

DRAFT NEXT STEP ACTION ITEMS

(Following 8-03-2018 Workshop #1)

Early Action Design Restoration Reaches/Process

1. Scott Boettcher:

- a. (Very Important) Set follow-up meetings with Thurston County, Lewis County, and Grays Harbor County to discuss county no rise policies and regulations, CRS, BAs (biological assessments/BEs (biological evaluations), and implications for the Early Action Design Restoration process. Will also need to coordinate with FEMA.
- b. Define preferred communication pathways between Design Consultants and Regulatory Agencies. Document in matrix showing preferred contacts by reach.
- c. Coordinate a technical sharing/exchange session involving Design Consultants and Regulatory Agencies to identify and discuss key technical considerations associated with submitting JARPA, efficiently and accurately characterizing and delineating wetlands, collecting and documenting baseline information, establishing preferred timing for application submittals, utilizing programmatic or streamlined permitting instruments/approaches, identifying critical thresholds and jurisdictional considerations (e.g., tidally-influenced or not, minimum shoreline CFS or not, navigable or not, etc.), etc..
- d. Set Workshop #2 (9-17-2018).
- e. Coordinate with DNR, DAHP, USFWS, and NMFS as potentially additional interested parties.

2. Chrissy Bailey and Scott Boettcher:

- a. Set-up an Ecology SharePoint site for each of the Early Action Design Restoration Reaches and notify meeting participants and invitees.

3. Design Consultants (John, John, and Merri):

- a. Compile maps, pictures, drone, time-series, etc. for posting to the Ecology SharePoint site.
- b. Compile reports, documentation, reference material, etc. showing the efficacy and results of key project elements likely to be used in each of the reaches for posting to the Ecology SharePoint site.

4. Regulatory Agencies:

- a. For the key project elements likely to be used in each of the reaches, compile examples of JARPAs, drawings, permits, etc. that would serve as good models for the Design Consultants. Note – See Wynoochee and Satsop River Sub-Basins (attached) for project elements likely to be used in each of the reaches.
- b. Identifying potential permit streamlining approaches including:
 - WDFW Fish Habitat Enhancement Projects process --
https://www.epermitting.wa.gov/Portals/_JarpaResourceCenter/VersionedDocuments/JARPA_Documents/JARPA%20Supplement%20Fish%20Enhancement%202014.pdf

- Corps Nationwide Permits process (NWP 27) – <http://www.nws.usace.army.mil/Missions/Civil-Works/Regulatory/Permit-Guidebook/NWPs/>

5. **Tim Kramer, Maggie McKeown, Emelie McKain, Chrissy Bailey (and Scott Boettcher):**

- a. Work with the Office of Chehalis Basin and Ecology to determine who is the applicant for any or all of the early action design reach projects.
- b. Work with the Office of Chehalis Basin and Ecology to determine who is the SEPA lead agency and how is SEPA most efficiently done for any or all of the early action design reach projects.

6. **Also:**

- a. Here is link to the Capitol Land Trust Program Michelle Cramer mentioned <https://secure.rco.wa.gov/prism/search/projectsnapshot.aspx?ProjectNumber=17-1125>.
- b. Also from Michelle Cramer: "The SRFB conditioned this project to use spatial layers in their model with layers from the ASRP....all in an effort to encourage collaboration with the ASRP steering committee." See SRFB document here <https://secure.rco.wa.gov/prism/search/ProjectSnapshotAttachmentData.aspx?id=321773>

7. **Attachments:**

- a. 8-03-2018 Workshop #1 Agenda (page 3).
- b. Attendees to Workshop #1 (page 4).
- c. Presentation 1 – Wynoochee and Satsop River Sub-Basins (starting page 5).
- d. Presentation 2 – Newaukum and South Fork Chehalis Sub-Basins (starting page 22).

AGENDA

Early Action Design Restoration Reaches/Process

Workshop #1
August 3, 2018
(9 a.m. to 1:00 p.m.)

Location:

Washington State Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503
<https://goo.gl/maps/hbznVXtLbu62>
Conference Room 1S-16/17

Purpose:

1. To introduce permitting and regulatory agencies early-on to the early action reach restoration design process for the Chehalis Basin.
2. To engage the interests of meeting participants (permitting/regulatory agencies, restoration design sponsor and consultants) around effective and successful delivery of the early action reach restoration design process (and ultimately the projects).
3. To share insights, perspectives, best ideas, etc. among colleagues.

Topics:

- | | |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| 1. Purpose and Introductions | Scott Boettcher |
| 2. Workshop Overview | Scott Boettcher |
| 3. Background – ASRP, Early Action Design Reaches, Timeline, Setting the Stage | Maggie Mckeown |
| 4. Sub-Basins and Starter Reaches – Where are they, what are we finding, maps, pictures, video, etc. | Merri Martz
John Soden
John Gaffney |
| 5. Regulatory Agencies – Thoughts, reactions, perspectives. | Roundtable |
| 6. Summary and Next Steps: <ul style="list-style-type: none">• Workshop (#2) – September 17, 2018 | Scott Boettcher |

8/03/2018 Sign - In

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Wynoochee and Satsop Rivers Proposed Restoration Elements

Key Elements

- ▶ Land acquisition
- ▶ Conservation easements
- ▶ Relocation options to accommodate target land use outside of erosion and flood risk areas
- ▶ Provide land owners with land to offset recent losses to channel migration and avulsion



Satsop River (RM 8.5) 2017 aerial (Google Earth).

Key Elements

- ▶ Engineered Log Jams (ELJs) within Channel and Floodplain to Create:
 - ▶ Channel stability
 - ▶ Flow deflection
 - ▶ Pools
 - ▶ Stable forested islands
 - ▶ Side channels

- ▶ Excavated side channels
- ▶ Constructed floodplain wetlands
 - ▶ Immediate habitat benefits
 - ▶ Restored process will ultimately be modified by dynamic river processes.



Engineered log jam on the Elwha River viewing downstream. Photo taken ~2018 by T. Abbe

Key Elements

- ▶ Complex timber revetments to reduce channel migration rates.
- ▶ Array of ELJ flow deflectors.
- ▶ Flood fences/post arrays to trap debris and protect riparian revegetation.



Complex timber revetment on South Fork Nooksack. View is downstream. Photo taken ~2012 by T. Abbe



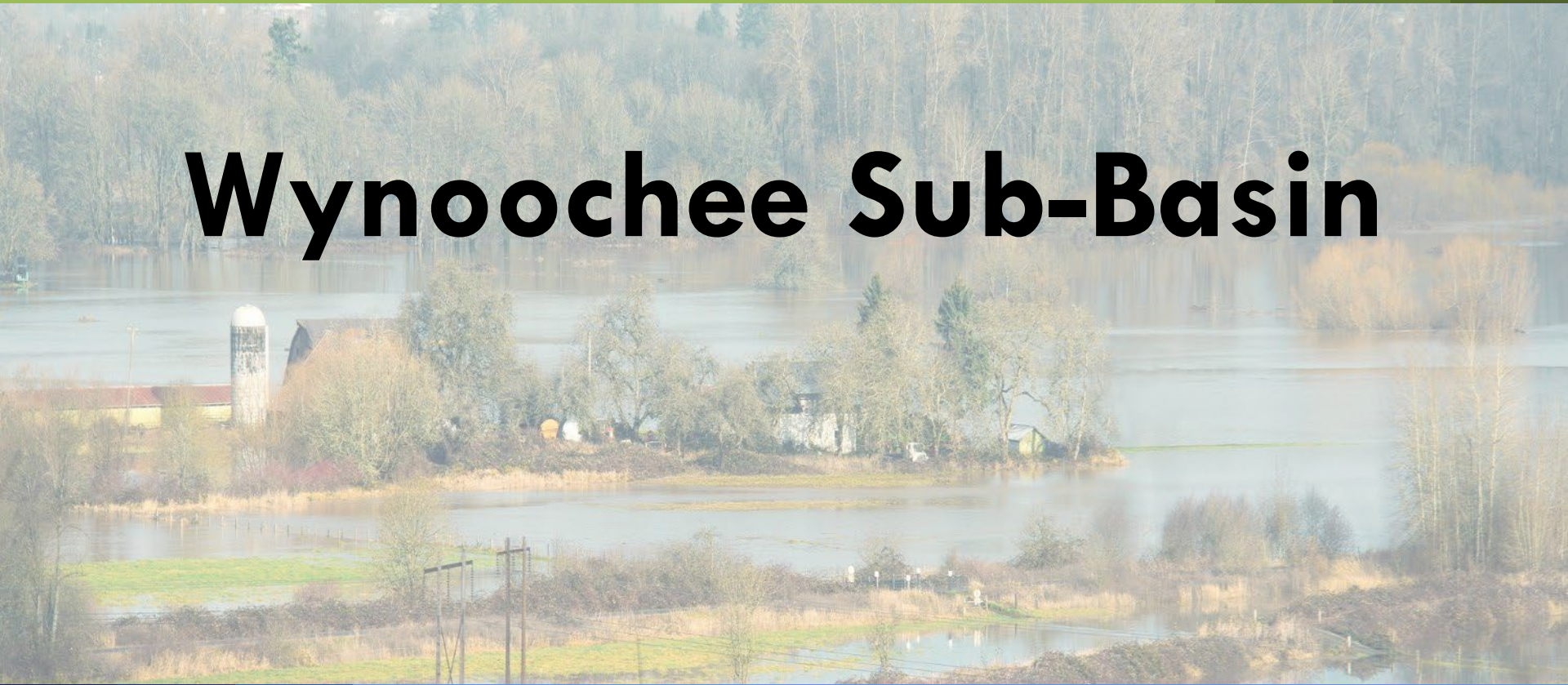
(8)
Flood fence revetment taken by Aldrich and DeVries 2017

Key Elements

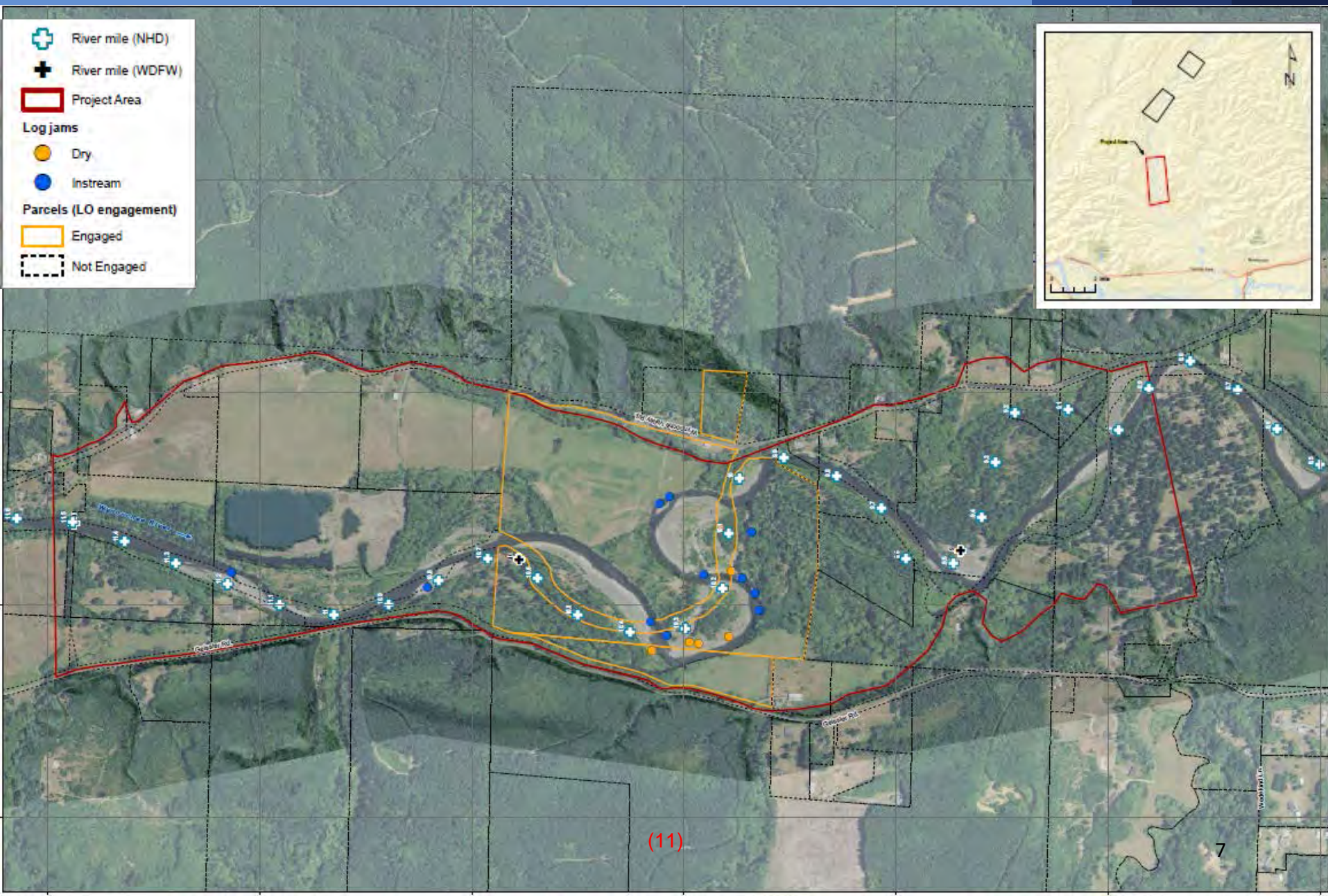
- ▶ Restart the large wood cycle through enhancing existing forests and planting new forests within the restoration corridor.
- ▶ Reduce channel migration rates.
- ▶ ELJs as hard points to allow forest maturation.
- ▶ Silviculture to accelerate growth of late seral trees (e.g., Western Red Cedar, Sitka Spruce, Doug Fir, Bigleaf Maple, Black Cottonwood)



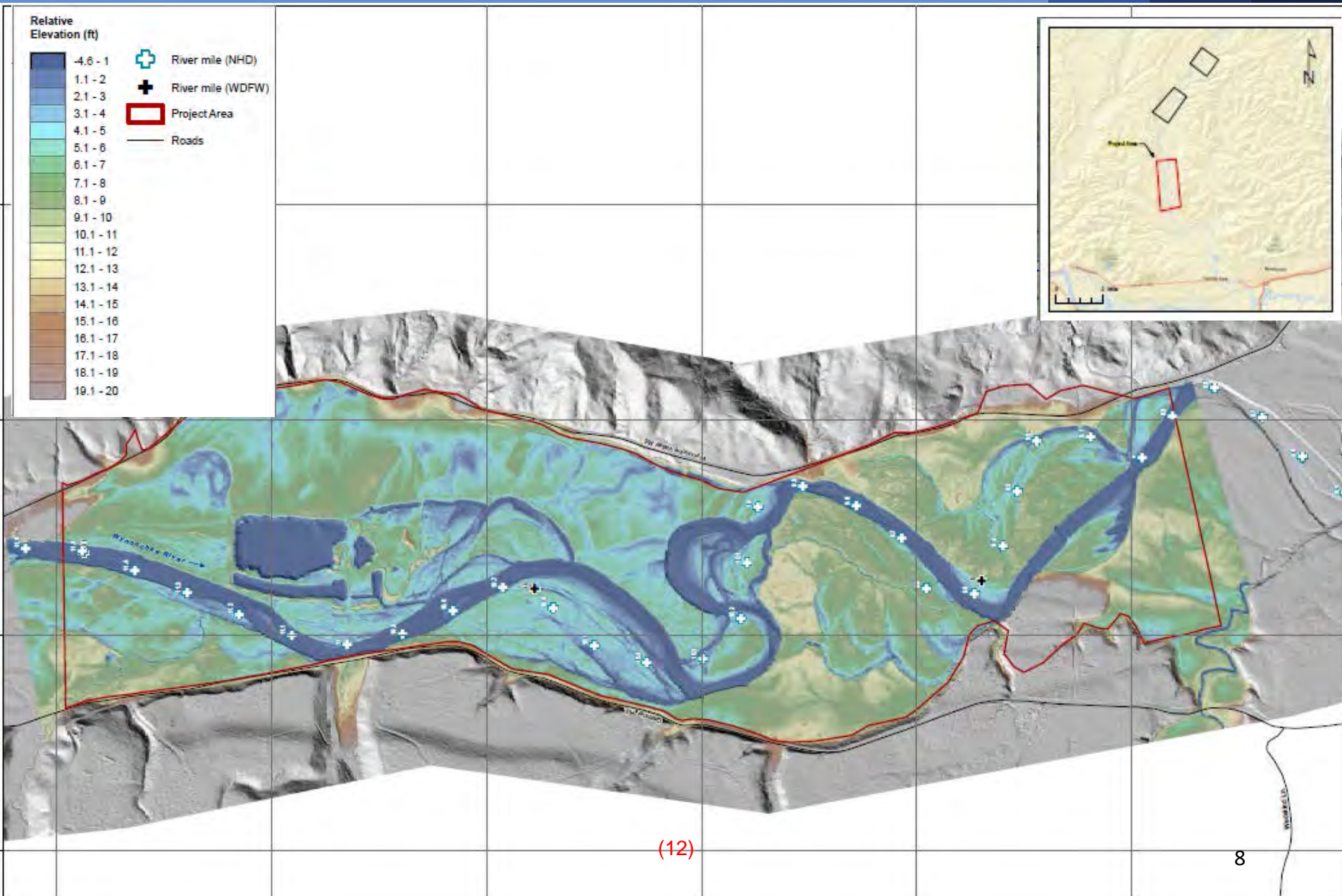
Wynoochee Sub-Basin



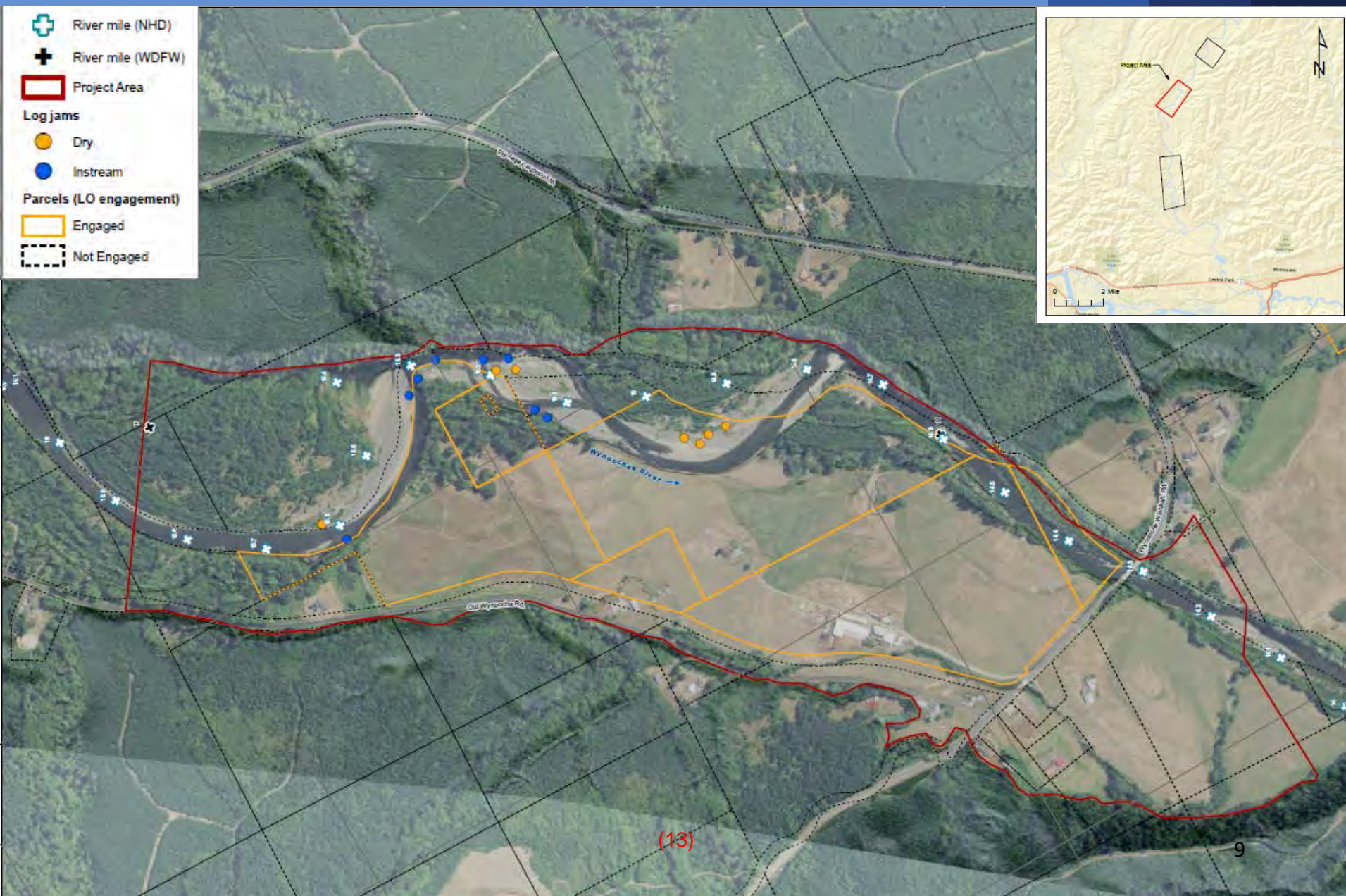
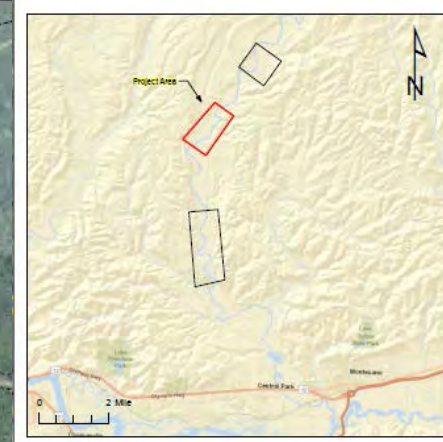
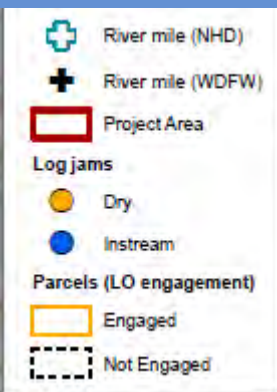
Wynoochee RM 8.5-11



