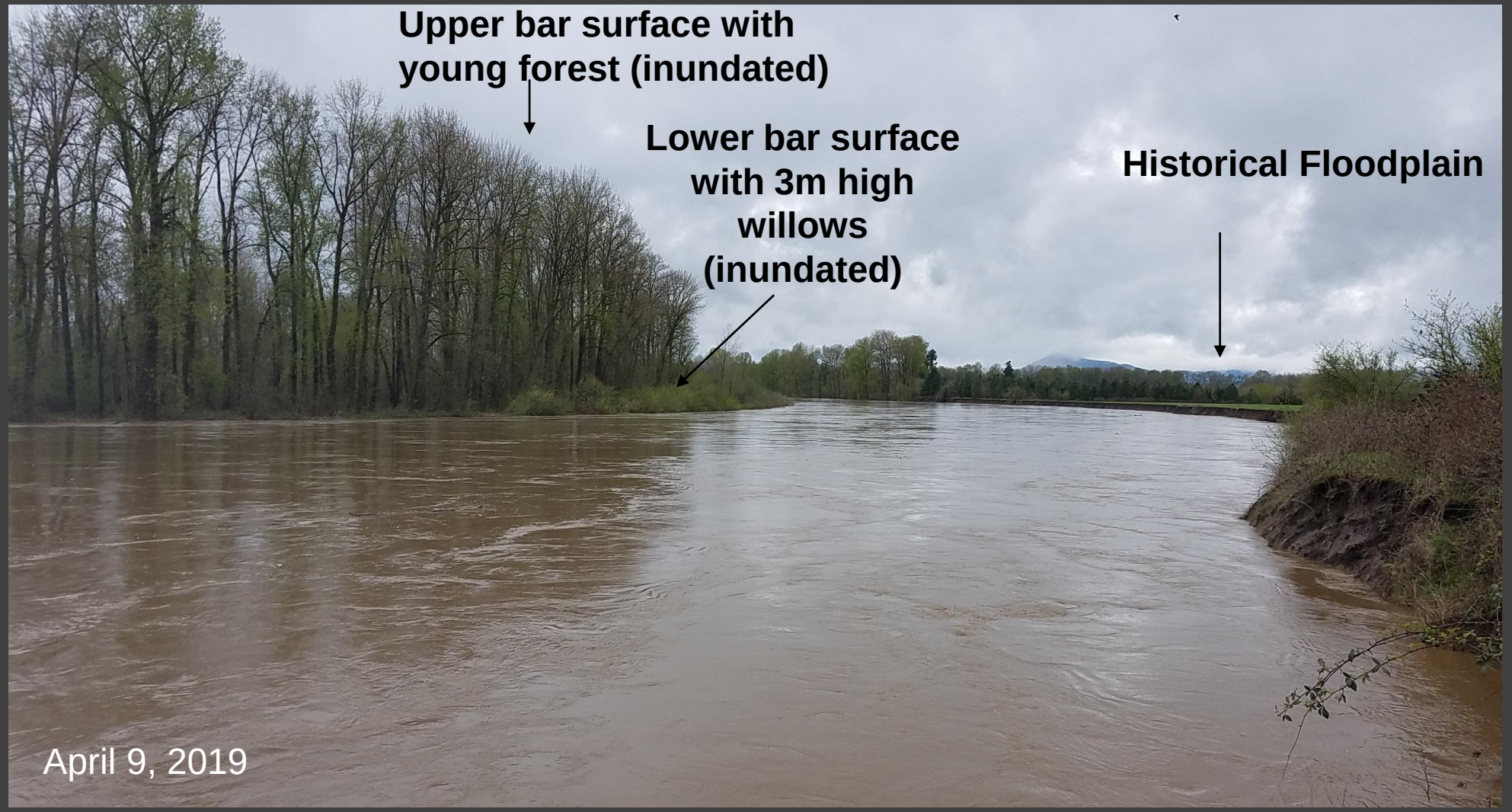
Dry (historical) Floodplains, Flooding on (present-day) Floodplains and Forested Bars

Example of Ingraham Bend, Upper Willamette River



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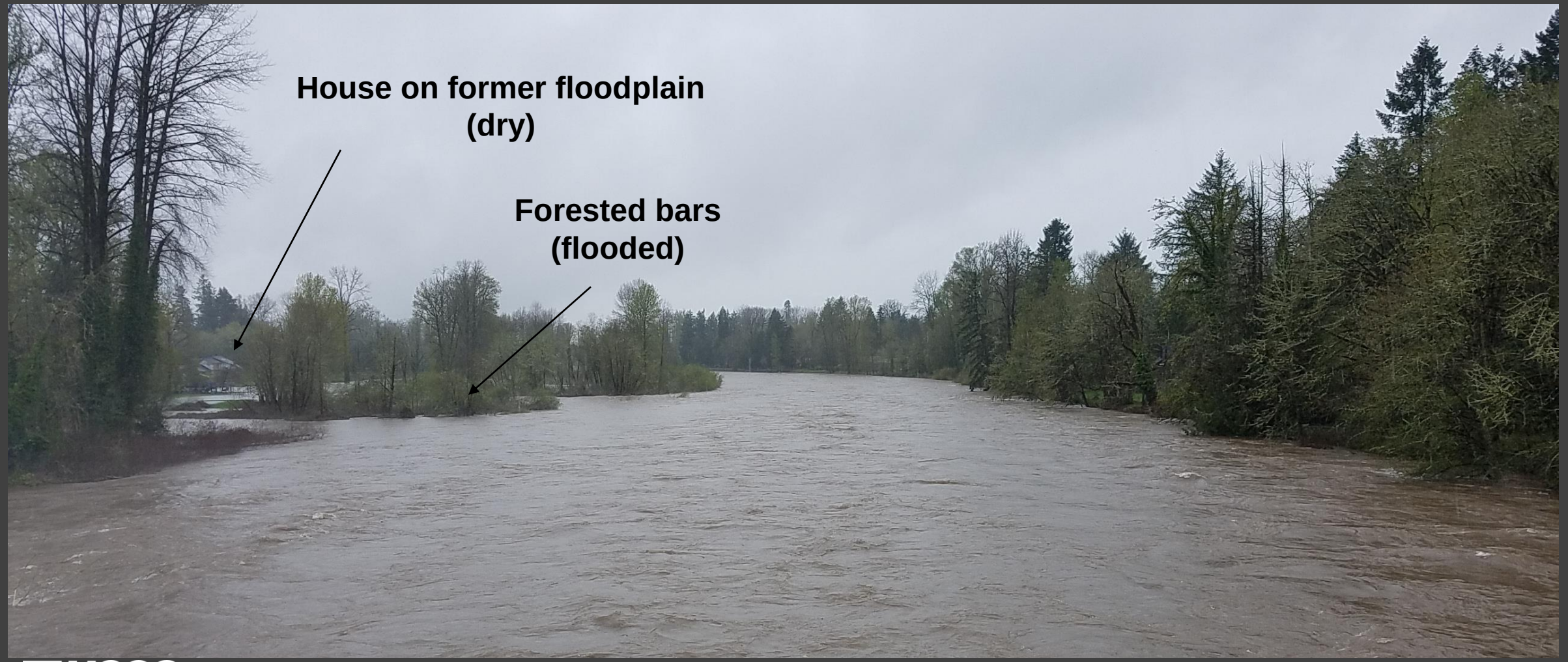
Forested Bars and (dry) Historical Floodplains are Present on all Regulated Rivers of Willamette Valley