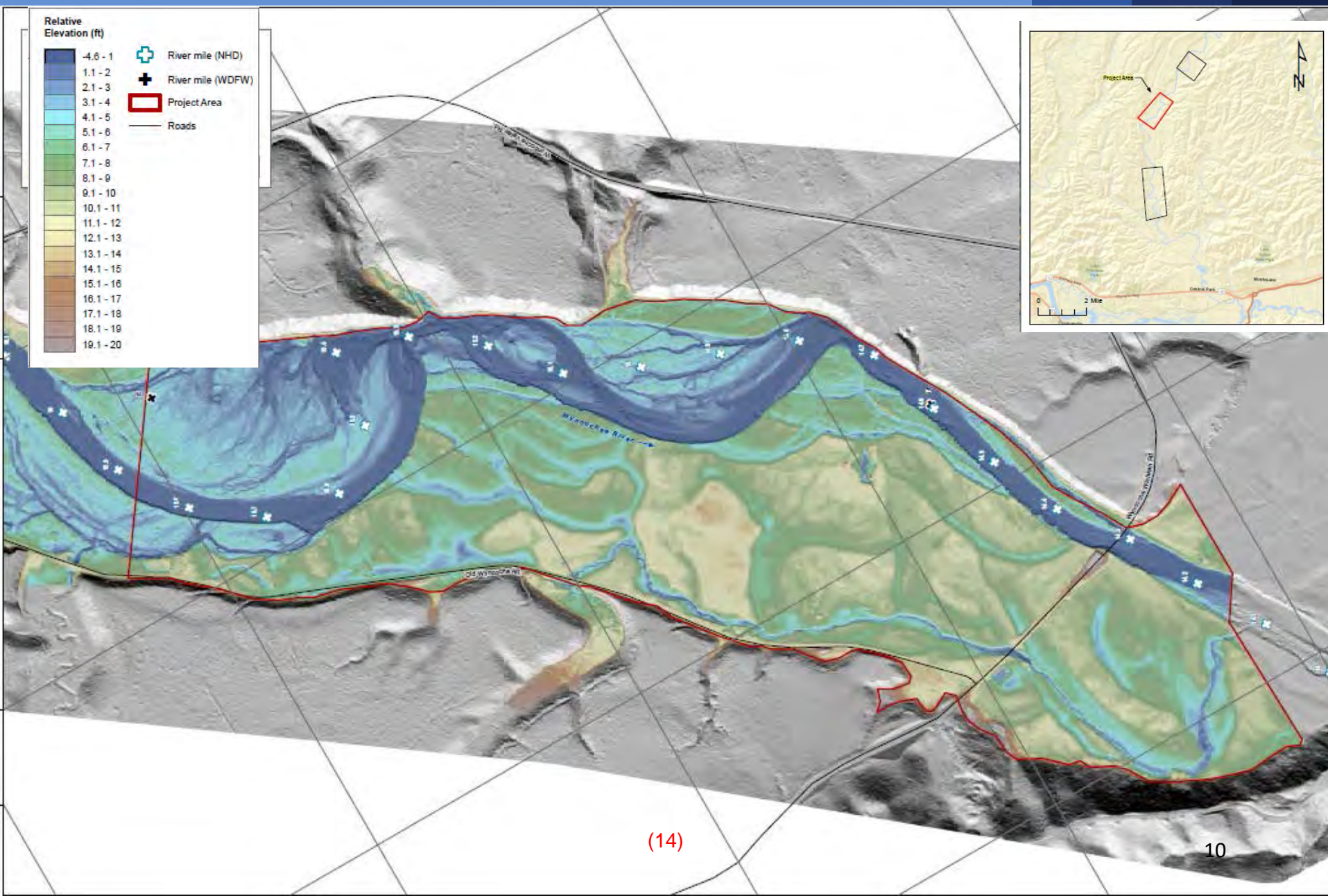
Wynoochee RM 8.5-11



Wynoochee RM 13.5 – 15.0



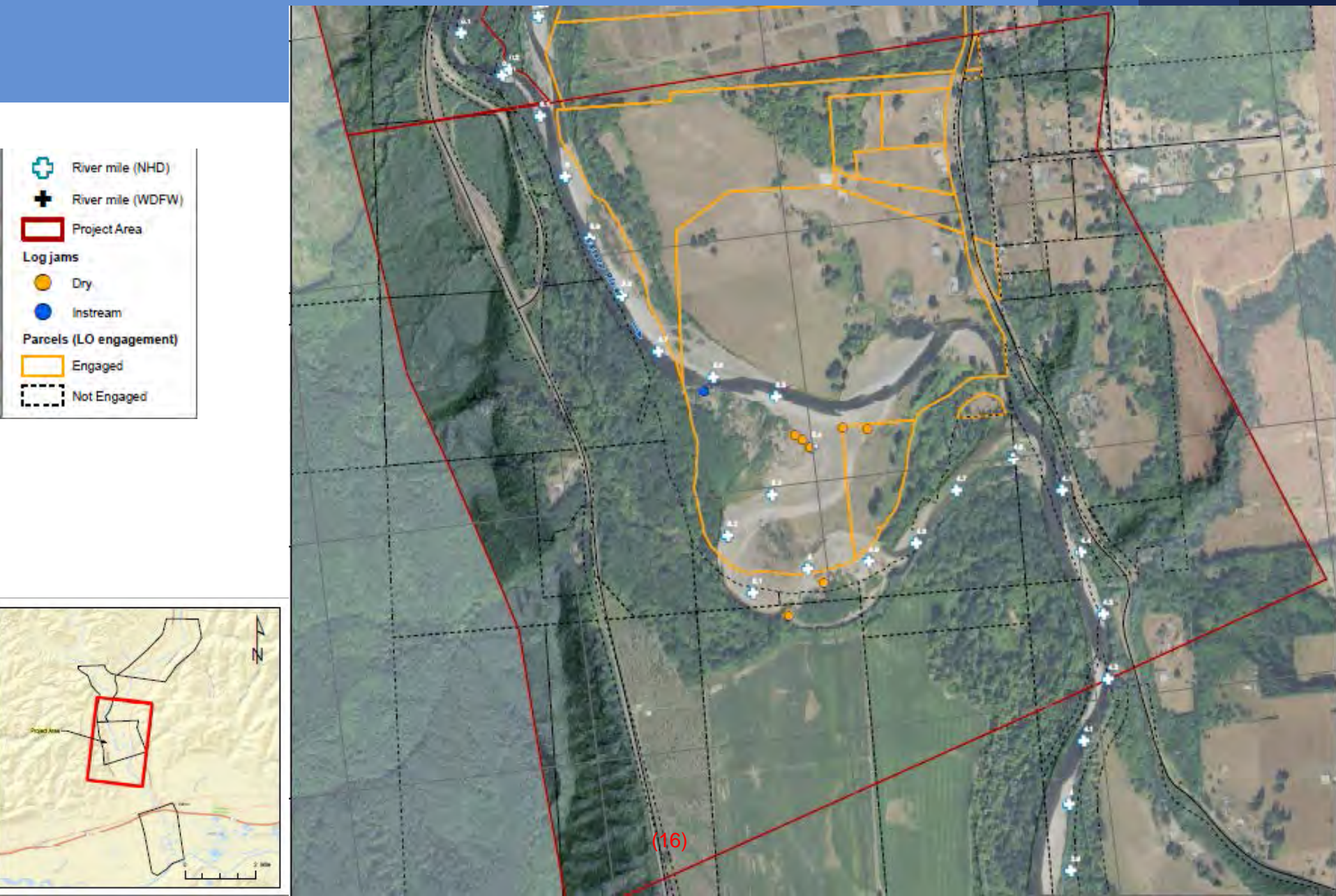
Wynoochee RM 13.5 – 15.0



Satsop Sub-Basin

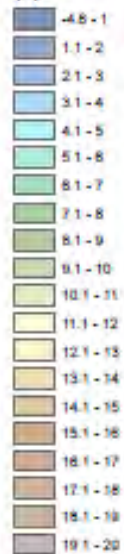


Satsop RM 4.5 – 6.5

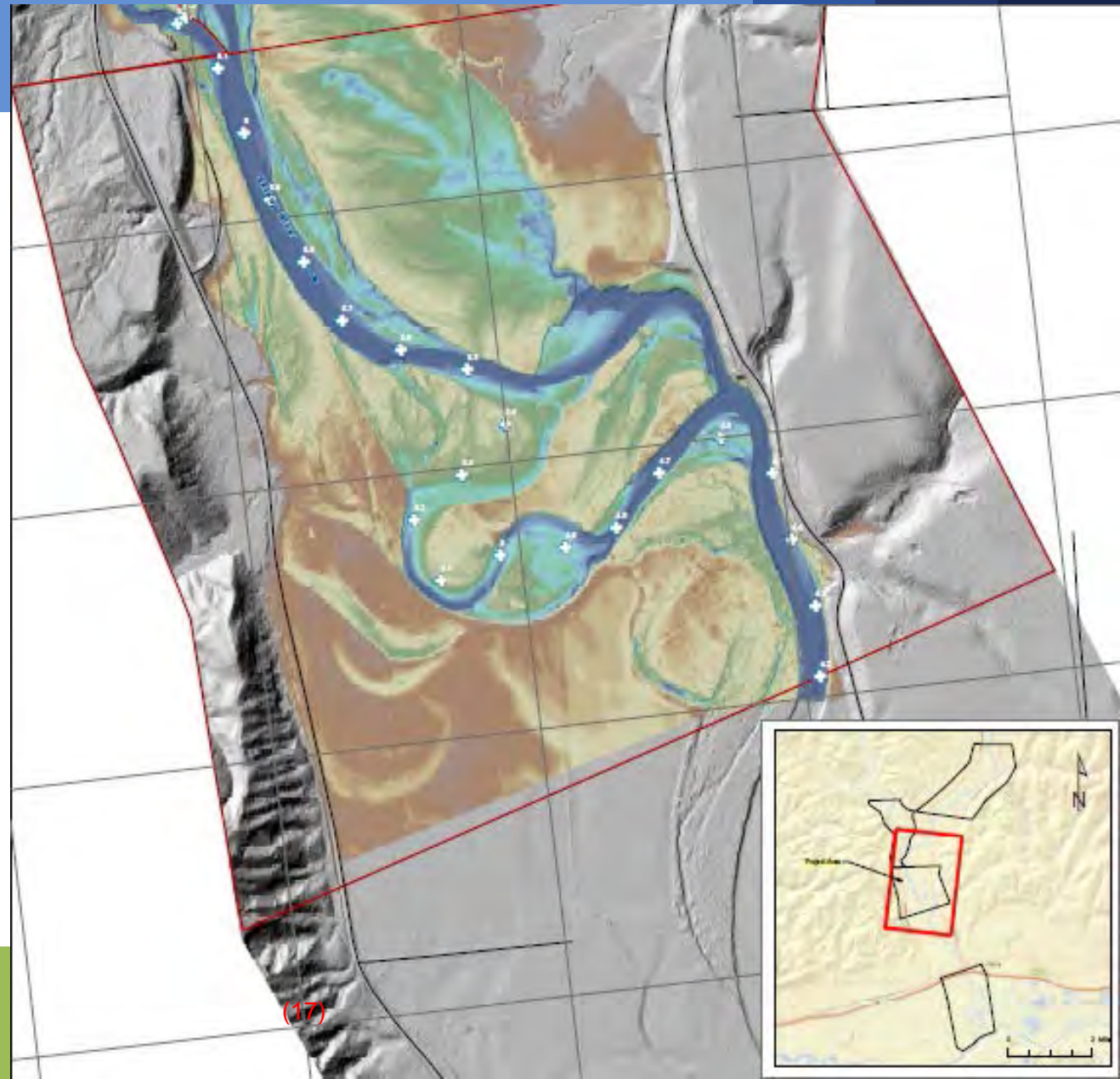


Satsop RM 4.5 – 6.5

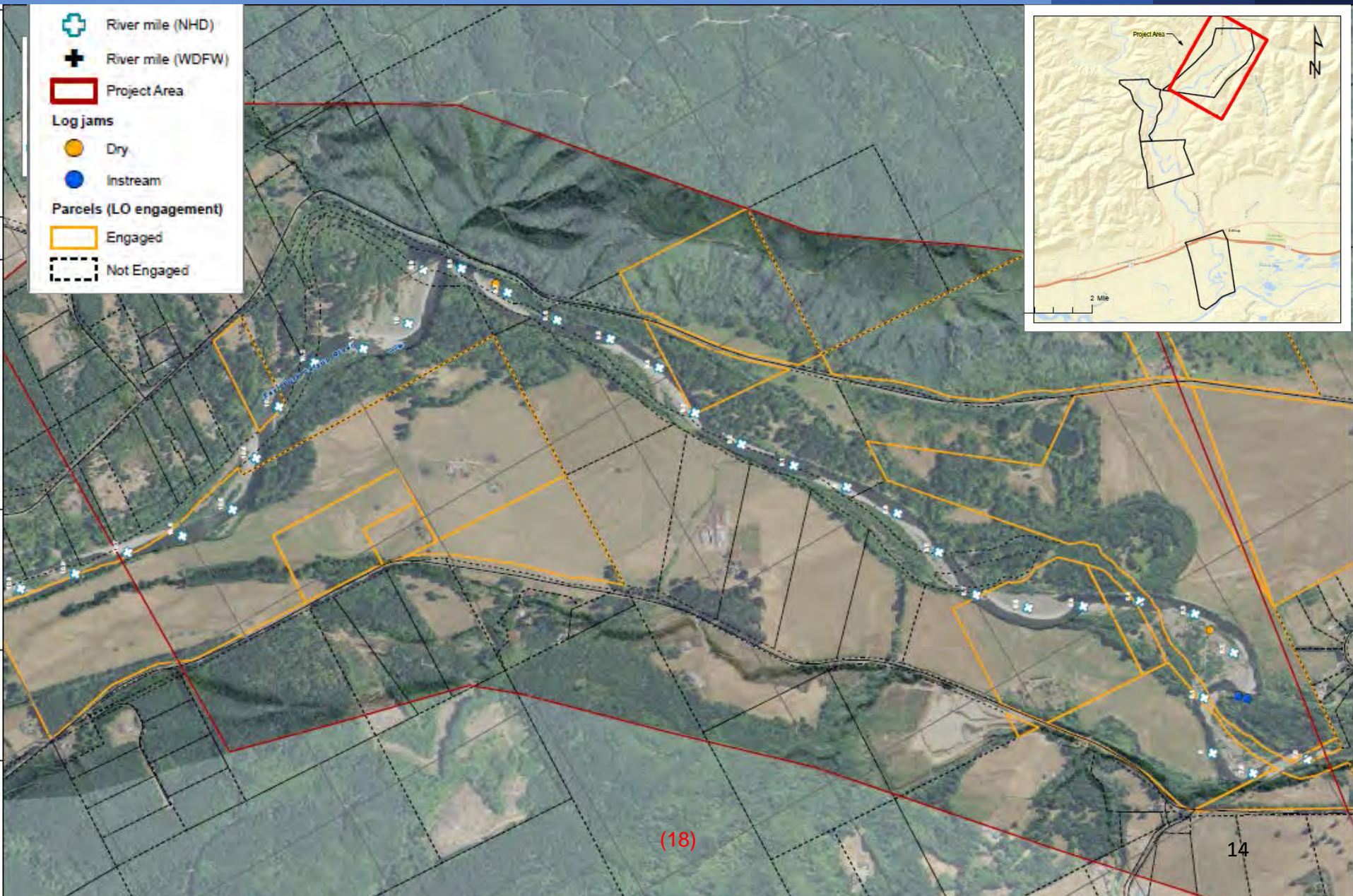
Relative Elevation (ft)