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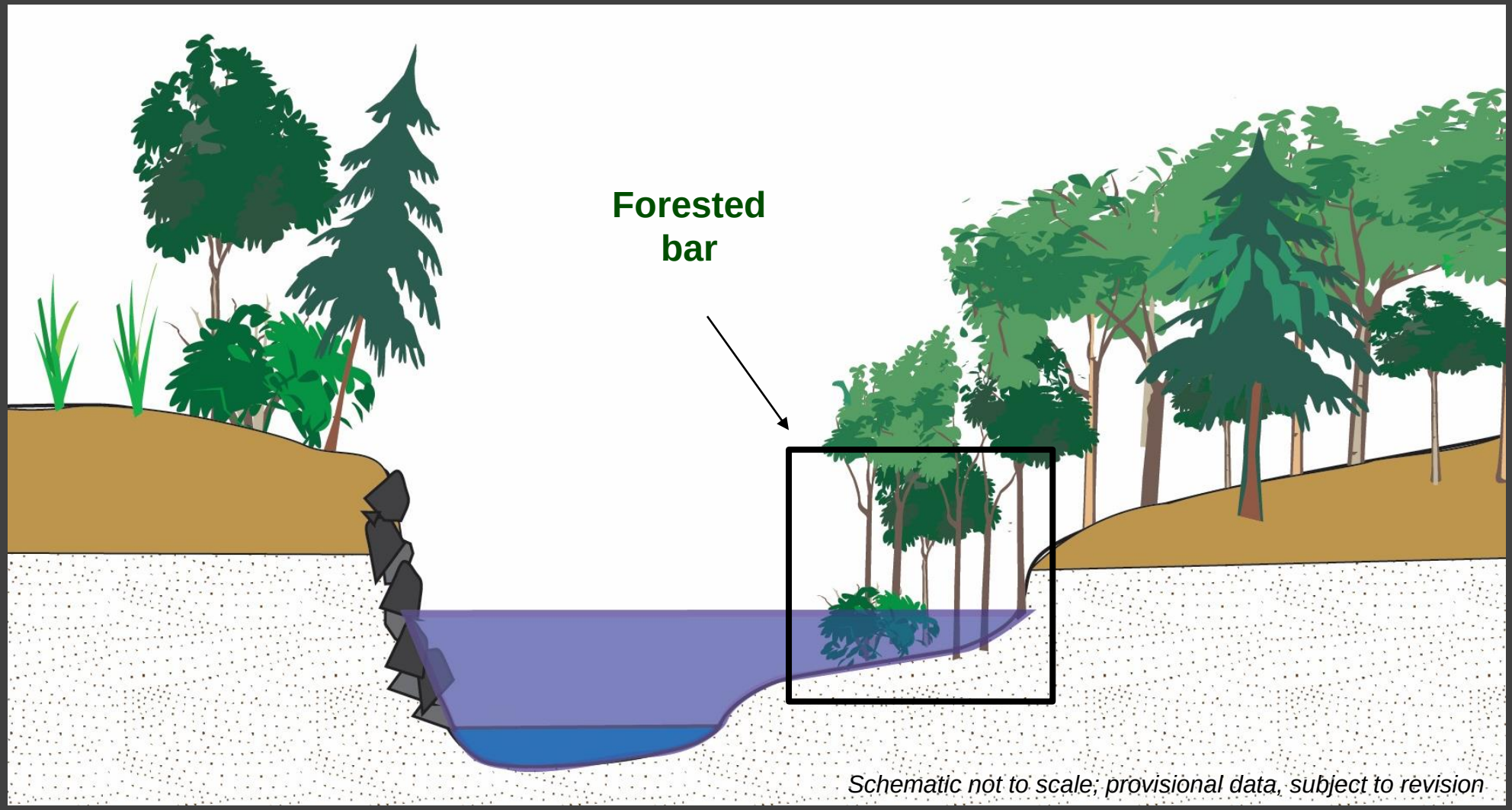
McKenzie River, April 8, 2019 Hendricks Bridge

Forested Bars:

Transitional geomorphic feature between low-flow channel and floodplain.
Forested bars were part of the historical forest mosaic, but today are a prominent feature reflecting river regulation



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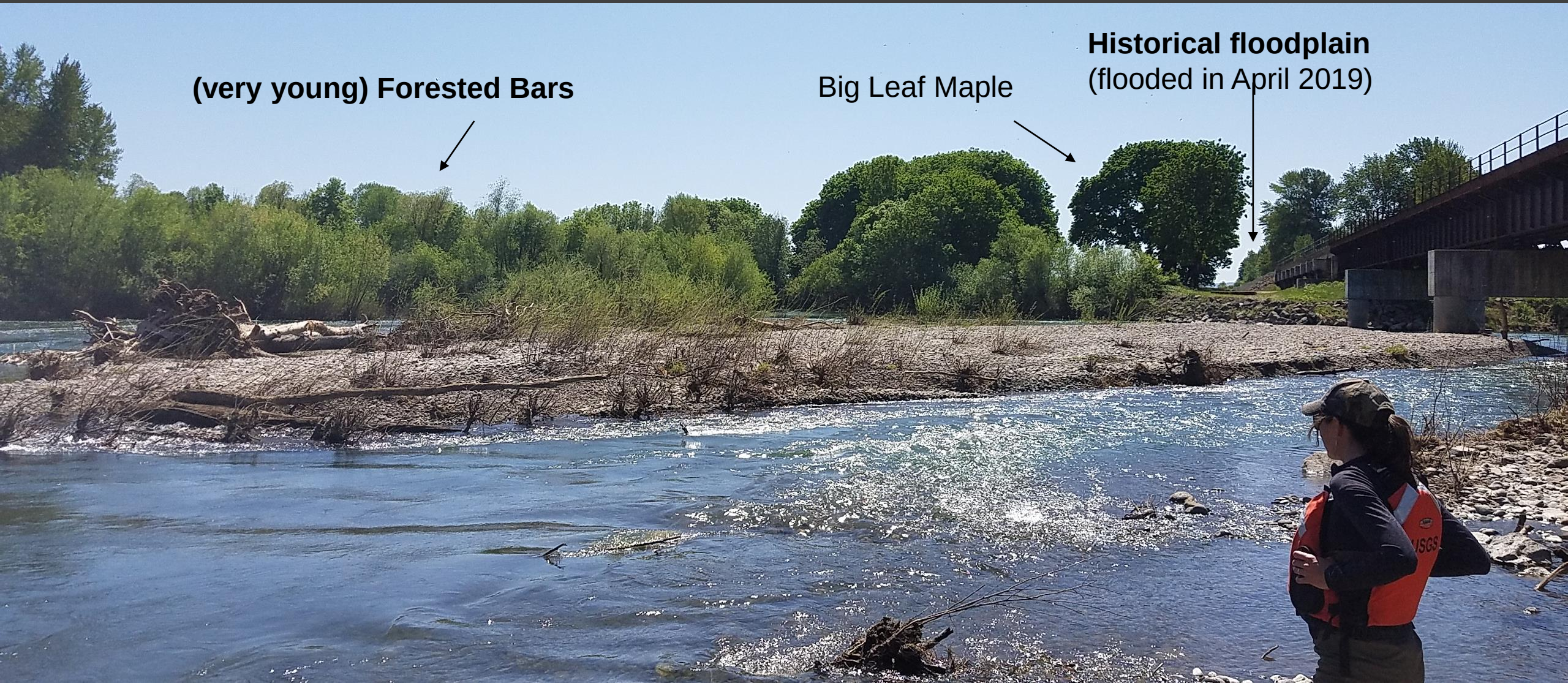
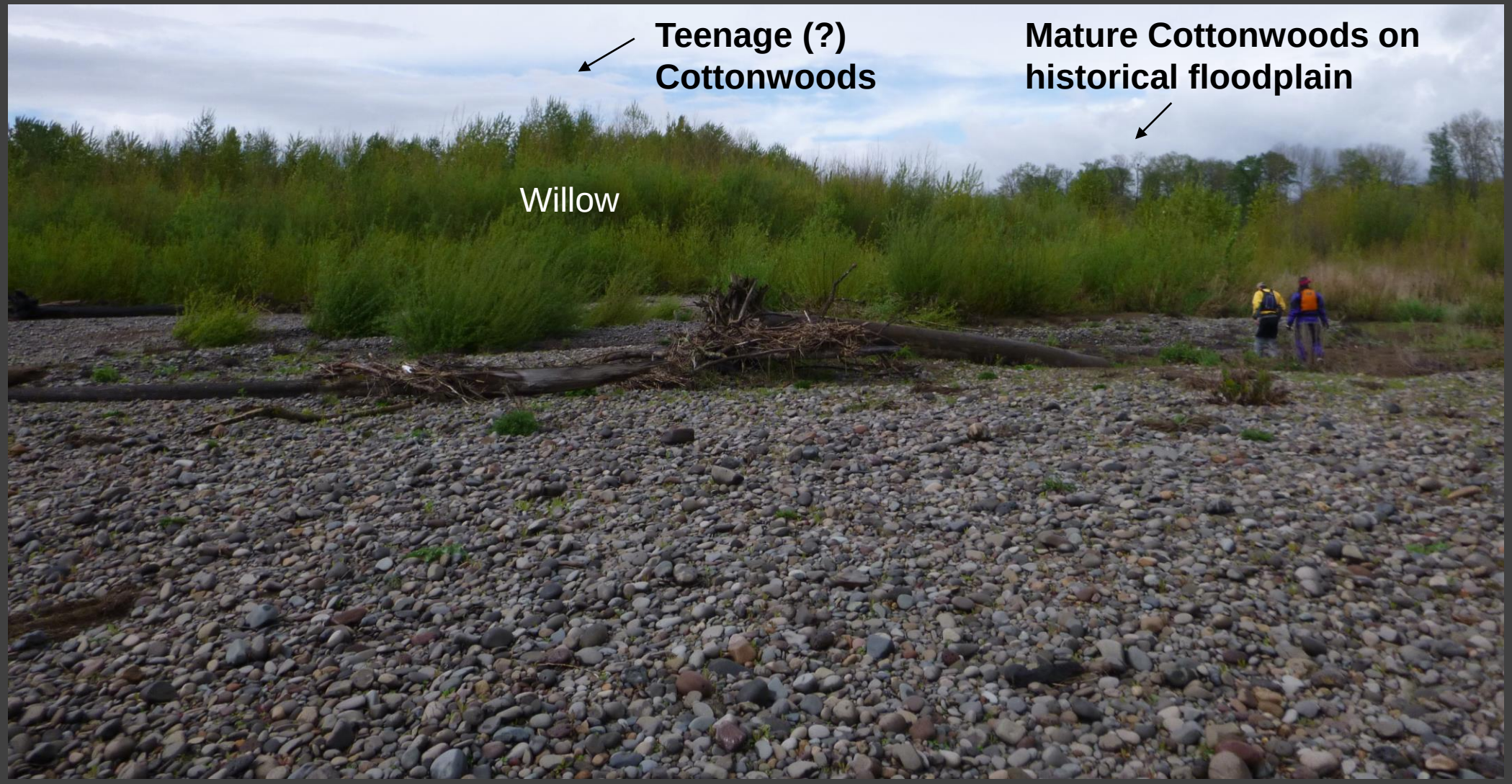
Forested Bars are Transitional Features between Floodplain and Channel

Example of forested bars from Harrisburg Railroad Bridge, Upper Willamette River



Forested Bars Support Varying Stages of Vegetation

Example of stand diversity across forested bars



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Photograph by JoJo Mangano, USGS

Fine sediment from April 2019 flooding

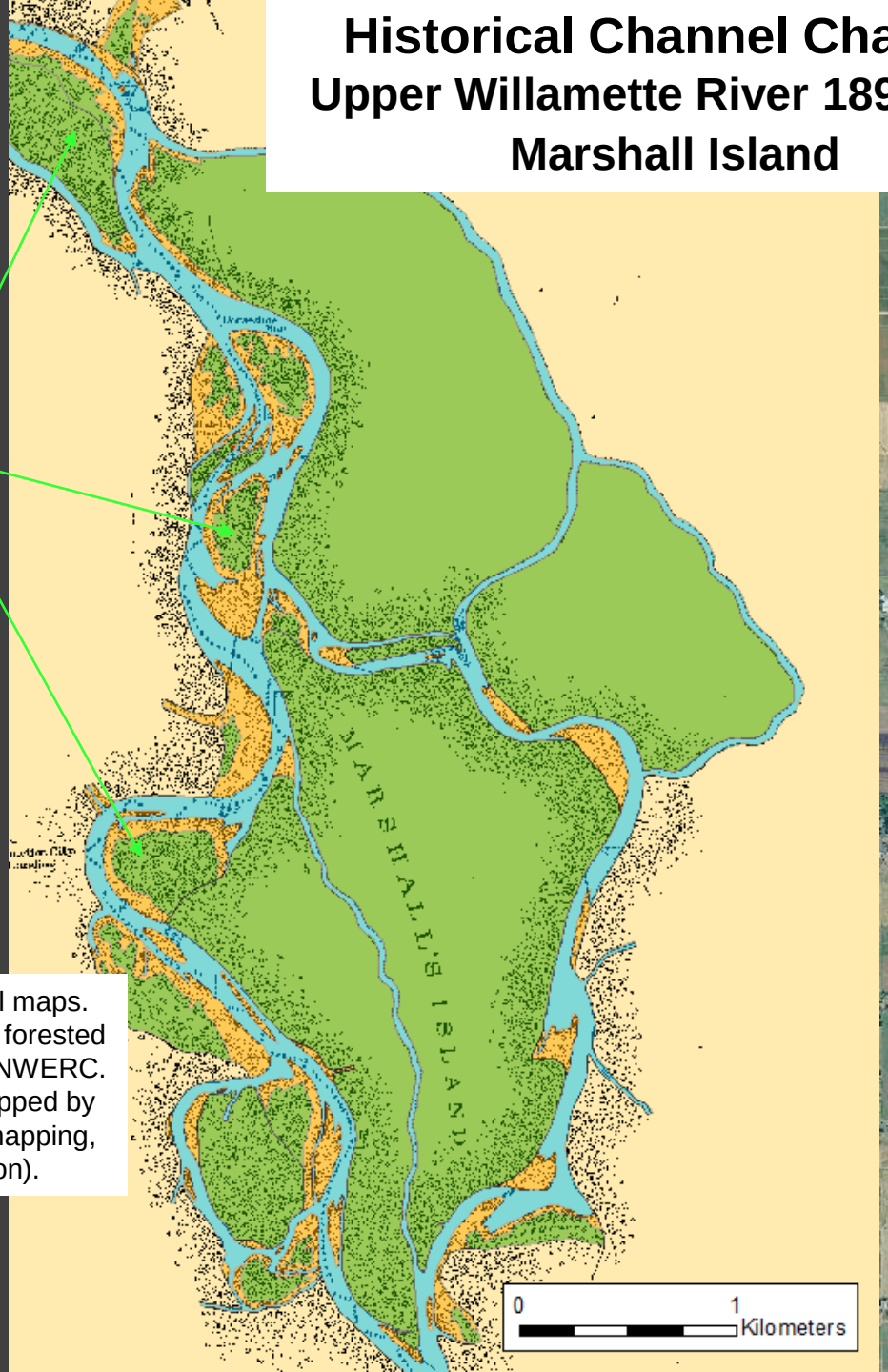
In Response to Frequent Flooding, Forested Bars Experience:

- Gravel Scour
- Gravel Deposition
- Fine Sediment Deposition

Upper Willamette between McKenzie confluence and Marshall Island April 21, 2019

Historical Channel Change:
Upper Willamette River 1895-2016
Marshall Island

Historically, forested bars were part of complex vegetation mosaic



1895

USACE navigational maps. Wetted channels and forested islands mapped by PNWERC. Bare gravel bars mapped by USGS (provisional mapping, subject to revision).