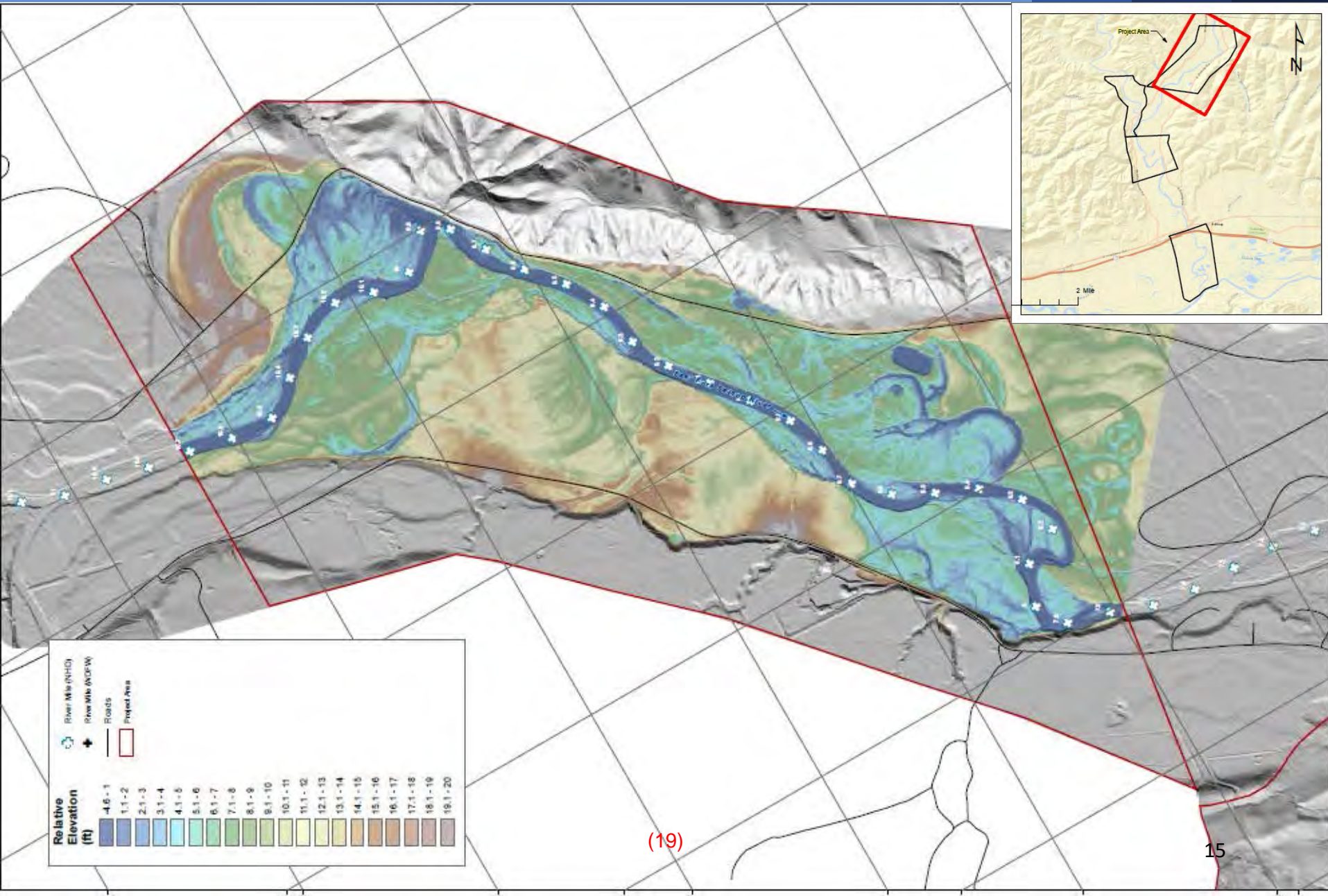
- River Mile (NRD)
- River Mile (KOPW)
- Project Area
- Roads



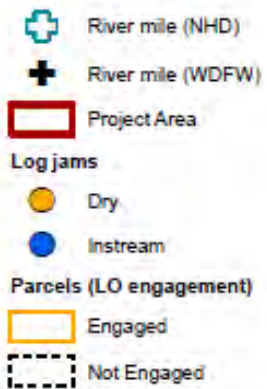
Satsop Lower East Fork RM 8.0 -10.5



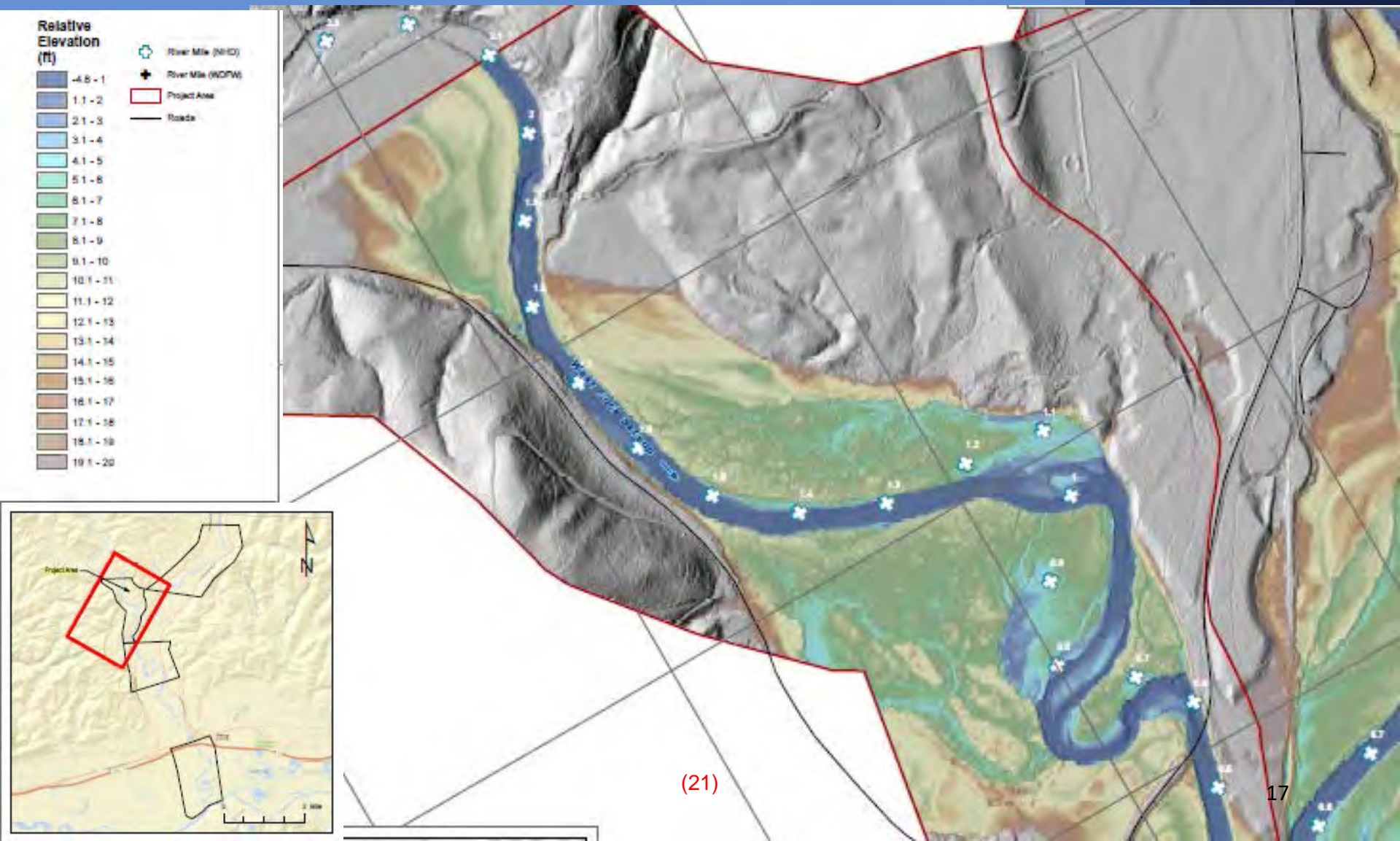
Satsop Lower East Fork RM 8.0 -10.5



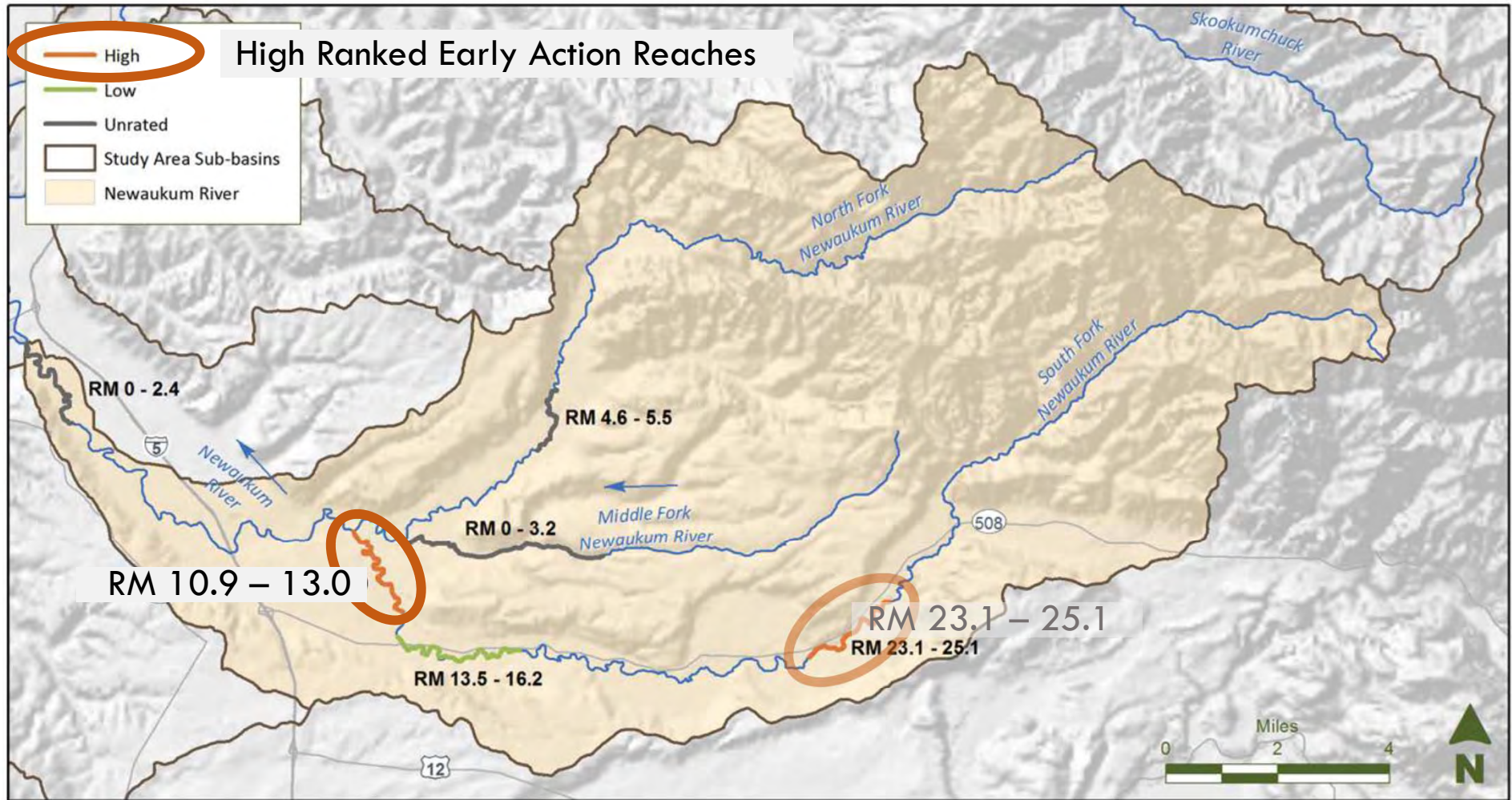
Satsop Lower West Fork RM 0.0 – 2.0



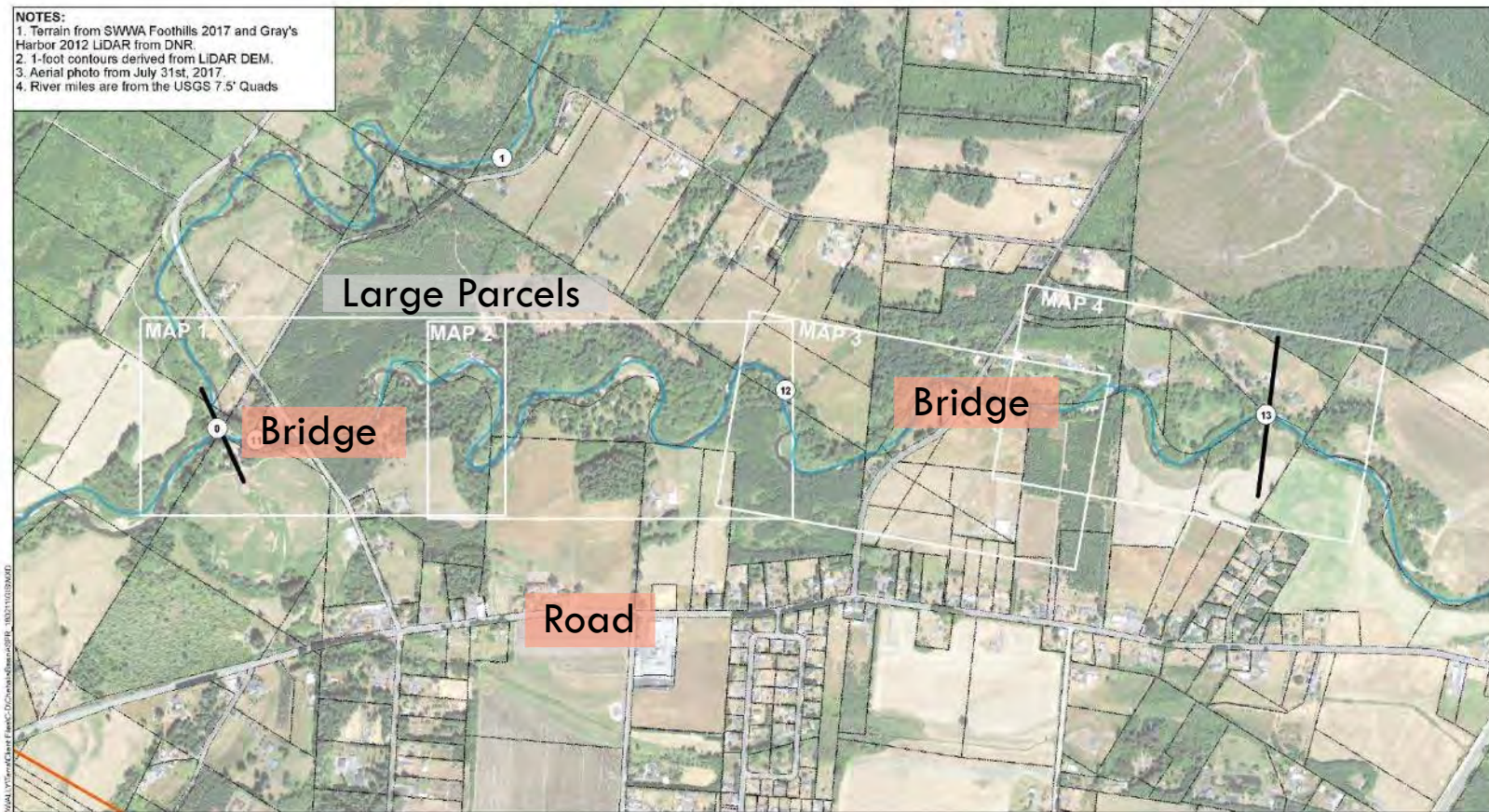
Satsop Lower West Fork RM 0.0 – 2.0



Newaukum Sub-Basin



South Fork Newaukum RM 10.9 – 13.0



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Projection: NAD 1983
State Plane Washington South FIPS 4602



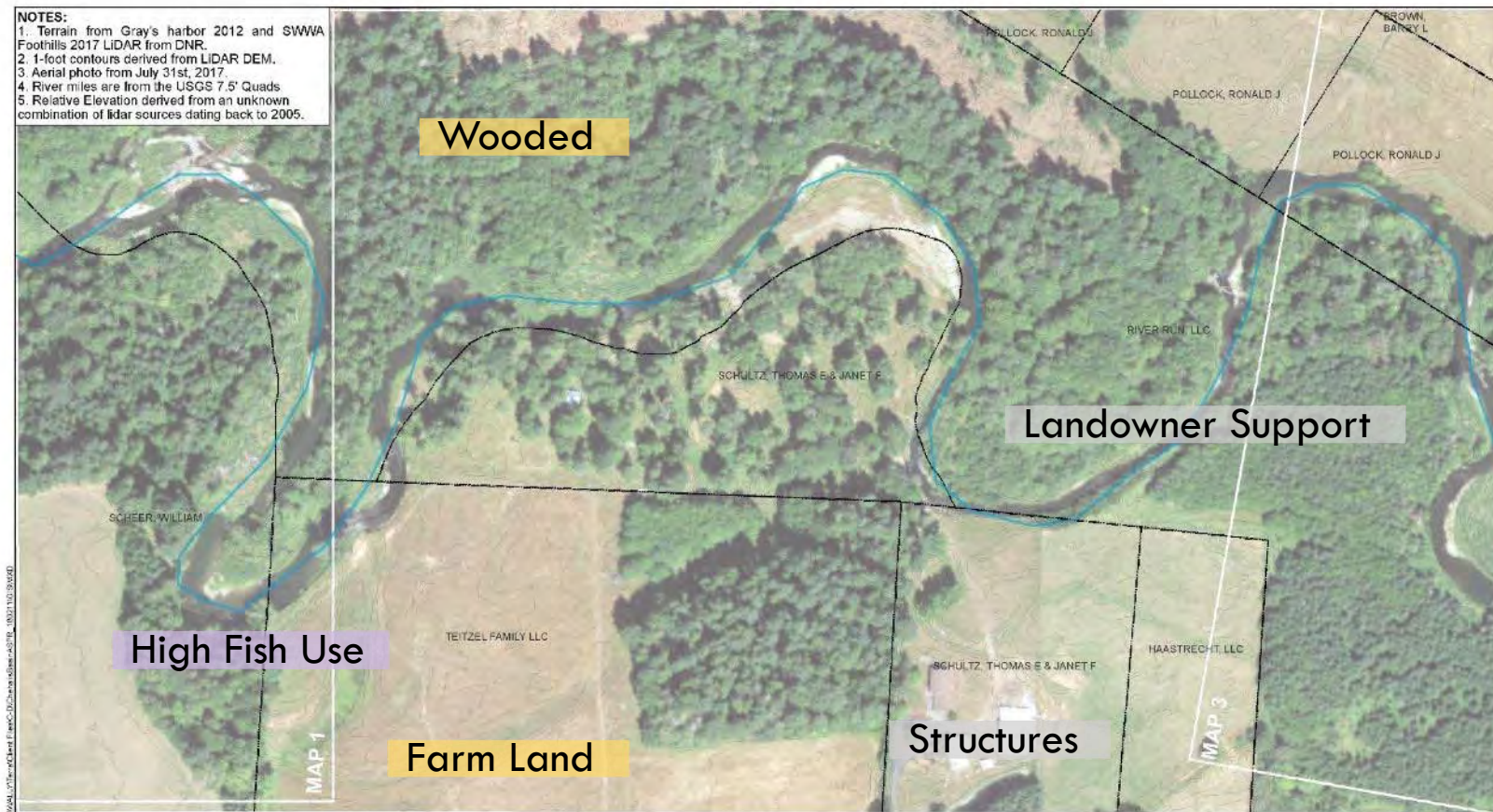
- Map Matchlines
- Parcels
- River Miles

River Survey - Full Reach

Early Action Reach RM: 10.9 to 13.0
South Fork Newaukum River, WA
Chehalis Basin ASRP Design

South Fork Newaukum | RM 10.9 – 13.0

Aerial Photo and Parcels



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Projection: NAD 1983
 State Plane Washington South FIPS 4602