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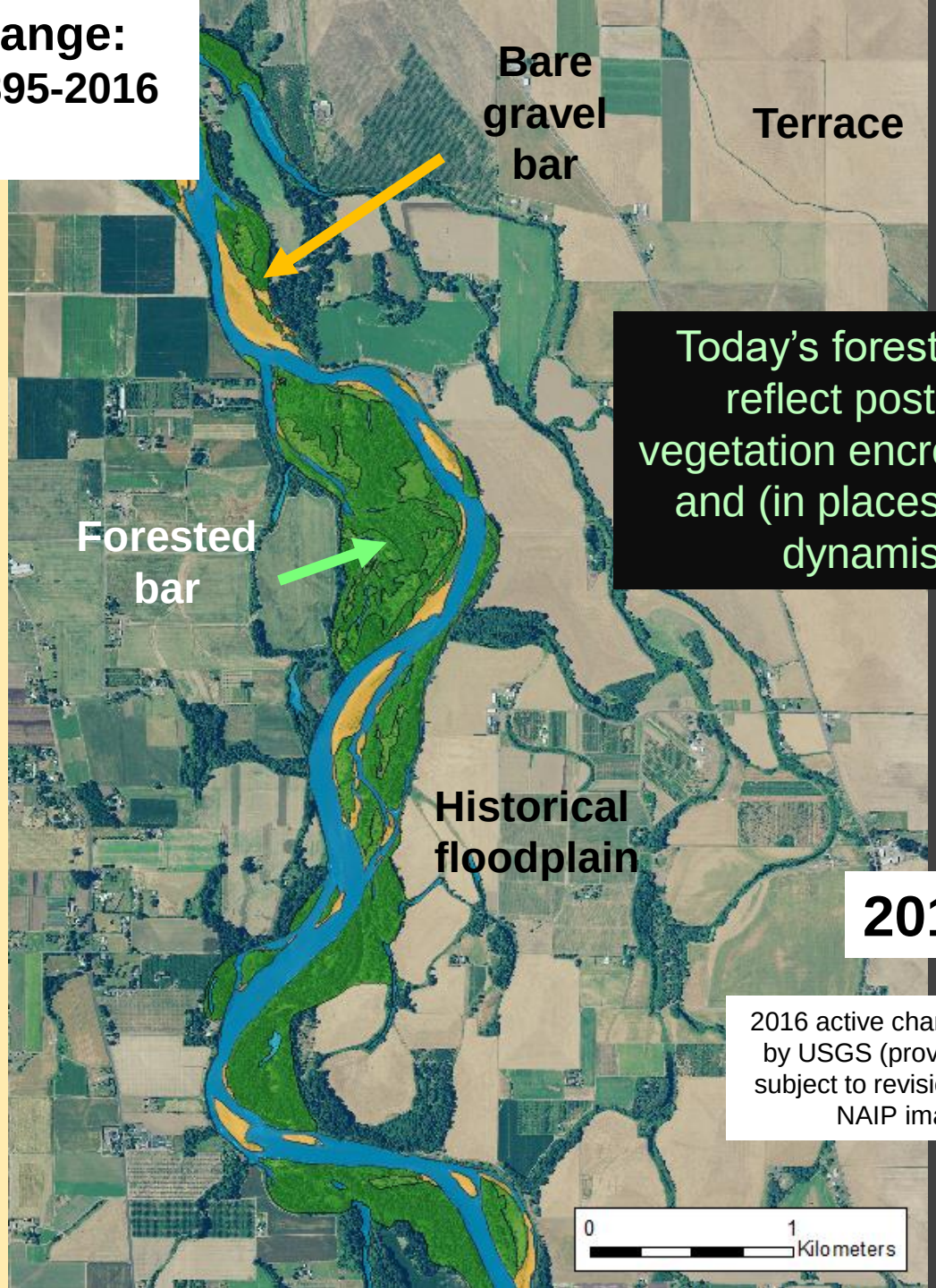


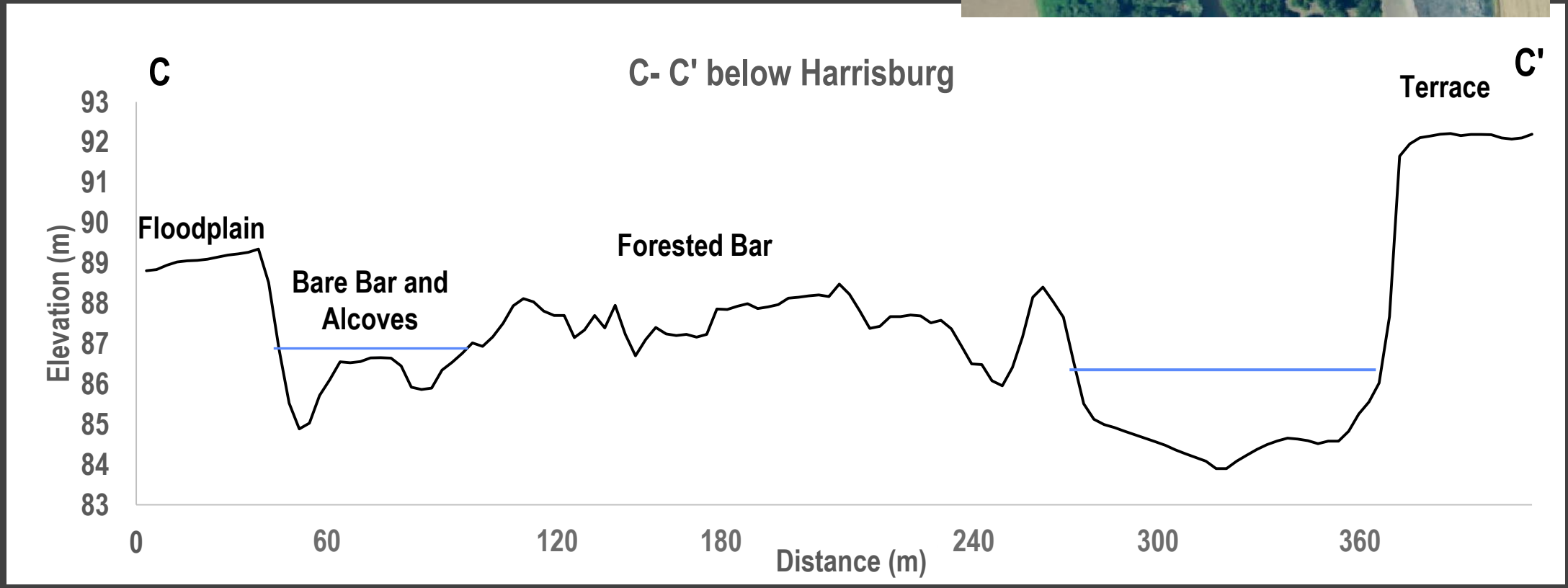
Today's forested bars reflect post-dam vegetation encroachment and (in places) lateral dynamism

2016

2016 active channel mapping by USGS (provisional data, subject to revision) based on NAIP imagery.