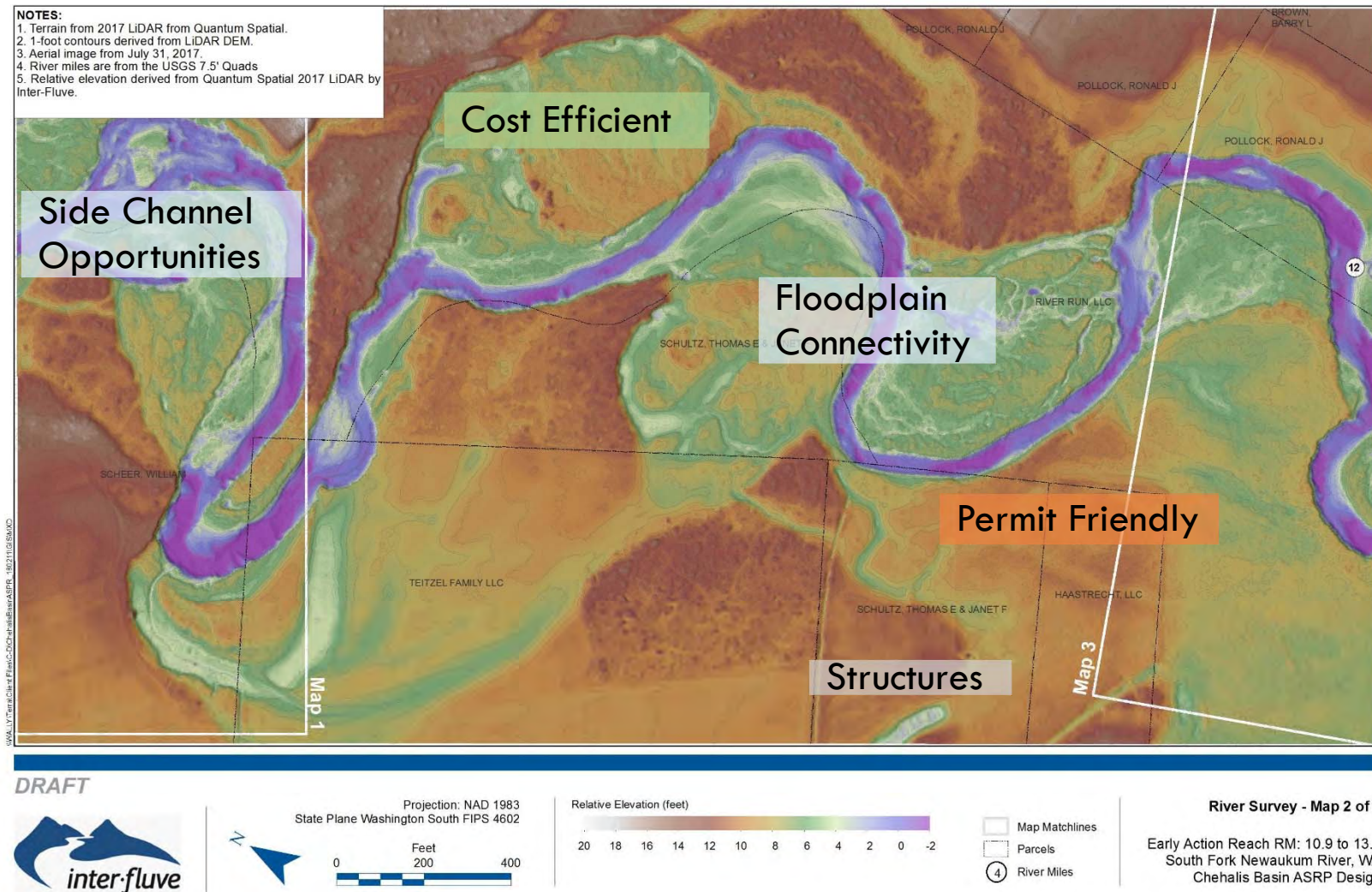
- Contours 1ft
- Map Matchlines
- Parcels
- River Miles

River Survey - Map 2 of 4

Early Action Reach RM: 10.9 to 13.0
 South Fork Newaukum River, WA
 Chehalis Basin ASRP Design

South Fork Newaukum | RM 10.9 – 13.0

Relative Elevation Map



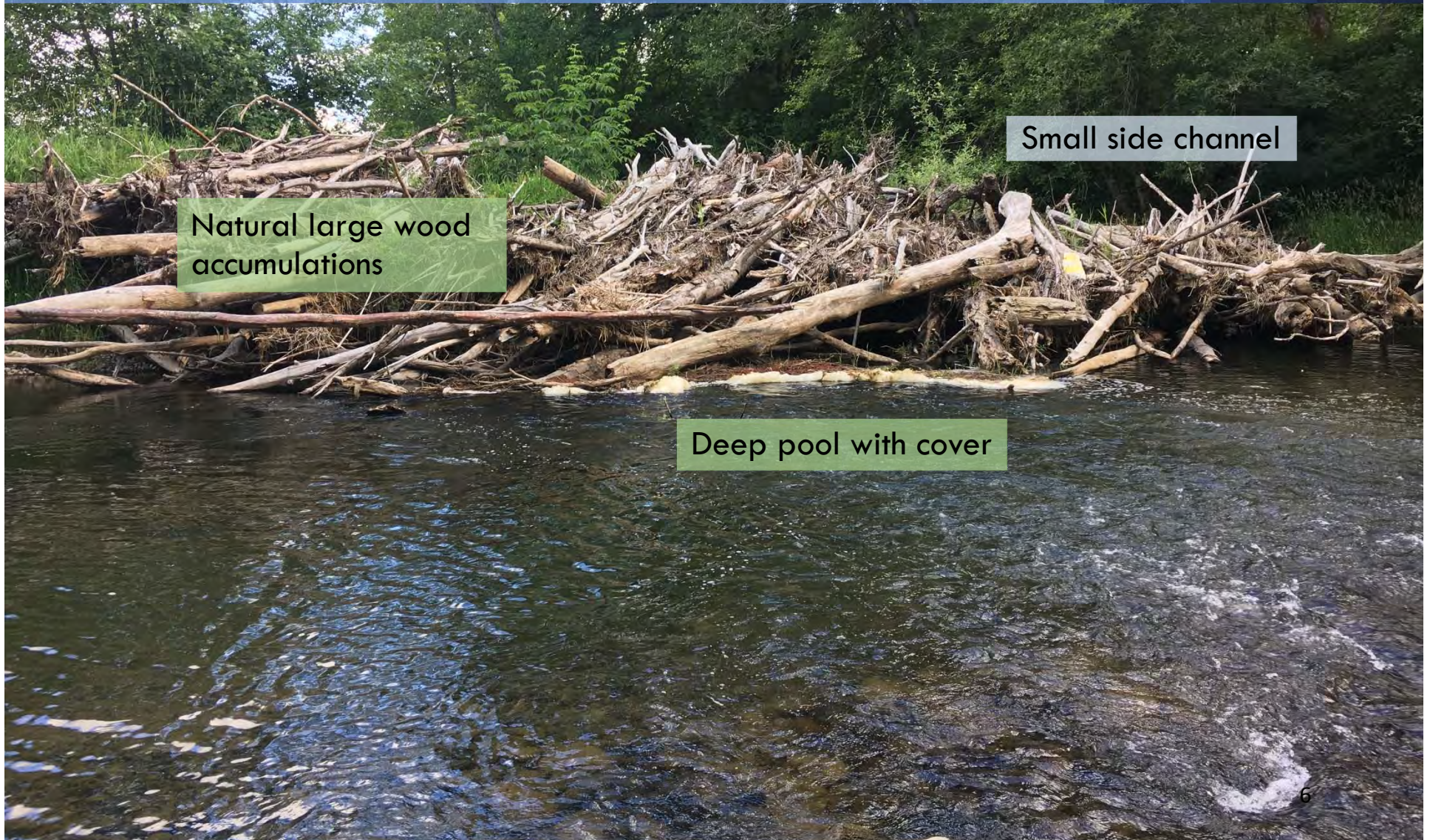
South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



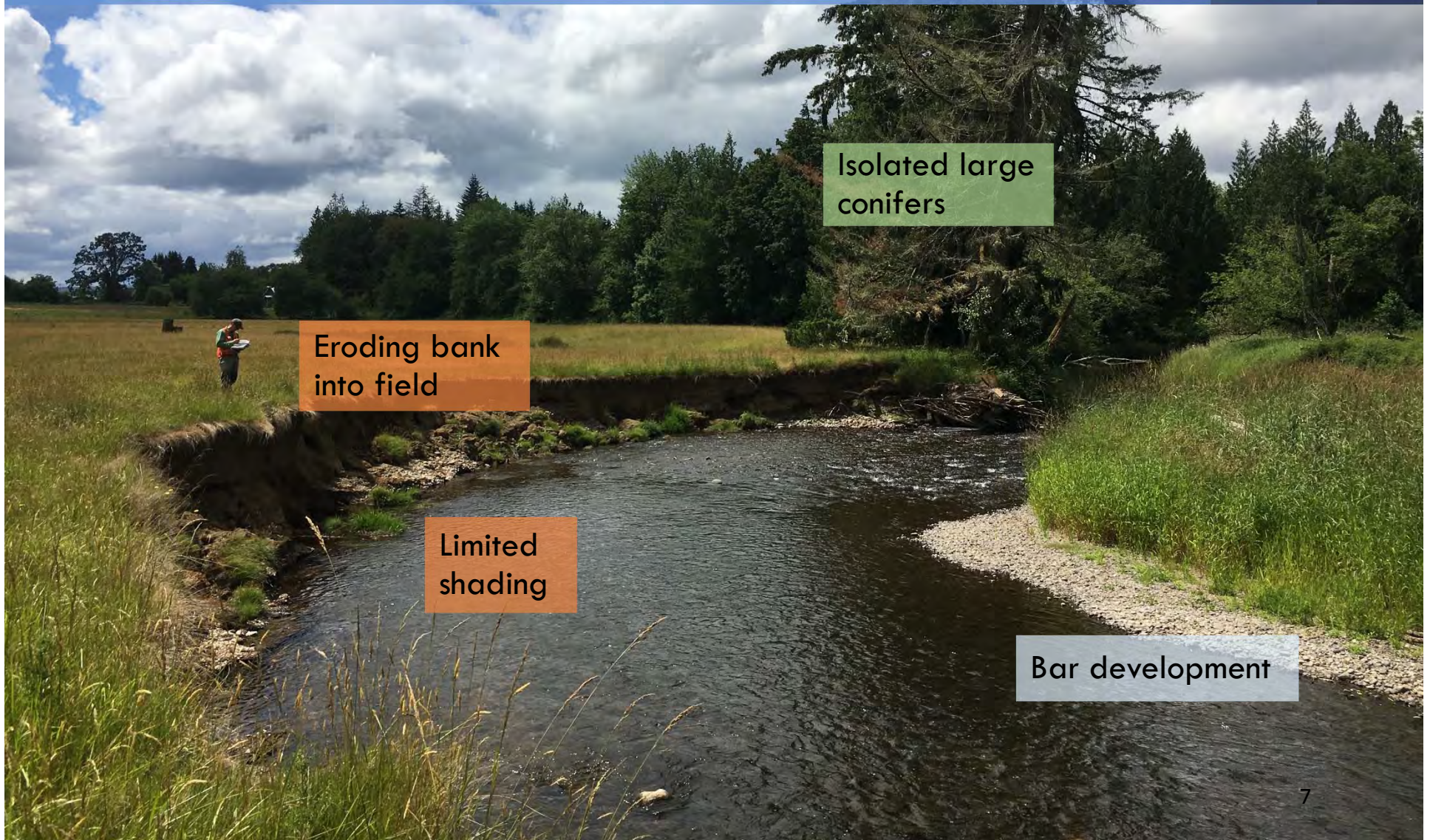
South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



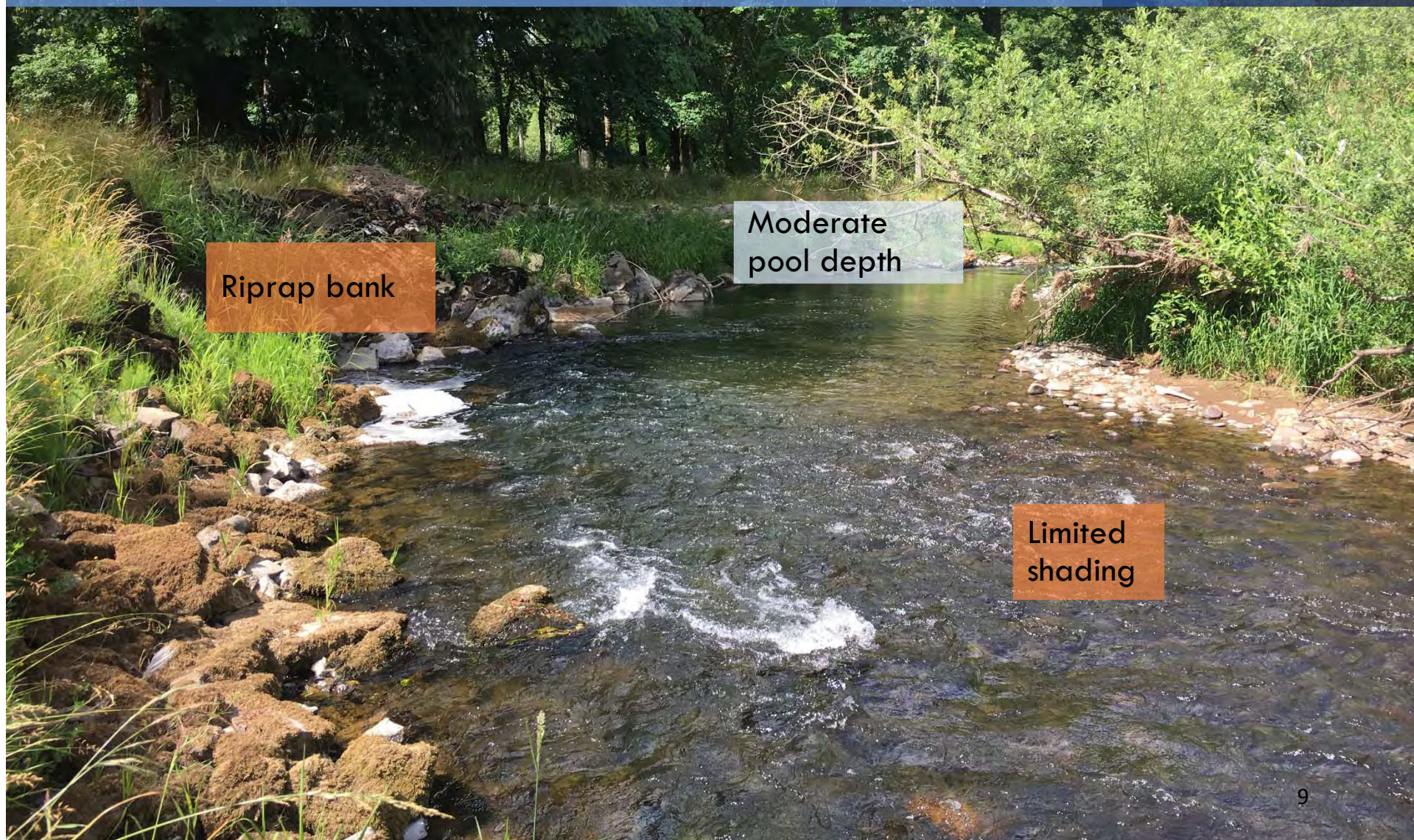
Deep pool
with no
structure

Limited
shading

Fencing to
the edge

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



Riprap bank

Moderate
pool depth

Limited
shading

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos

Young forest

Limited bar
development

High
banks

Plane bed
channel

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



Macroinvertebrates

Clay and
Silts in
Gravels

Freshwater
mussels

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



Macroinvertebrates

Sand in
Gravels

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



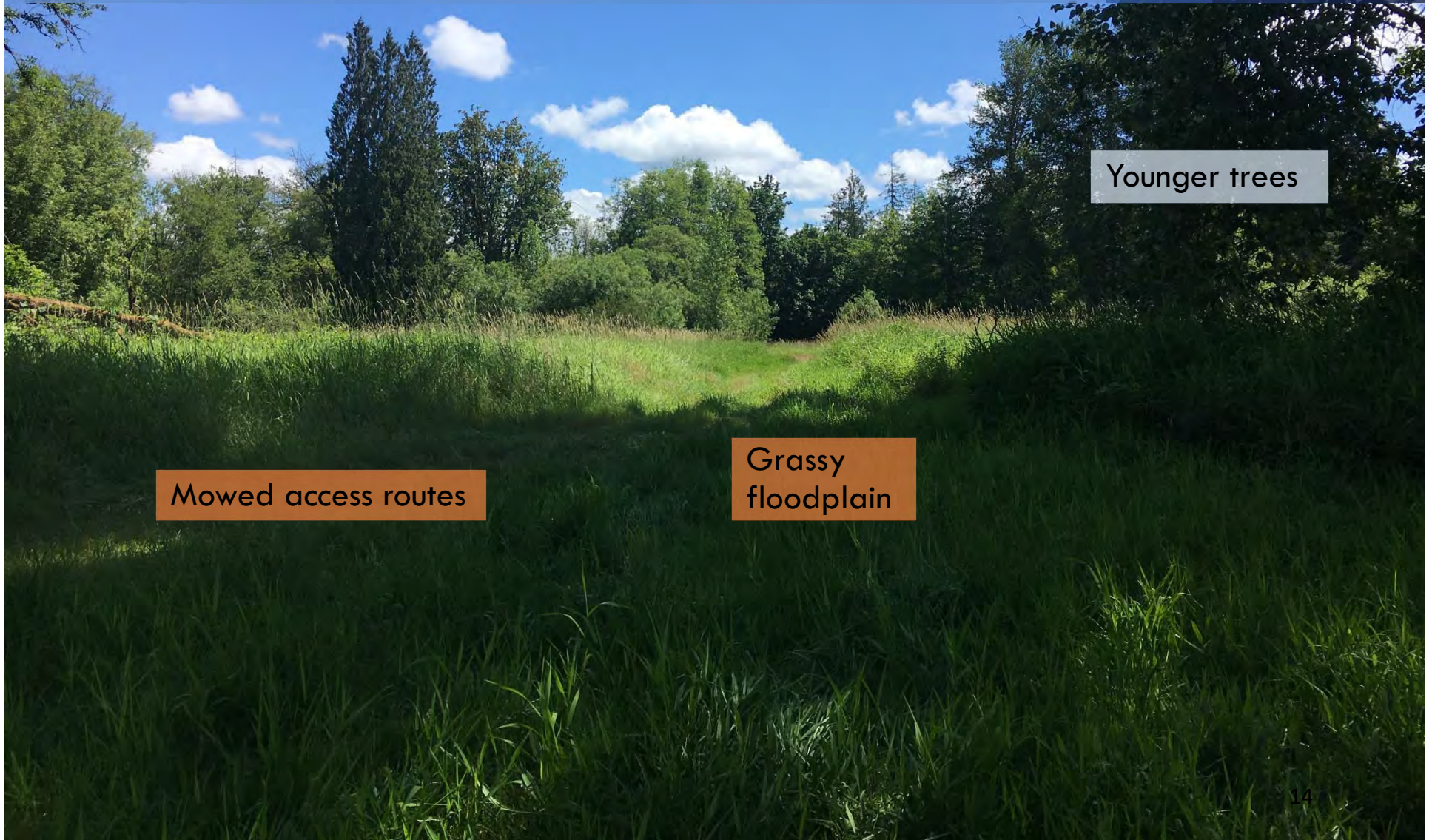
High terrace

Second
growth forest

Native Plants

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



Younger trees

Mowed access routes

Grassy
floodplain

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos

Levees and
riparian buffer
isolates the area

Invasive
vegetation

Old rearing
ponds

Limited
shading

South Fork Newaukum | RM 10.9 – 13.0

Representative Photos



Isolated
alcove

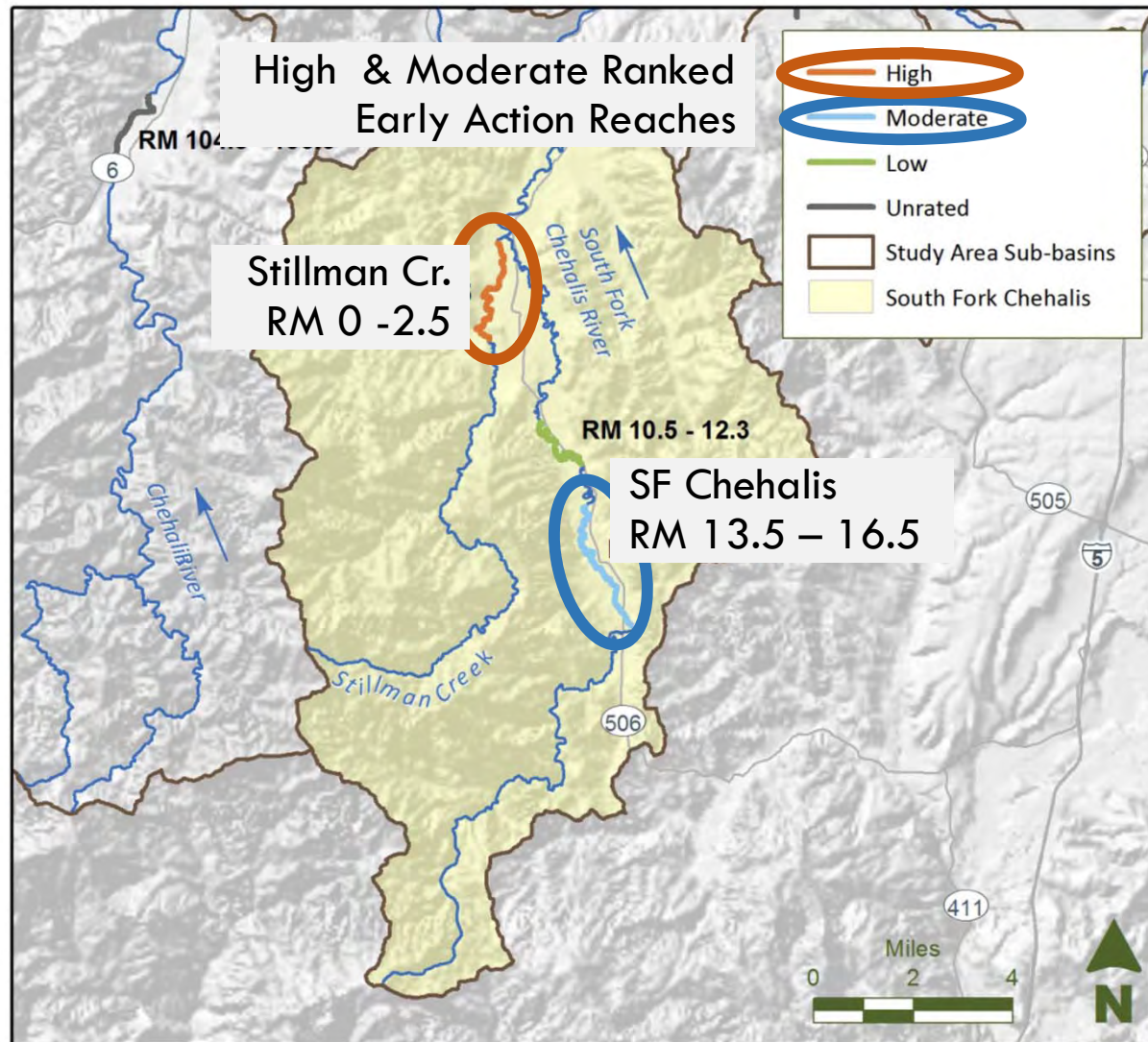
Grassy
floodplain

South Fork Newaukum | RM 10.9 – 13.0

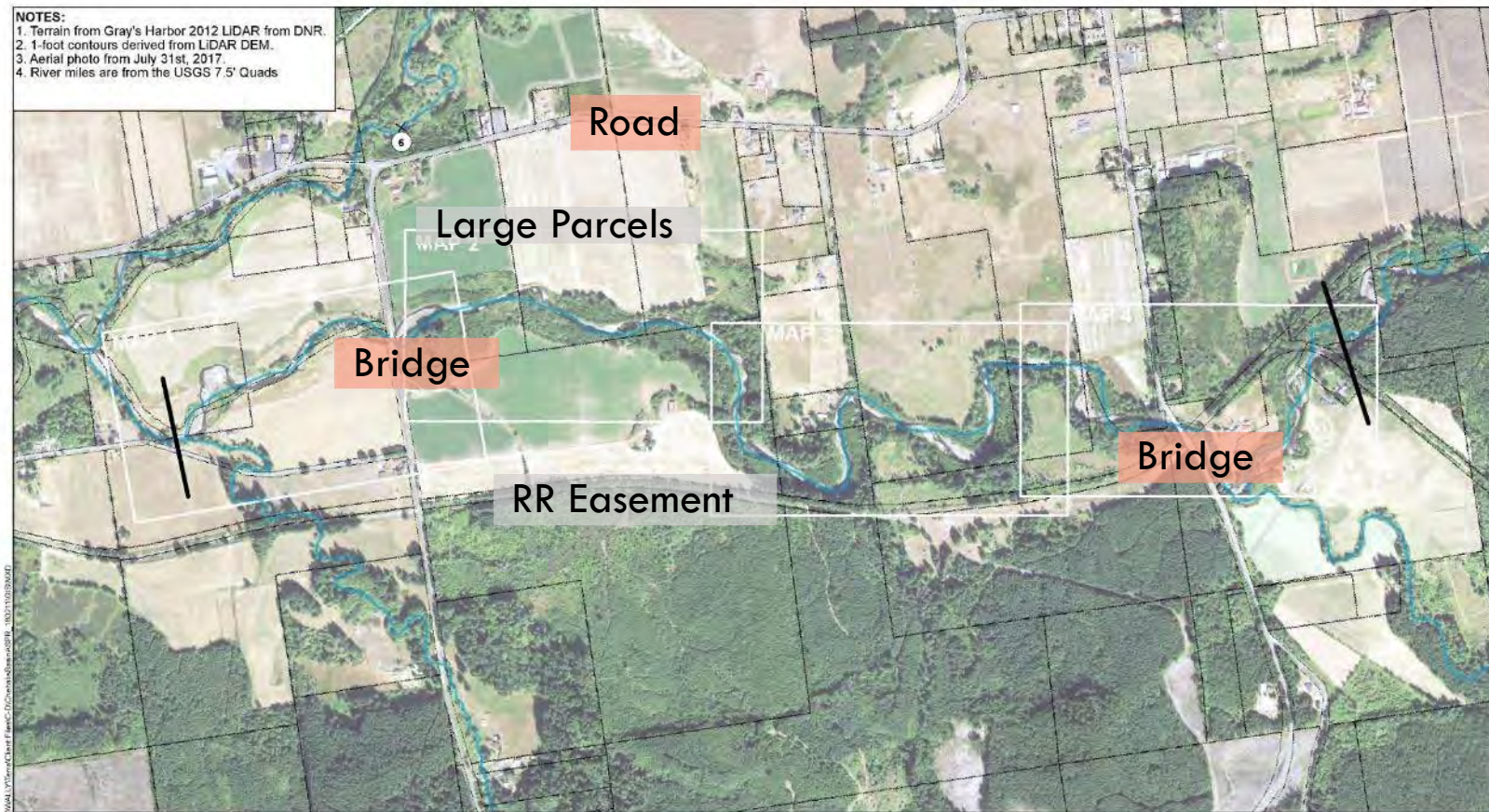
Reach Summary

Criteria	RM 10.9 – 13.0
Ecological Metrics	Connected floodplain, side chls.
Fish & Other Species Use	Salmon use, freshwater mussels
Natural Process	Wooded, planform freedom
Landowner Support	Large parcels, willing
Risk & Public Safety	Bridges
Permitting	No issues identified
Project Unit Cost	Cost effective
Summary	Cool projects, willing owners

South Fork Chehalis Sub-Basin



Stillman Creek RM 0 – 2.5



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Projection: NAD 1983
 State Plane Washington South FIPS 4602



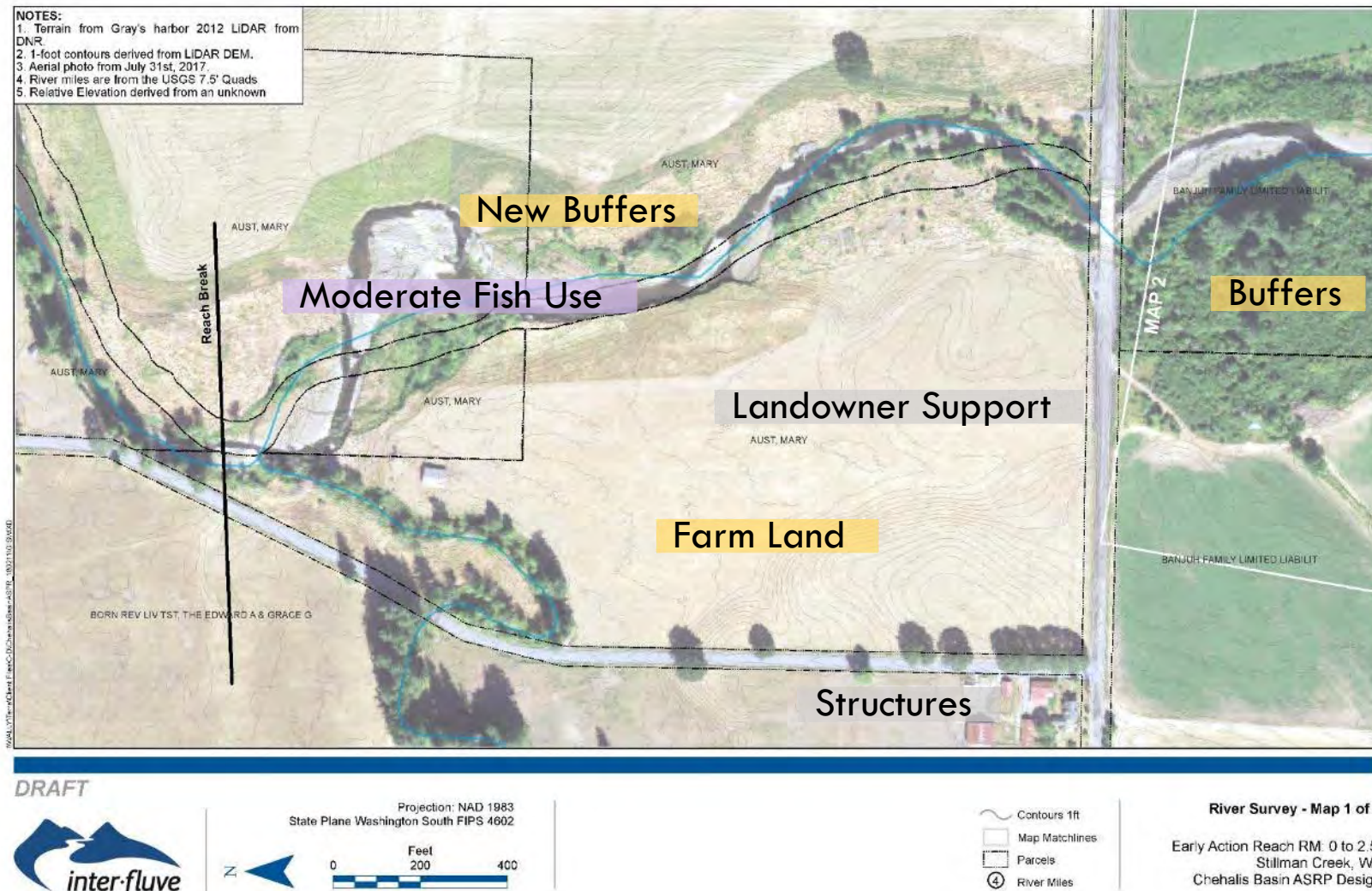
- Map Matchlines
- Parcels
- 4 River Miles