Topography of Forested Bars and Floodplains Reflect Geomorphic Processes

Floodplain transect from 1km downstream of Harrisburg



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Developed by Gabriel Gordon, USGS. Elevations from 2017 topo-bathy lidar (QSI, 2018) and USGS sonar (White and others, 2019)

Historical Channel Change: Middle Willamette River 1895-2016

Windsor Island, near Salem

On Middle Willamette, today's forested bars mostly reflect post-dam vegetation encroachment

1895

USACE navigational maps. Wetted channels and forested islands mapped by PNWERC. Bare gravel bars mapped by USGS (provisional mapping, subject to revision)

2016

2016 active channel mapping by USGS (provisional data, subject to revision) based on NAIP imagery.

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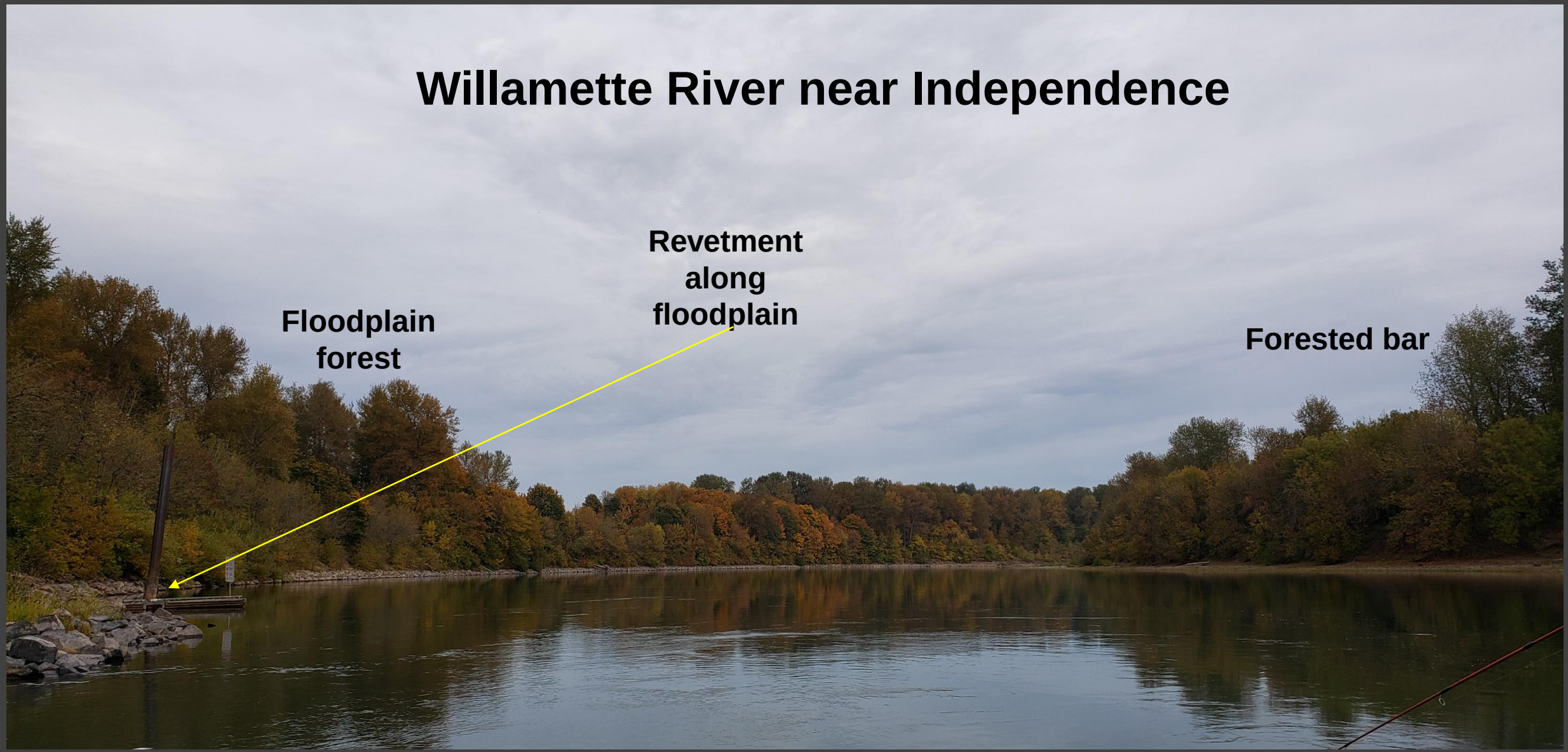
Willamette River near Independence



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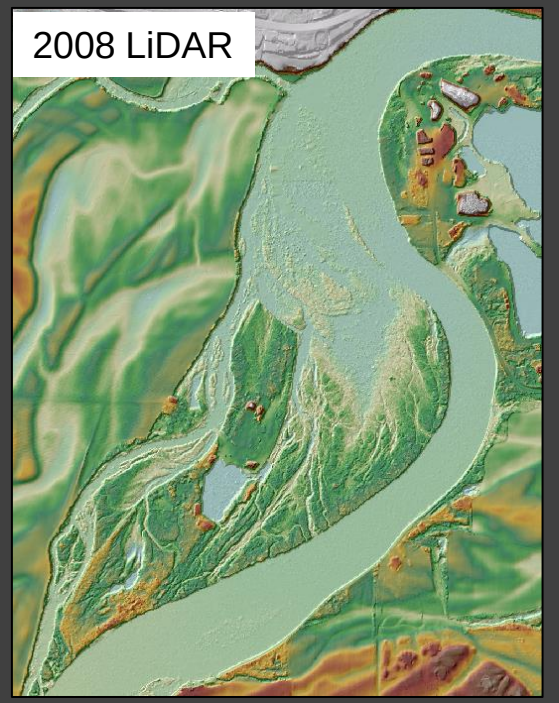
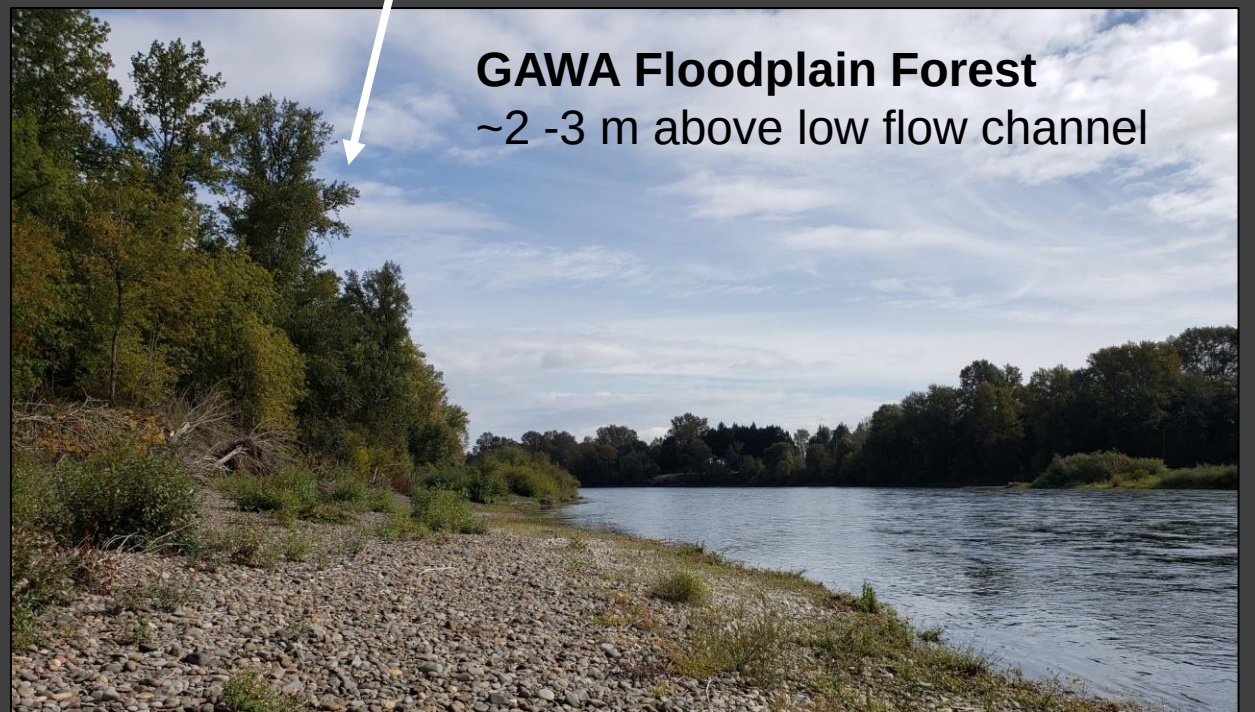
Middle Willamette River

Gail Achterman Wildlife Area near Salem





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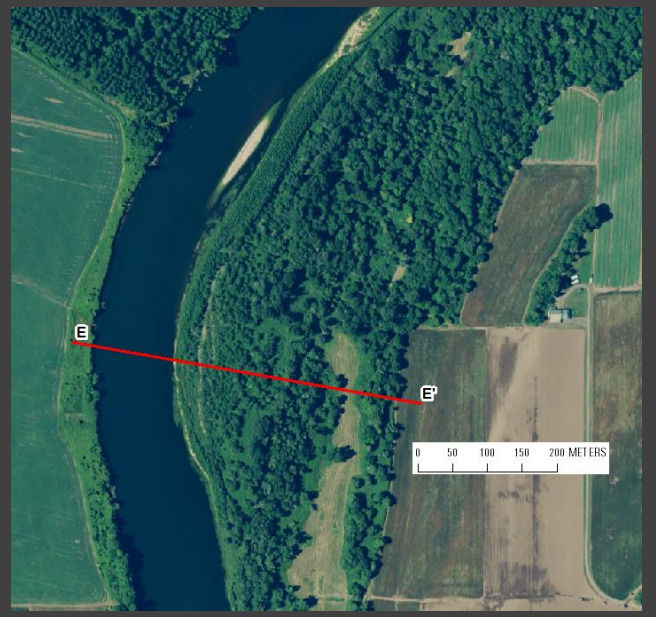
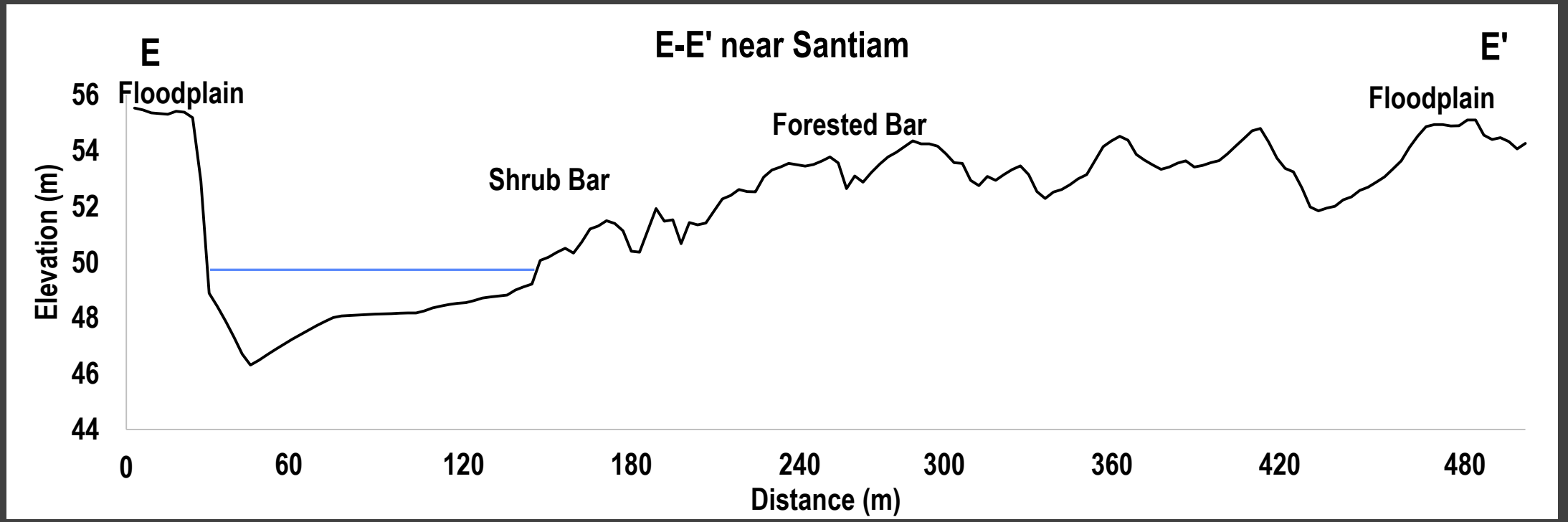
Topography of Forested Bars and Floodplains Reflect Geomorphic Processes