River Survey - Full Reach

Early Action Reach RM: 0 to 2.5
 Stillman Creek, WA
 Chehalis Basin ASRP Design

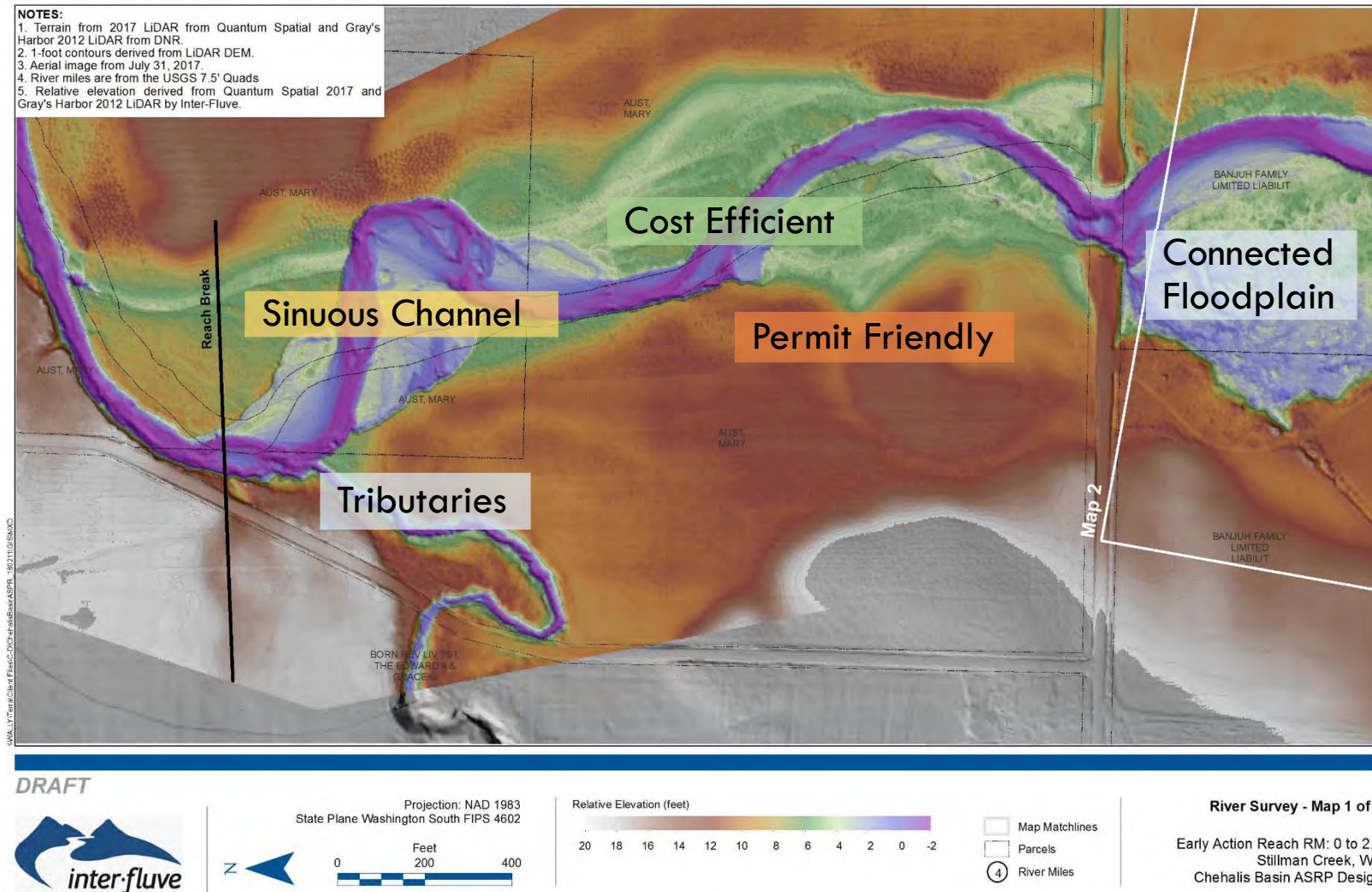
Stillman Creek | RM 0 – 2.5

Aerial Photo and Parcels



Stillman Creek | RM 0 – 2.5

Relative Elevation Map



Stillman Creek | RM 0 – 2.5

Representative Photos



Stillman Creek | RM 0 – 2.5

Representative Photos



Stillman Creek | RM 0 – 2.5

Representative Photos

Limited riparian

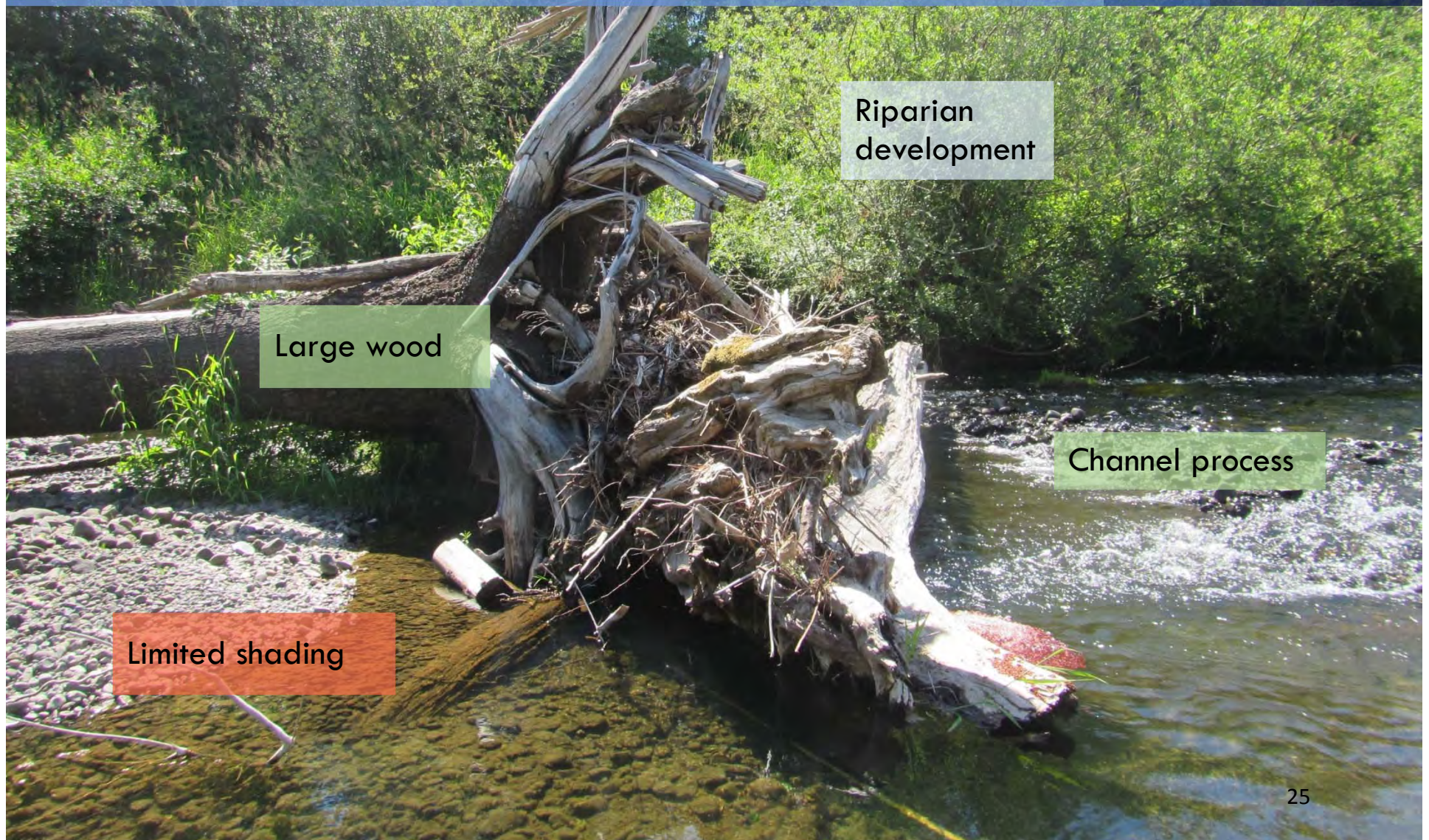
High
banks

Pools with
limited cover

Bar
development

Stillman Creek | RM 0 – 2.5

Representative Photos



Riparian
development

Large wood

Channel process

Limited shading

Stillman Creek | RM 0 – 2.5

Representative Photos



Riparian re-growth

Old large wood

Limited
shading

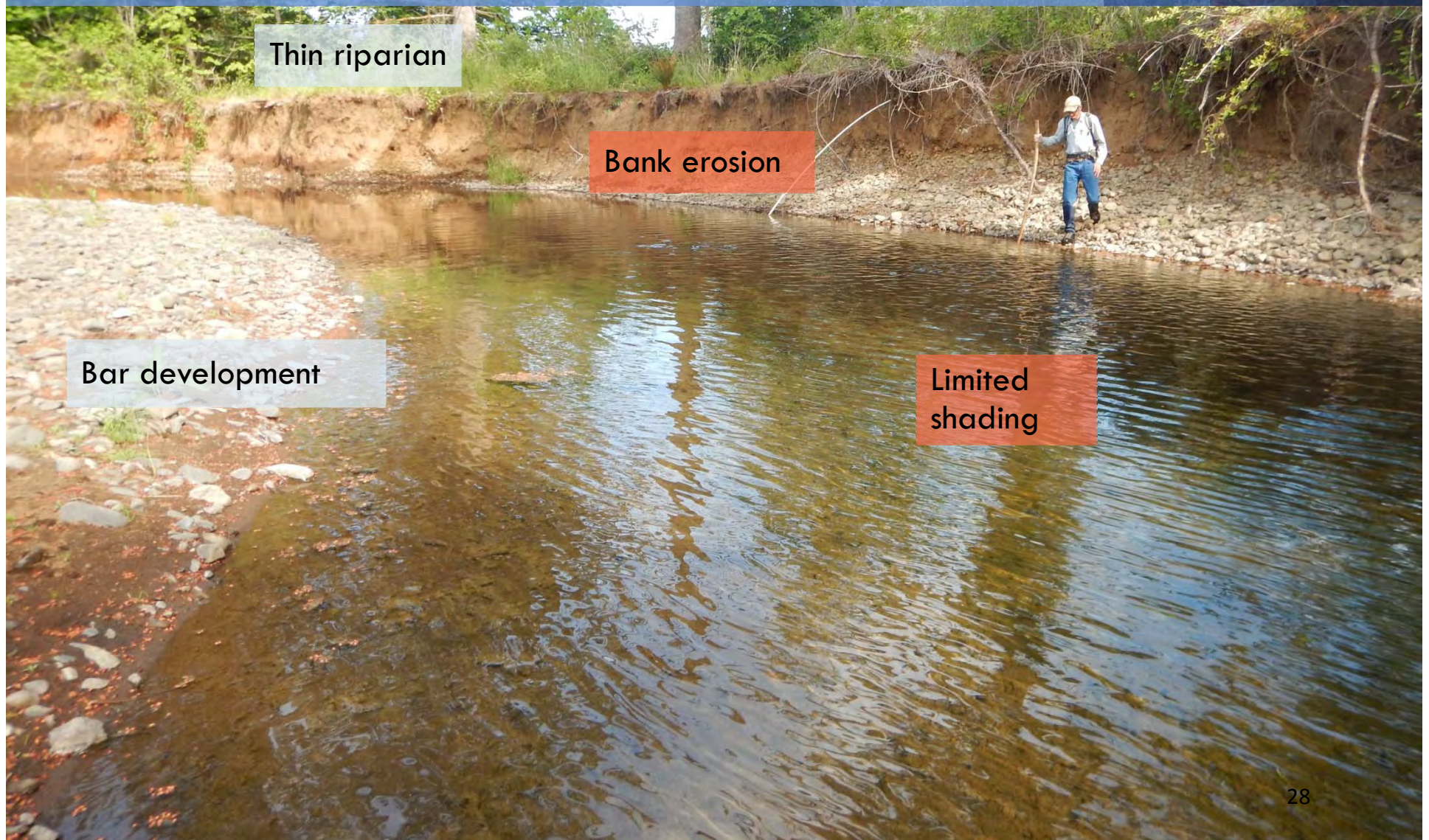
Stillman Creek | RM 0 – 2.5

Representative Photos



Stillman Creek | RM 0 – 2.5

Representative Photos

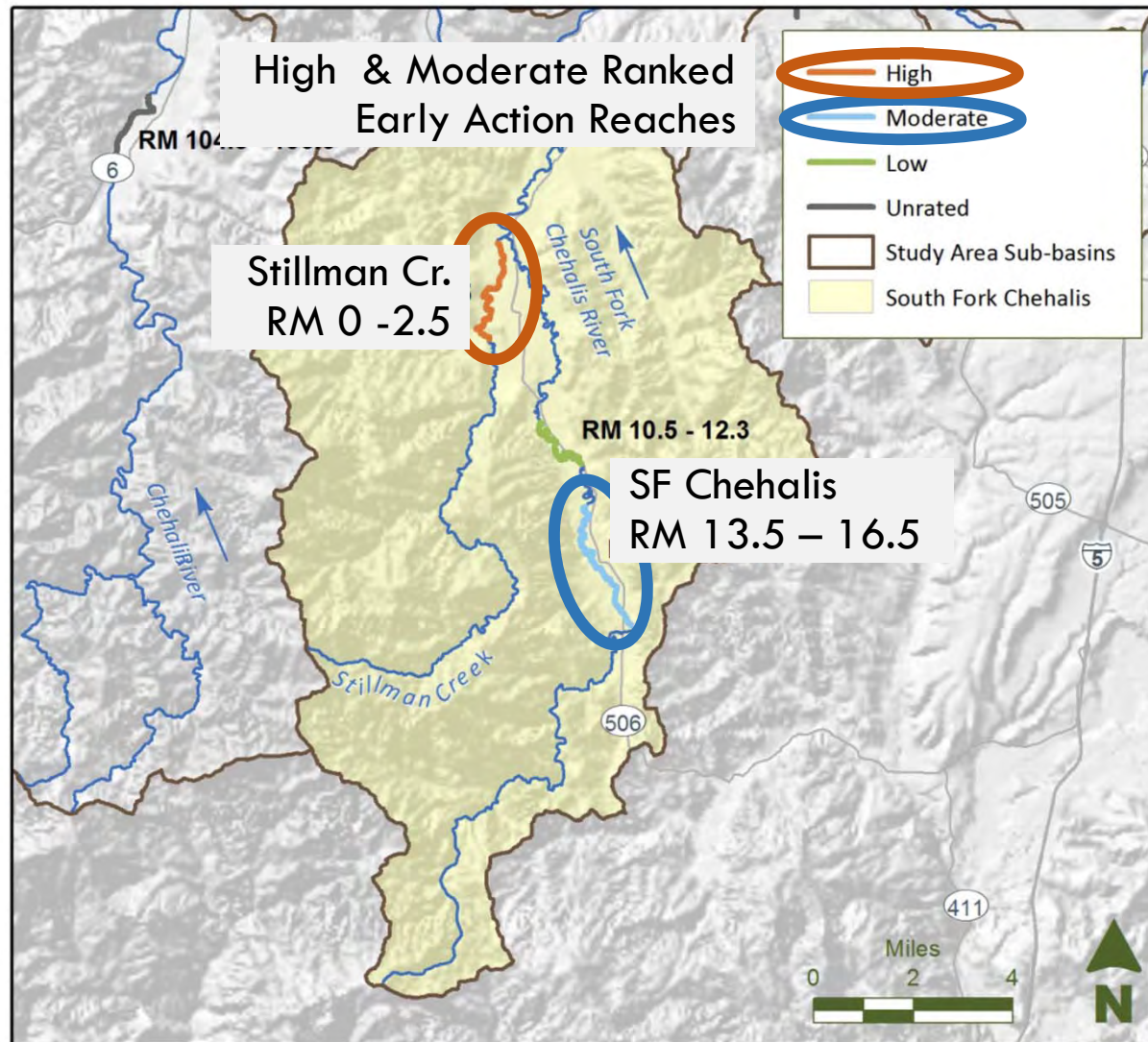


Stillman Creek | RM 0 – 2.5

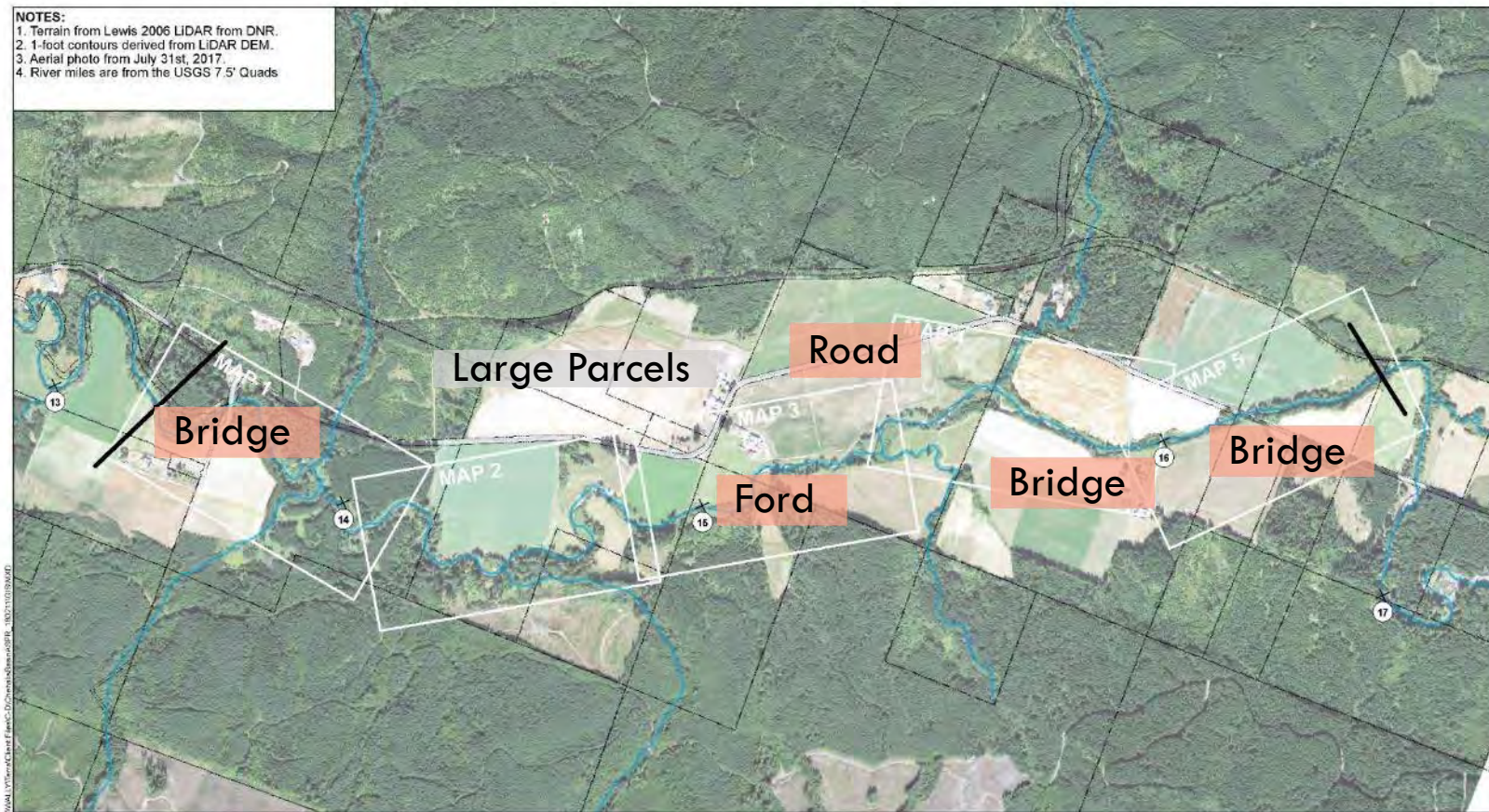
Reach Summary

Criteria	Stillman Cr. RM 0-2.5
Ecological Metrics	Tributaries, connected floodplain
Fish & Other Species Use	Salmon
Natural Process	Farm land, new buffers, sinuosity
Landowner Support	Large parcels
Risk & Public Safety	Bridges
Permitting	Permittable
Project Unit Cost	Cost effective
Summary	Cost effective project opportunities

South Fork Chehalis Sub-Basin



South Fork Chehalis RM 13.5 – 16.5



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Projection: NAD 1983
 State Plane Washington South FIPS 4602

Feet
 0 800 1,600

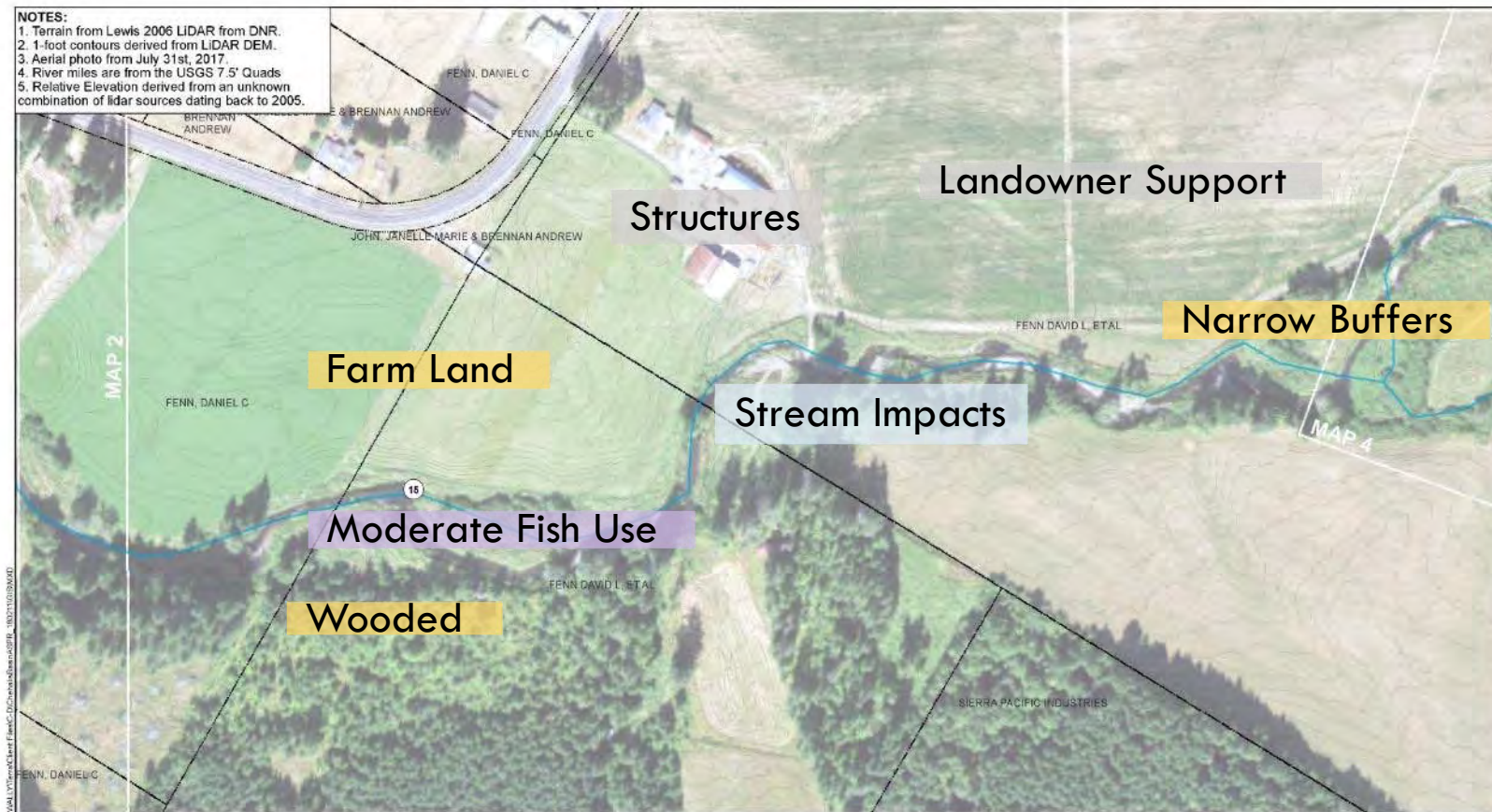
- Map Matchlines
- Parcels
- 4 River Miles

River Survey - Full Reach

Early Action Reach RM: 13.5 to 16.5
 Middle South Fork Chehalis River, WA
 Chehalis Basin ASRP Design

South Fork Chehalis | RM 13.5 – 16.5

Aerial Photo and Parcels



DRAFT



Projection: NAD 1983
State Plane Washington South FIPS 4602

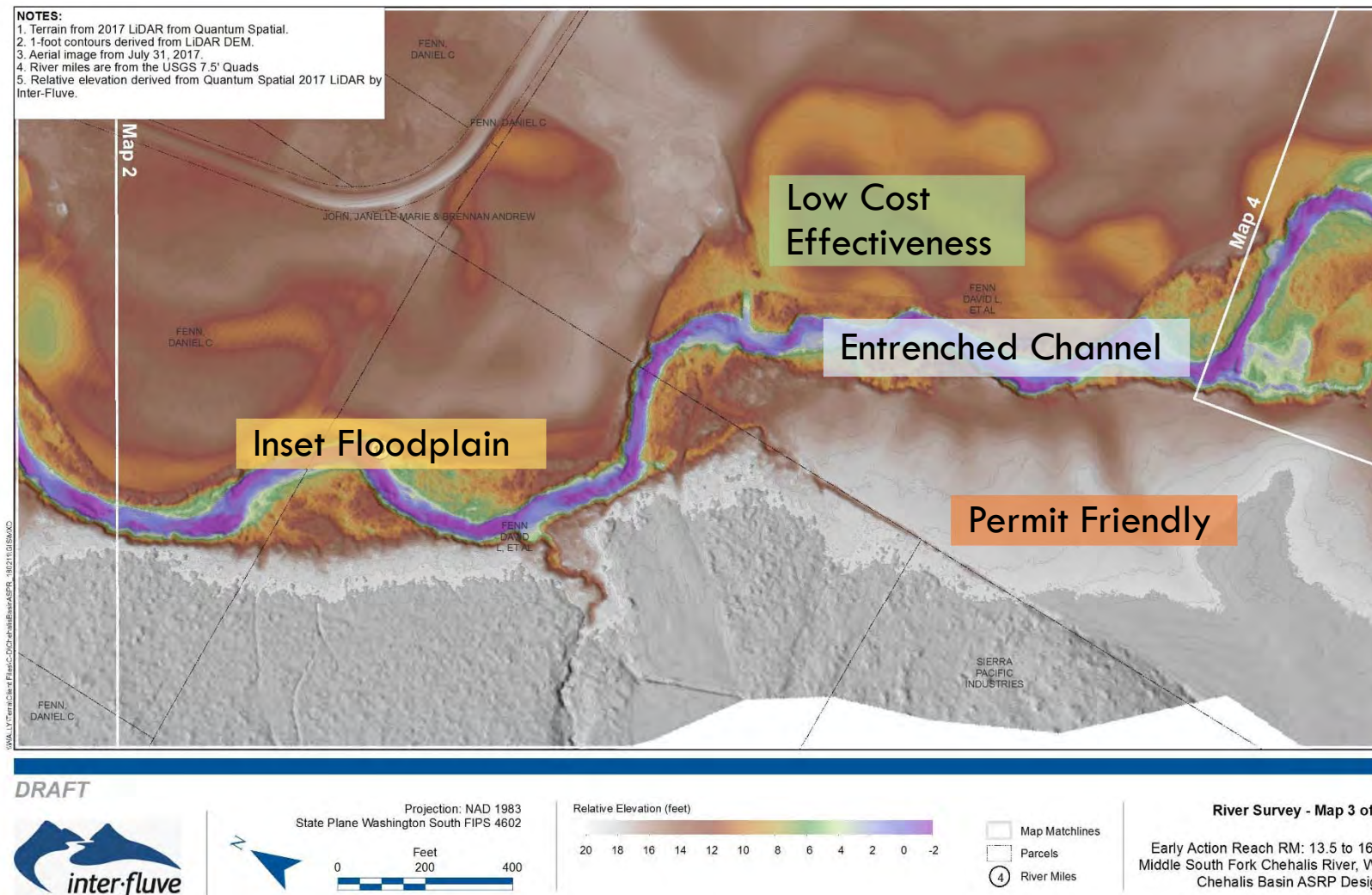


River Survey - Map 3 of 5

Early Action Reach RM: 13.5 to 16.5
Middle South Fork Chehalis River, WA
Chehalis Basin ASRP Design