Floodplain transect from 4km upstream of Santiam Confluence





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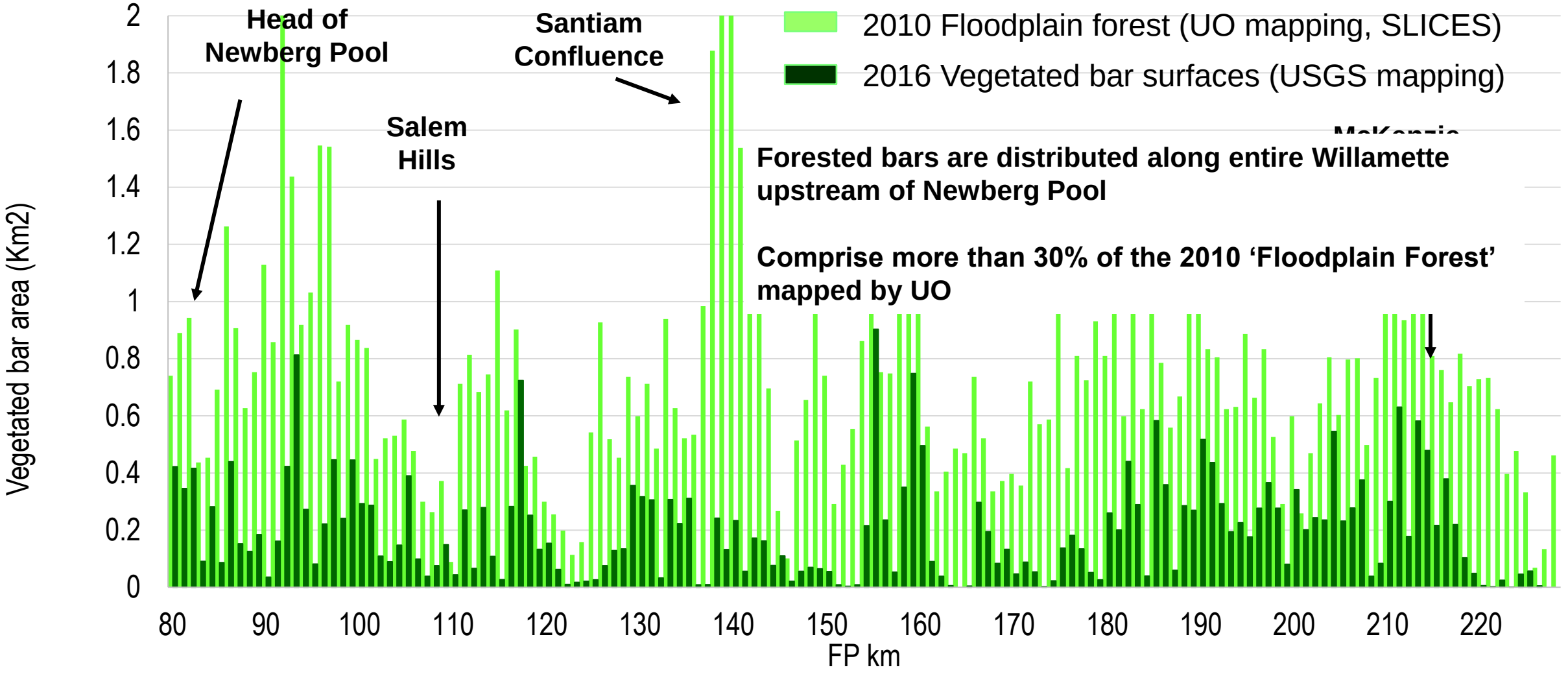
Developed by Gabriel Gordon, USGS. Elevations from 2017 topo-bathy lidar (QSI, 2018) and USGS sonar (White and others, 2019)

Distribution of Forested Bars on Willamette River



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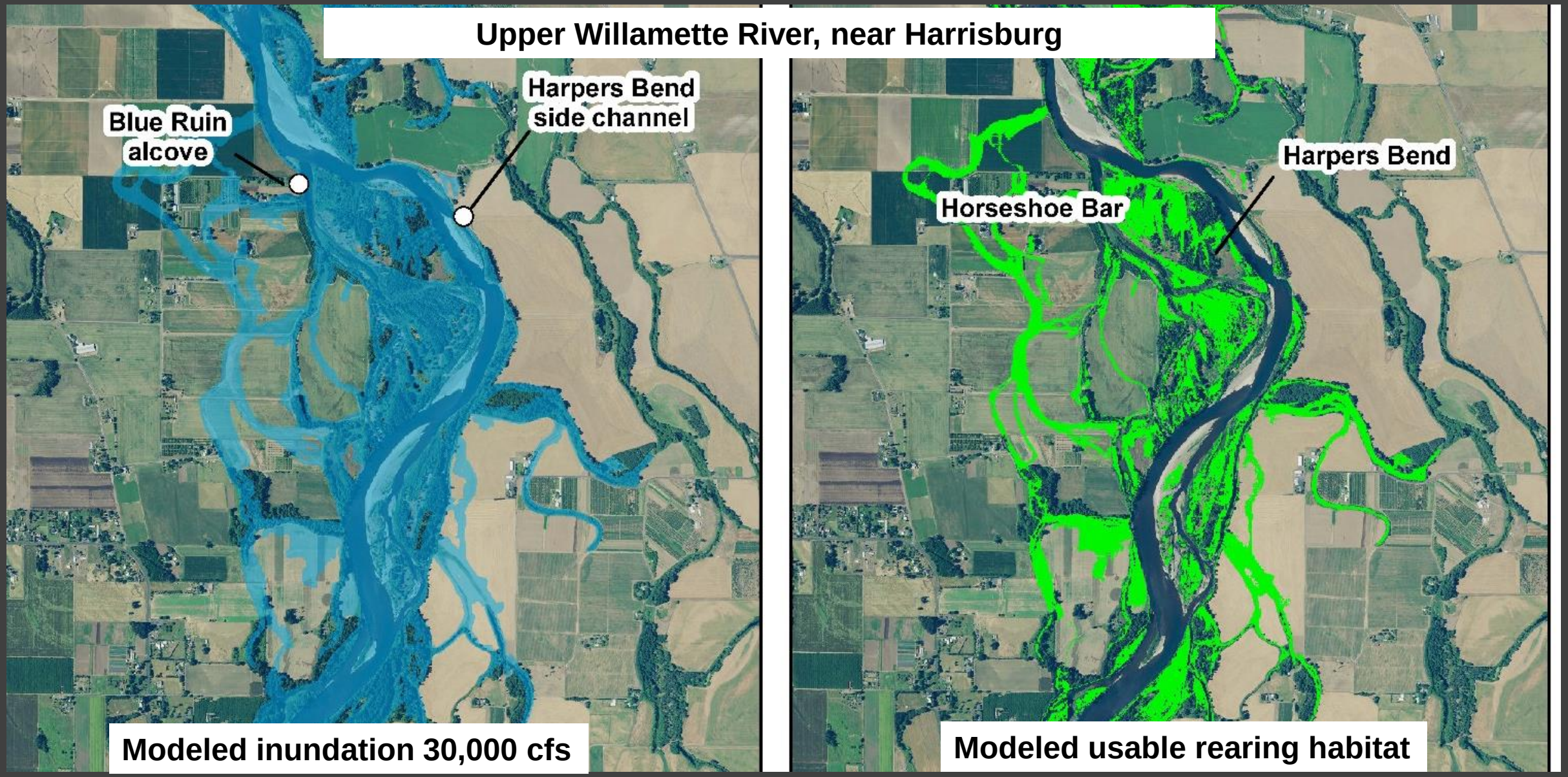
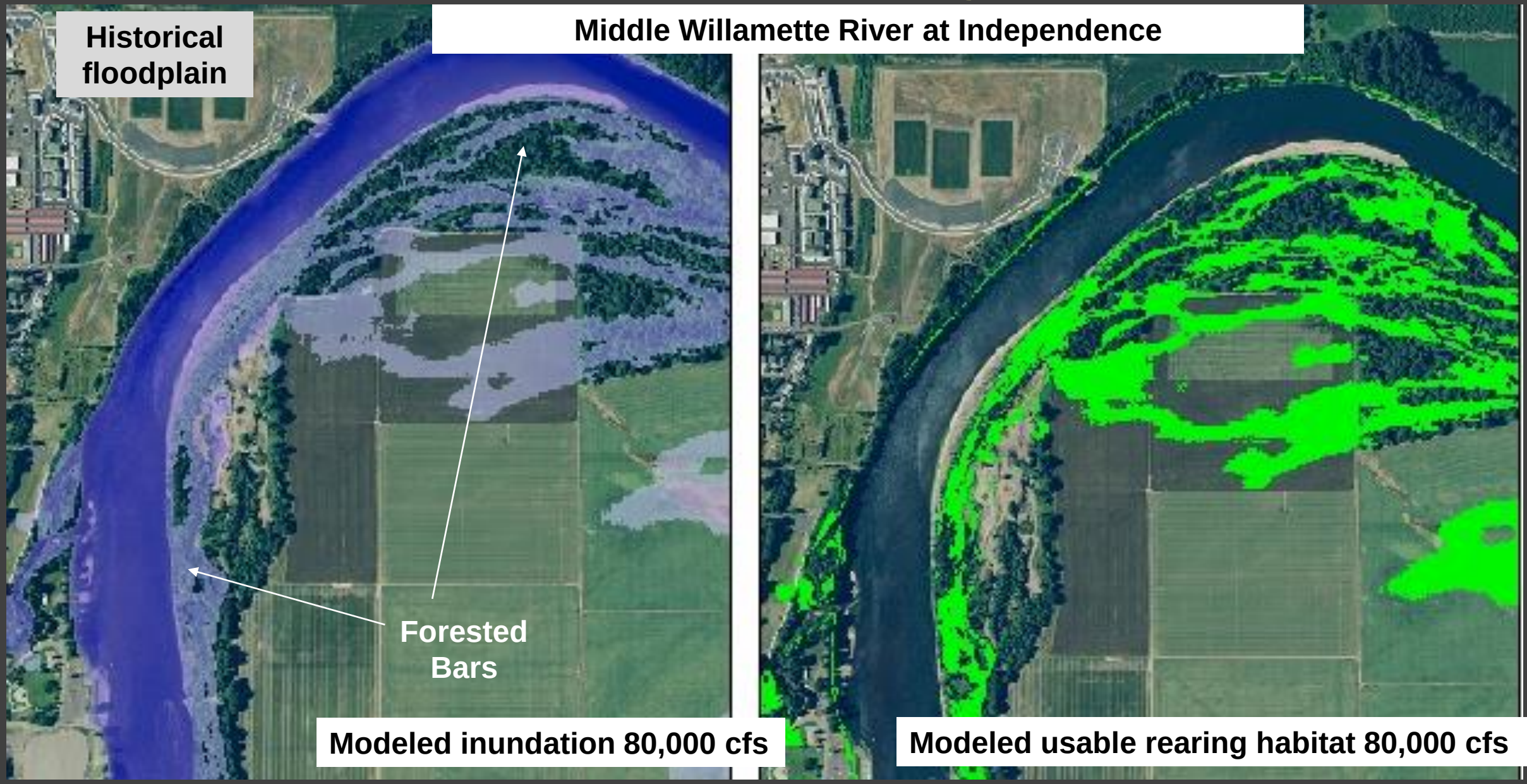
Provisional USGS mapping and analyses by Gabriel Gordon, subject to revision
SLICES data available at: https://oregonexplorer.info/slices