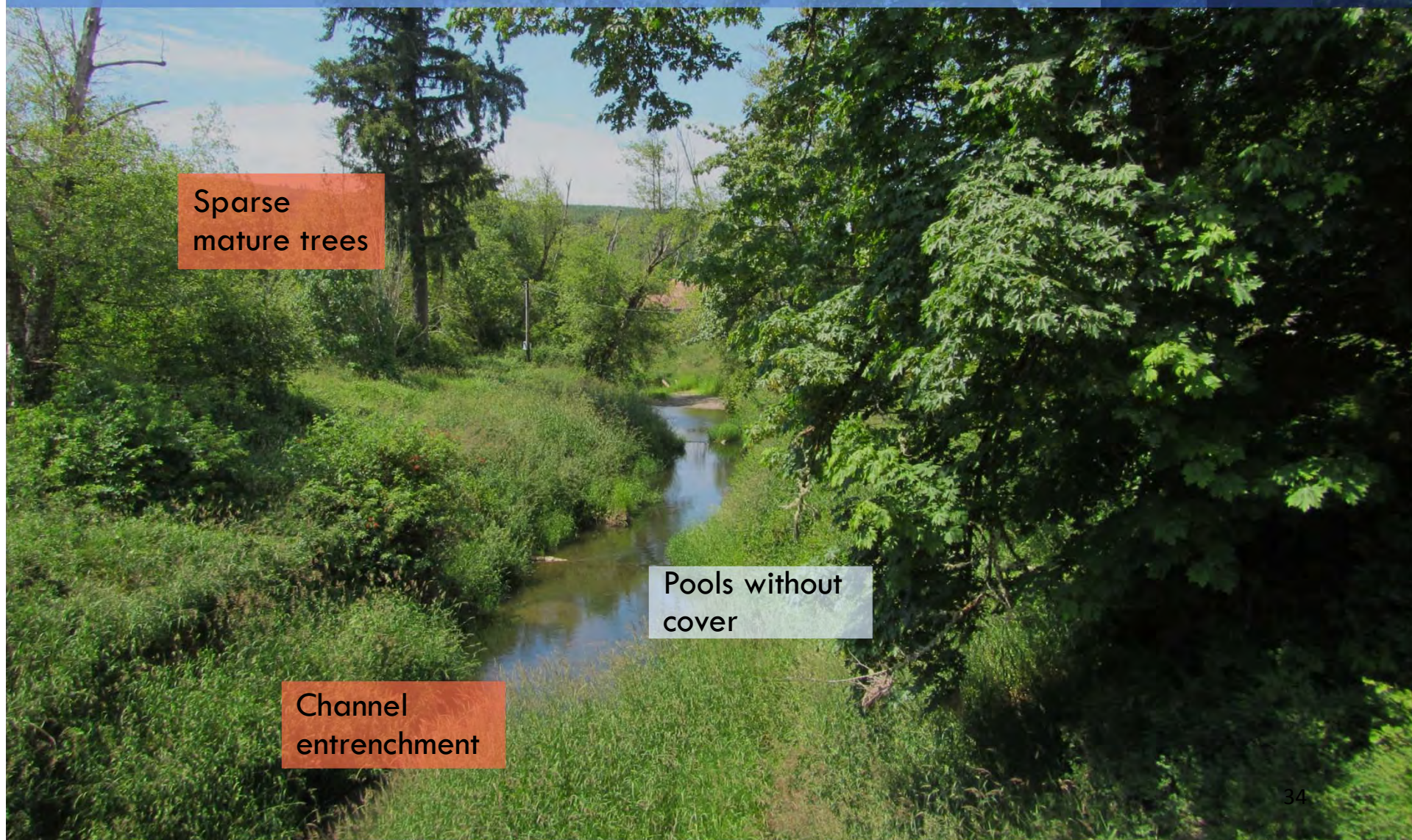
South Fork Chehalis | RM 13.5 – 16.5

Relative Elevation Map



South Fork Chehalis | RM 13.5 – 16.5

Representative Photos



South Fork Chehalis | RM 13.5 – 16.5

Representative Photos




South Fork Chehalis | RM 13.5 – 16.5

Representative Photos



South Fork Chehalis | RM 13.5 – 16.5

Representative Photos

A photograph of a large, weathered tree trunk in a grassy field. The tree trunk is heavily textured with vertical grooves and some moss. A yellow tag is attached to the trunk. The surrounding area is filled with green grass and some dry, brown grass. A thin wire runs across the foreground.

What once was

Pasture corner

South Fork Chehalis | RM 13.5 – 16.5

Representative Photos



High banks

Limited
riparian

Bar
development

38

South Fork Chehalis | RM 13.5 – 16.5

Reach Summary

Criteria	MSFC RM13.5-16.5
Ecological Metrics	Incised channel & inset floodplain
Fish & Other Species Use	Salmon & Western Toad
Natural Process	Farm land, narrow buffers
Landowner Support	Large parcels
Risk & Public Safety	Bridges & roads
Permitting	Permittable, no wetland mitigation
Project Unit Cost	Low cost effectiveness
Summary	Big projects, high unit cost

Newaukum Sub-Basin Reach Evaluation Summary

Criteria	RM10.9-13.0	RM 23.1-25.1
Ecological Metrics	Best	Good
Fish & Other Species Use	Good	Fair
Natural Process	Best	Fair
Landowner Support	Best	Fair
Risk & Public Safety	Best	Good
Permitting	Best	Fair
Project Unit Cost	Good	Fair
Summary	Best	Fair

South Fork Chehalis Sub-Basin Reach Evaluation Summary

Criteria	MSFC RM13.5-16.5	Stillman RM 0-2.5
Ecological Metrics	Fair	Good
Fish & Other Species Use	Fair	Fair
Natural Process	Fair	Good
Landowner Support	Good	Good
Risk & Public Safety	Fair	Good
Permitting	Good	Good
Project Unit Cost	Fair	Good
Summary	Fair	Good

Ecological Metrics

- Ecological metrics are a combination of a number of factors:
 - Side channels
 - Floodplain
 - Channel length
 - Wetlands
 - Riparian community
 - Wood structures
 - Pools
- A high score shows more ecological benefit than a low score

Fish & Other Species Use

- Fish & other species use is a combination of a number of factors:
 - Steelhead (adult migration, spawning, rearing)
 - Fall Chinook (adult migration, spawning, rearing)
 - Spring Chinook (adult migration, spawning, rearing)
 - Coho (adult migration, spawning, rearing)
 - Chum (adult migration, spawning, rearing)
 - Other species (Western Toad, Coastal Tailed Frog, Oregon Spotted Frog, Van Dyke's Salamander, Northern Red-legged Frog, Western Ridge Mussel, Beaver)
- A high score shows more benefit to more numbers of species than a low score

Natural Process

- Natural process is a representation of the consistency with and sustainability of a approach
 - Does restoration support natural processes?
 - Are there opportunities for the preservation of high quality habitat?
- A high score is better than a low score

Landowner Support

- Landowner support is a combination of a number of factors:
 - Number of landowners per mile
 - Willingness (if known)
 - Public landownership
 - Active use? (e.g. ag, residential, forest)
 - Percent of area within willing landowners
- A high score shows more support by landowners than a low score

Risk & Public Safety

- Risk & Public Safety score is high for low levels of risk and public safety concerns:
 - Arterial roads in floodplain channel migration zone
 - Bridges in or downstream of reach
 - Utilities
 - Houses/structures
 - Levees (flood protection)
 - Recreation (public safety)
- The score is low for high levels of risk and public safety concerns

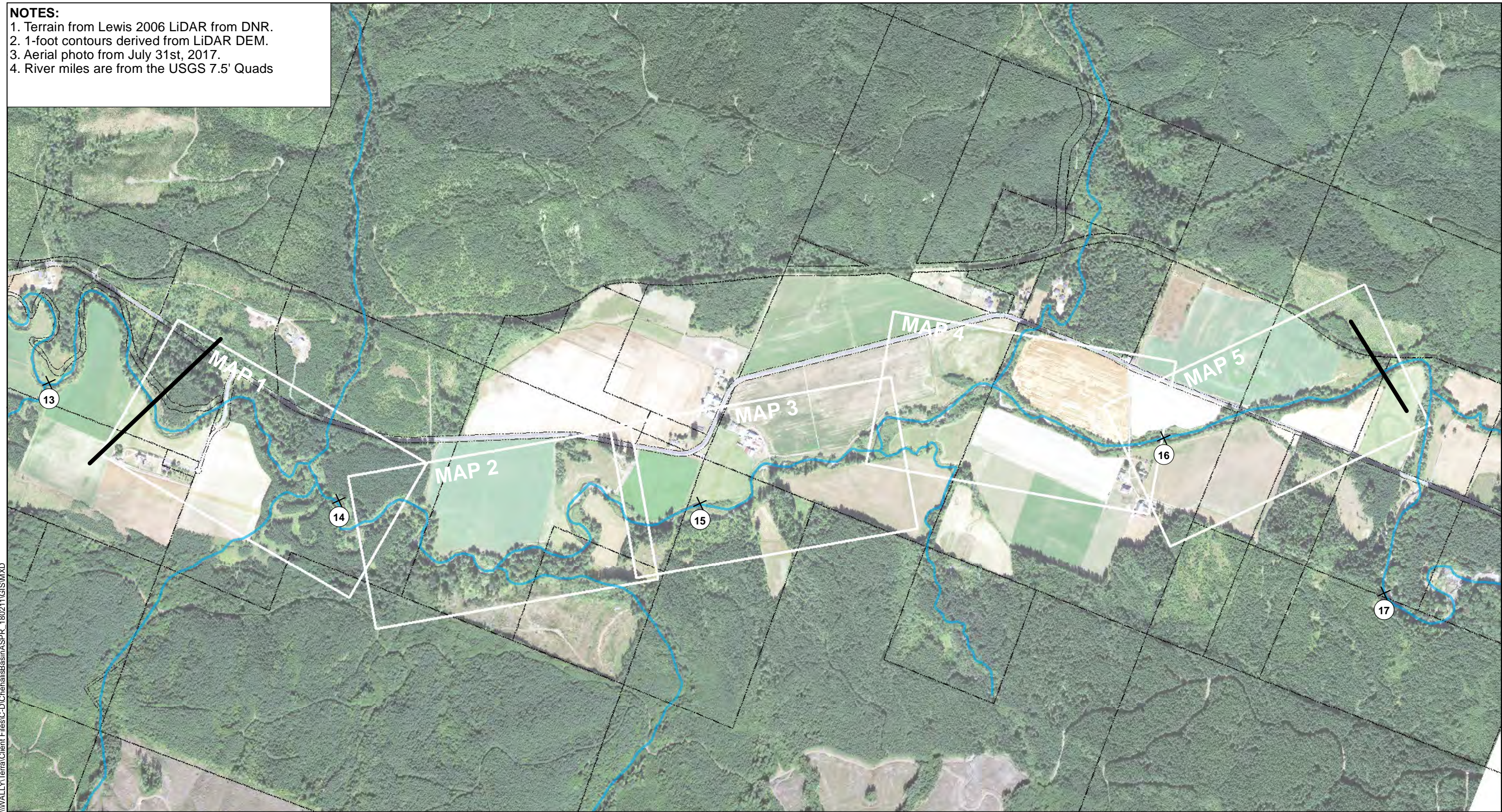
Permitting

- Permitting score is high for a relatively straightforward permitting process and low for a complex permitting process
- Indicators:
 - Streamlined/programmatic
 - High value resources impacted (cultural, wetlands, etc.)
 - Is mitigation needed
 - Contaminated soils
 - Timing

Project Unit Cost

- Project costs are by unit (area, length, etc.) to normalize for large simple projects compared to small complex projects that may have similar total costs
- A high score is better than a low score

NOTES:
 1. Terrain from Lewis 2006 LiDAR from DNR.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial photo from July 31st, 2017.
 4. River miles are from the USGS 7.5' Quads

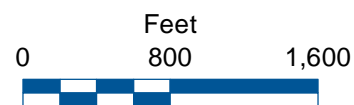


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Projection: NAD 1983
 State Plane Washington South FIPS 4602



- Map Matchlines
- Parcels
- River Miles


River Survey - Full Reach

Early Action Reach RM: 13.5 to 16.5
 Middle South Fork Chehalis River, WA
 Chehalis Basin ASRP Design


- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.




DRAFT



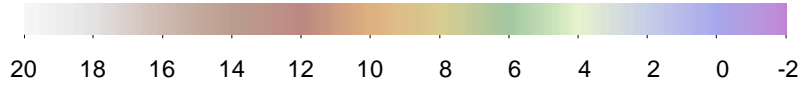
Projection: NAD 1983
State Plane Washington South FIPS 4602



0 200 400
Feet



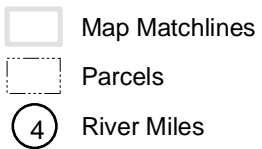
Relative Elevation (feet)



20 18 16 14 12 10 8 6 4 2 0 -2

(71)

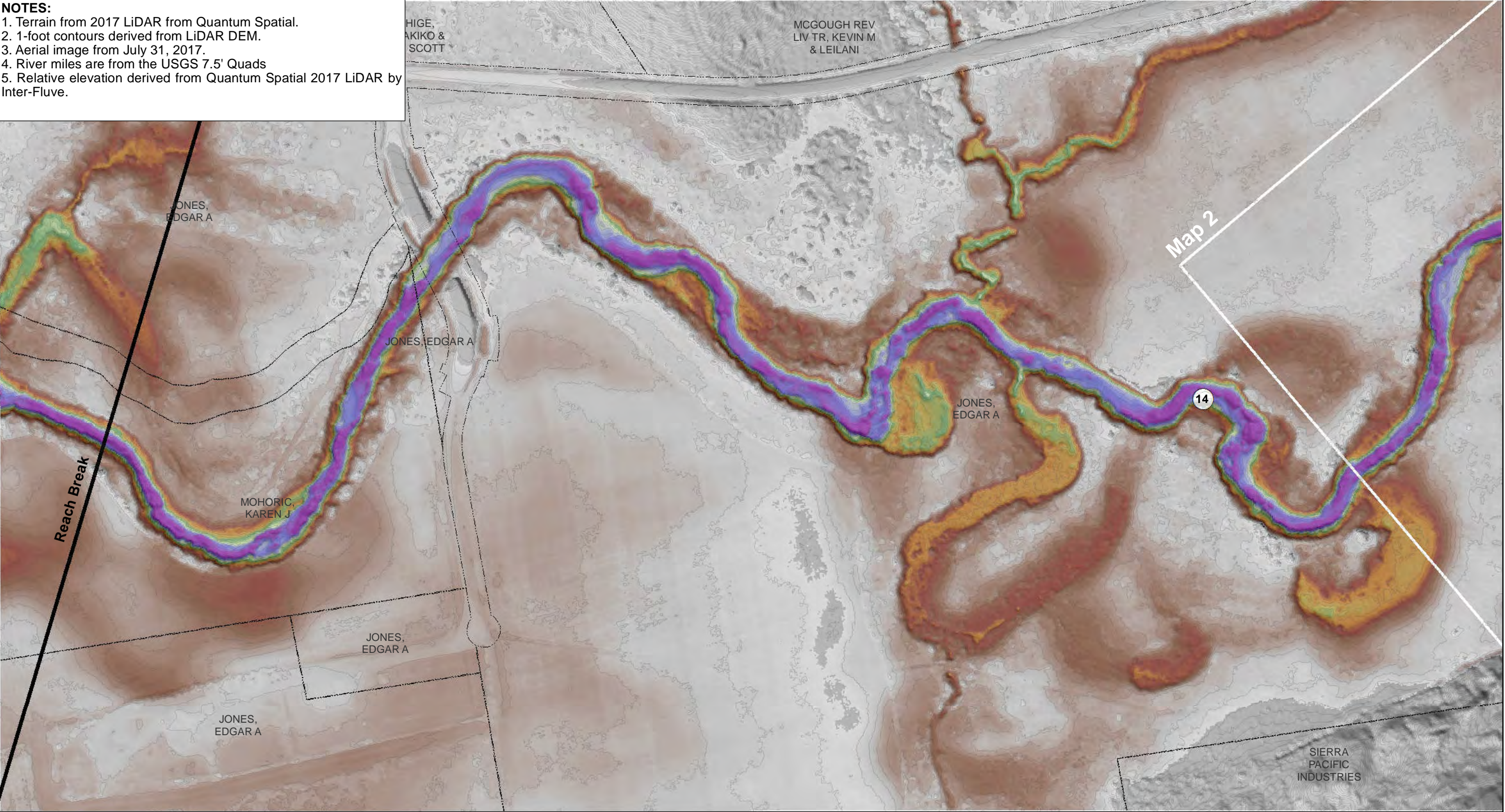
Map Matchlines
Parcels
River Miles




River Survey - Map 1 of 5

Early Action Reach RM: 13.5 to 16.5
Middle South Fork Chehalis River, WA
Chehalis Basin ASRP Design


- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.