Inundation and Habitat Availability on Forested Bars



Preliminary modeling by James White, subject to revision. Habitat criteria developed by James Peterson, (USGS) Jessica Pease, Tyrell Deweber (OSU)

Inundation and Habitat Availability on Forested Bars



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Summary

Floodplains: *planar surfaces evolving by occasional fine sediment deposition*

- Present-day (post-dam) floodplain mainly consists of low-elevation historical floodplains and former bars with substantial post-dam sedimentation
- Historical floodplain is predominantly in agriculture and other landuses; seldom flooded
- Forested areas of historical floodplain includes riparian channel margins, remnant stands and forested bars

Forested bars: *gravel bars with thin mantle of fine sediment and young forest*

- Transitional surface between historical floodplain and low-flow channel
- Frequently inundated
- Bisected by channels with gravel deposition, scour, and fine sediment deposition
- In some non-revetted areas, forested bars contribute to channel stability
- Potentially more stand diversity on Upper Willamette than Middle Willamette

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Questions?

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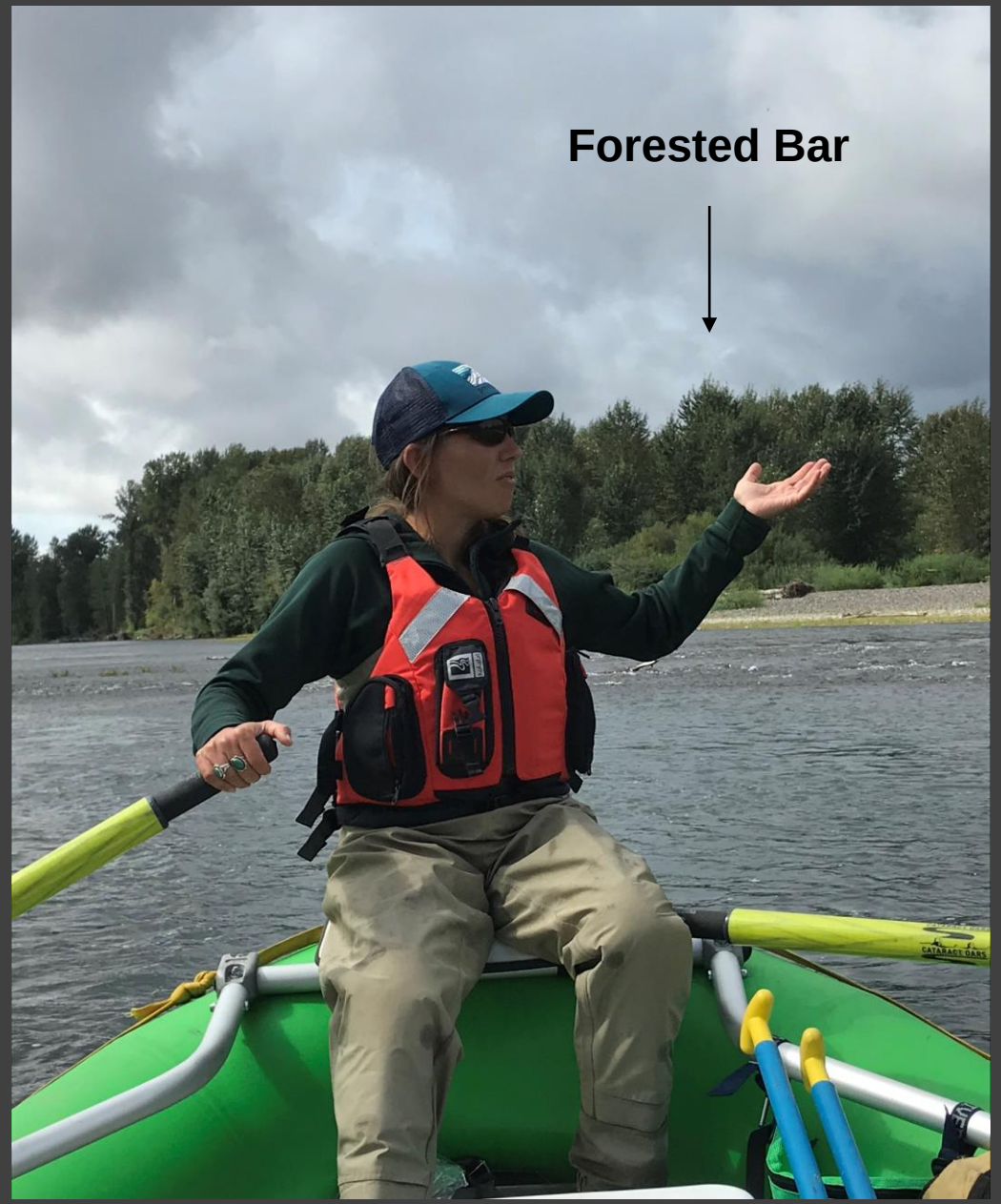

Photo courtesy of Matt Blakely Smith, GLT, 2019

Extra slides with photos

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Middle Willamette River at Independence

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McKenzie River

Bellinger to Hayden Bridge

USGS

McKenzie River between Belinger to Hayden Bridge April 28, 2019

Flooding on (present-day) Floodplains and Forested Bars

Example of flooding on low-elevation floodplain surfaces and forested bars at McCartney Park, Upper Willamette

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