DRAFT



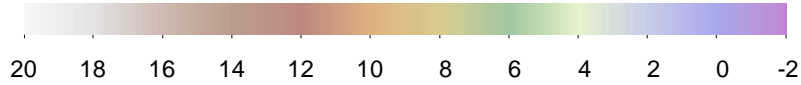
Projection: NAD 1983
State Plane Washington South FIPS 4602



0 200 400
Feet



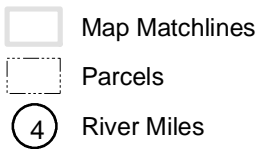
Relative Elevation (feet)



20 18 16 14 12 10 8 6 4 2 0 -2

(72)

Map Matchlines
Parcels
River Miles



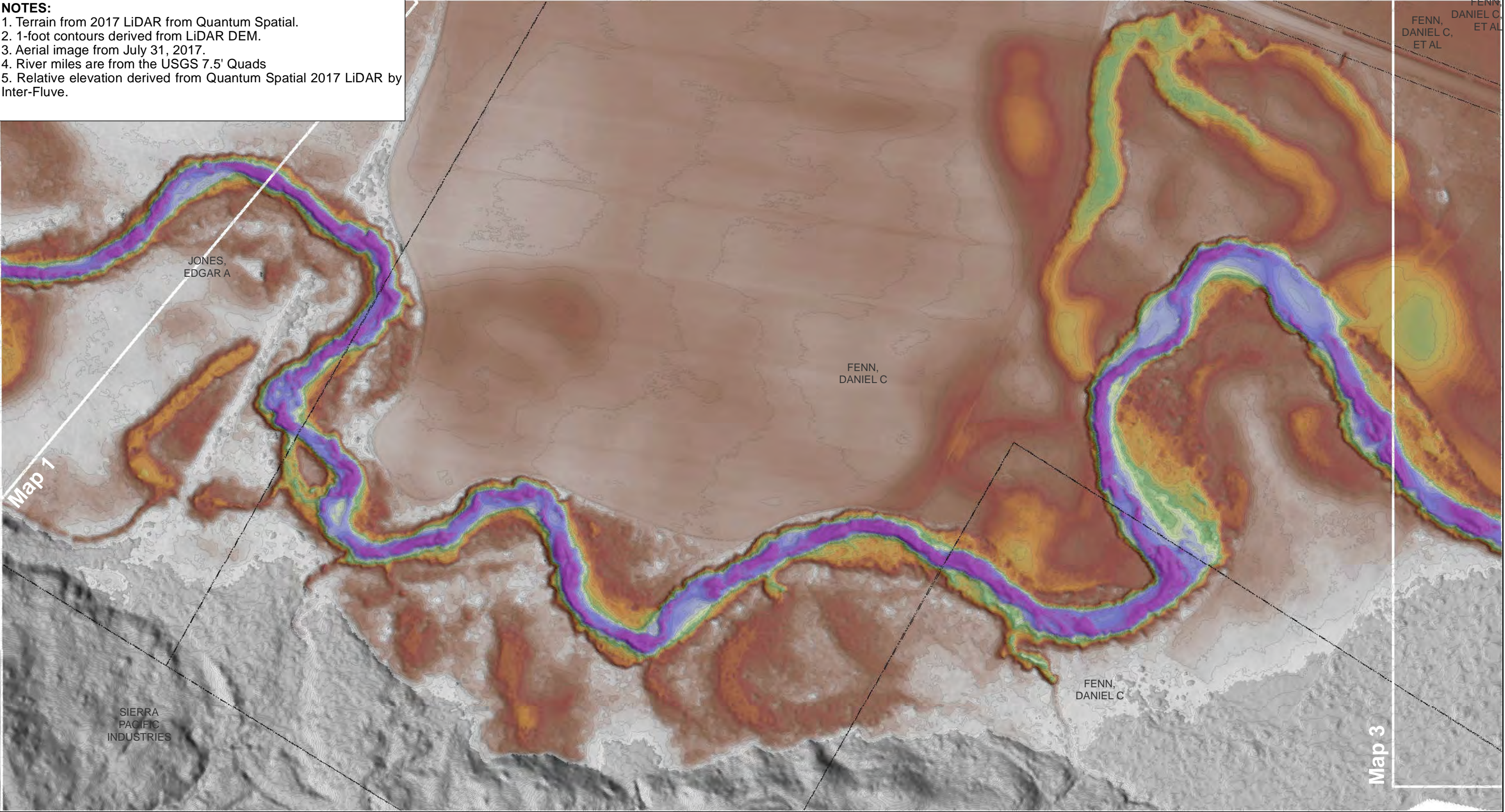
River Survey - Map 1 of 5

Early Action Reach RM: 13.5 to 16.5
Middle South Fork Chehalis River, WA
Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



- NOTES:**
1. Terrain from 2017 LiDAR from Quantum Spatial.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial image from July 31, 2017.
 4. River miles are from the USGS 7.5' Quads
 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.





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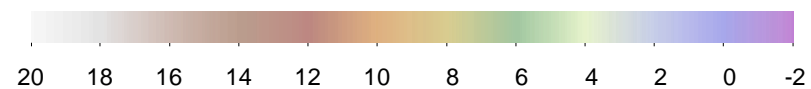
DRAFT



Projection: NAD 1983
State Plane Washington South FIPS 4602



Relative Elevation (feet)



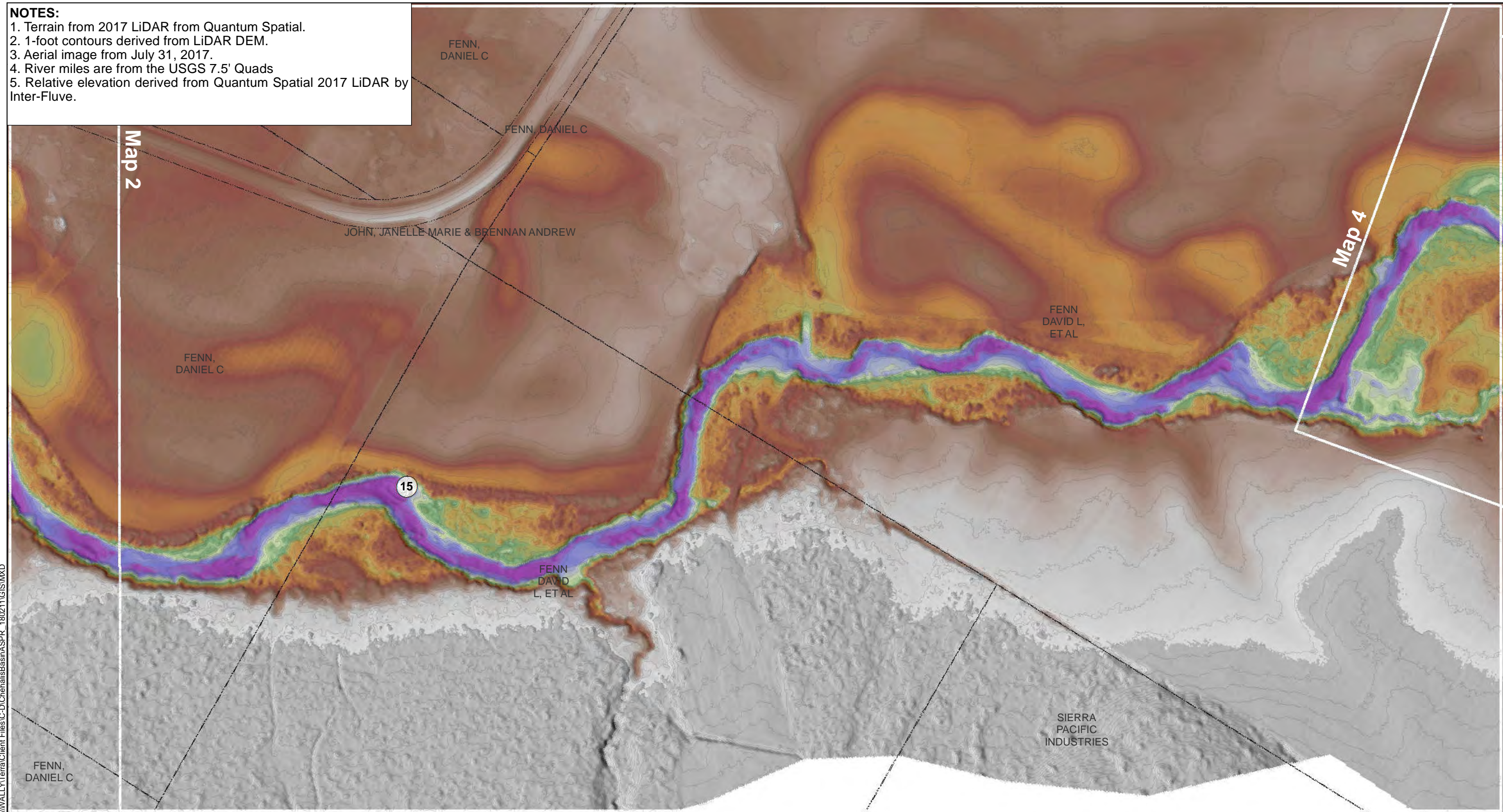
(75)

- Map Matchlines
- Parcels
- River Miles

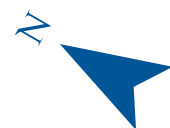
River Survey - Map 3 of 5

Early Action Reach RM: 13.5 to 16.5
Middle South Fork Chehalis River, WA
Chehalis Basin ASRP Design

NOTES:
 1. Terrain from 2017 LiDAR from Quantum Spatial.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial image from July 31, 2017.
 4. River miles are from the USGS 7.5' Quads
 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



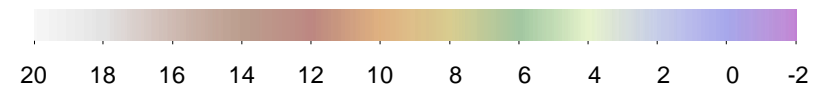
DRAFT



Projection: NAD 1983
 State Plane Washington South FIPS 4602



Relative Elevation (feet)



(76)

- Map Matchlines
- Parcels
- River Miles


River Survey - Map 3 of 5

Early Action Reach RM: 13.5 to 16.5
 Middle South Fork Chehalis River, WA
 Chehalis Basin ASRP Design


- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



DRAFT

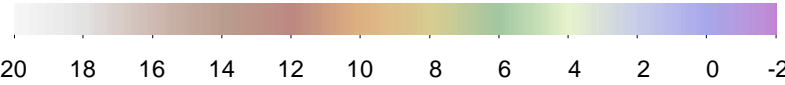


Projection: NAD 1983
State Plane Washington South FIPS 4602



0 200 400
Feet

Relative Elevation (feet)



20 18 16 14 12 10 8 6 4 2 0 -2

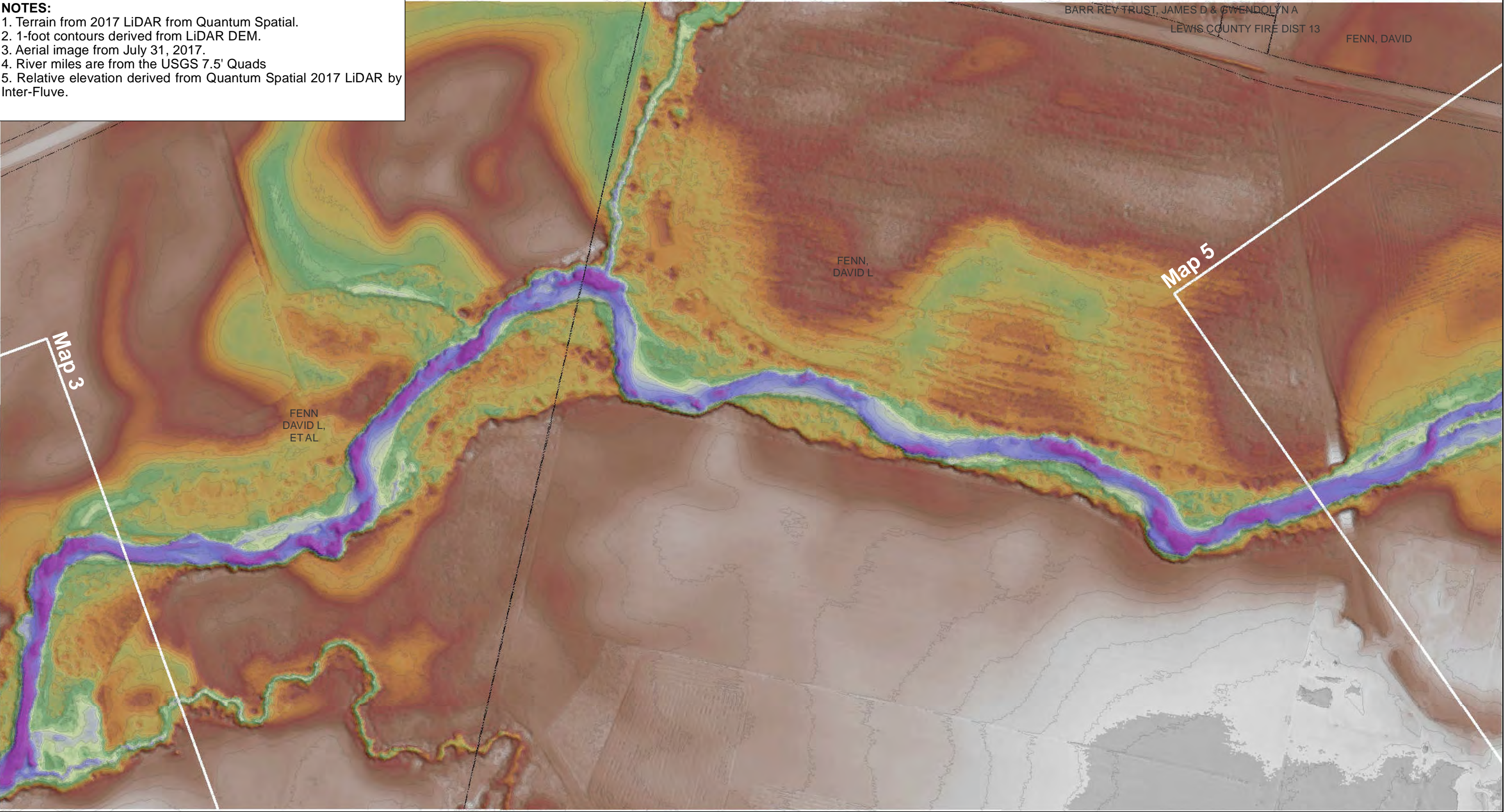
(77)

Map Matchlines
Parcels
④ River Miles

River Survey - Map 4 of 5

Early Action Reach RM: 13.5 to 16.5
Middle South Fork Chehalis River, WA
Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



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Projection: NAD 1983
State Plane Washington South FIPS 4602

Feet
0 200 400

Relative Elevation (feet)

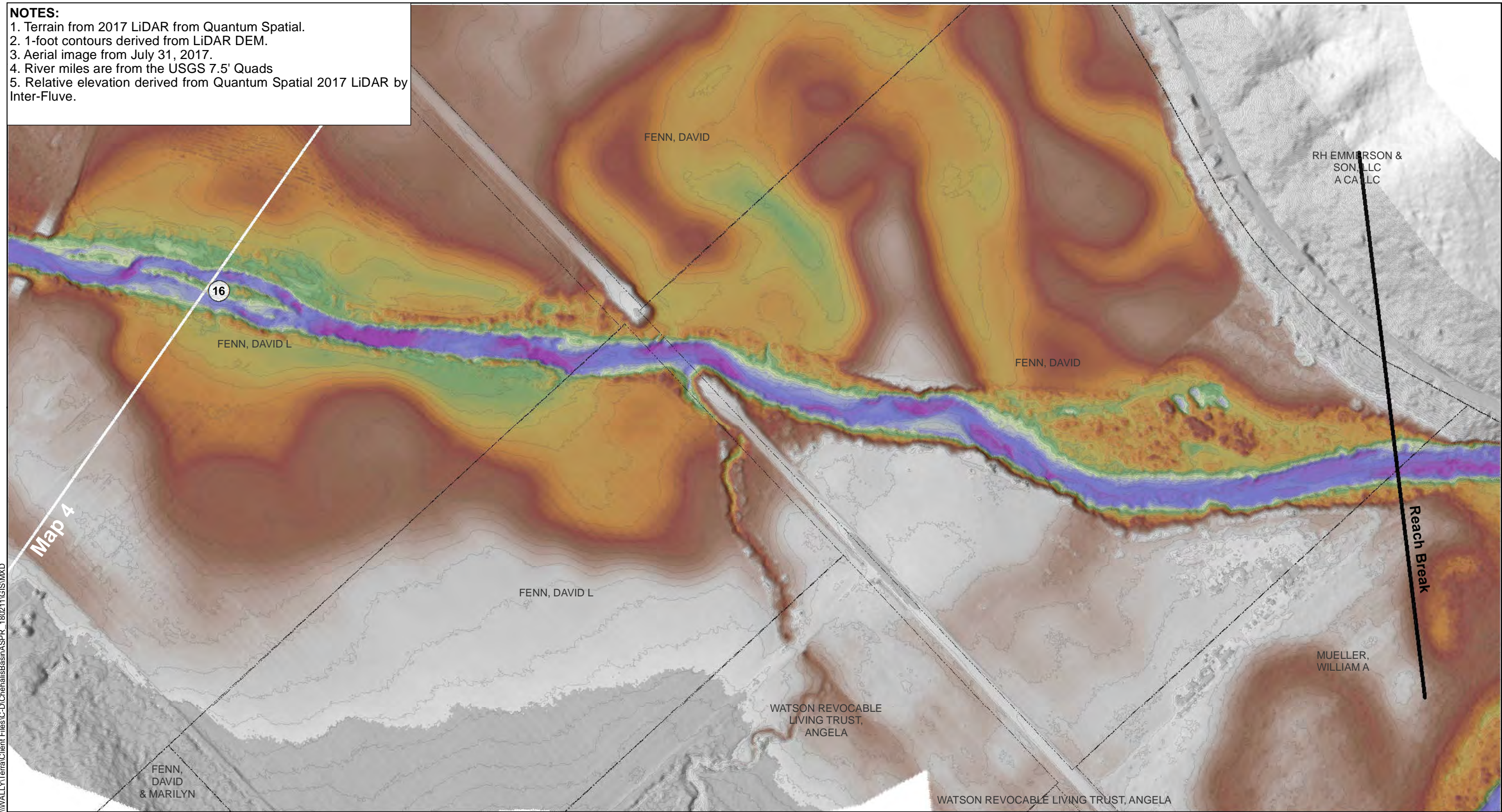
(79)

- Map Matchlines
- Parcels
- River Miles

River Survey - Map 5 of 5

Early Action Reach RM: 13.5 to 16.5
Middle South Fork Chehalis River, WA
Chehalis Basin ASRP Design

- NOTES:**
1. Terrain from 2017 LiDAR from Quantum Spatial.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial image from July 31, 2017.
 4. River miles are from the USGS 7.5' Quads
 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



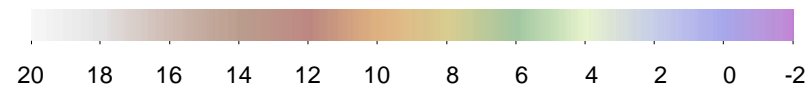
DRAFT



Projection: NAD 1983
State Plane Washington South FIPS 4602



Relative Elevation (feet)



(80)

- Map Matchlines
- Parcels
- River Miles

River Survey - Map 5 of 5

Early Action Reach RM: 13.5 to 16.5
Middle South Fork Chehalis River, WA
Chehalis Basin ASRP Design

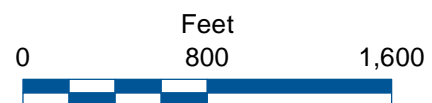
- NOTES:**
1. Terrain from Gray's Harbor 2012 LiDAR from DNR.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial photo from July 31st, 2017.
 4. River miles are from the USGS 7.5' Quads



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Projection: NAD 1983
State Plane Washington South FIPS 4602

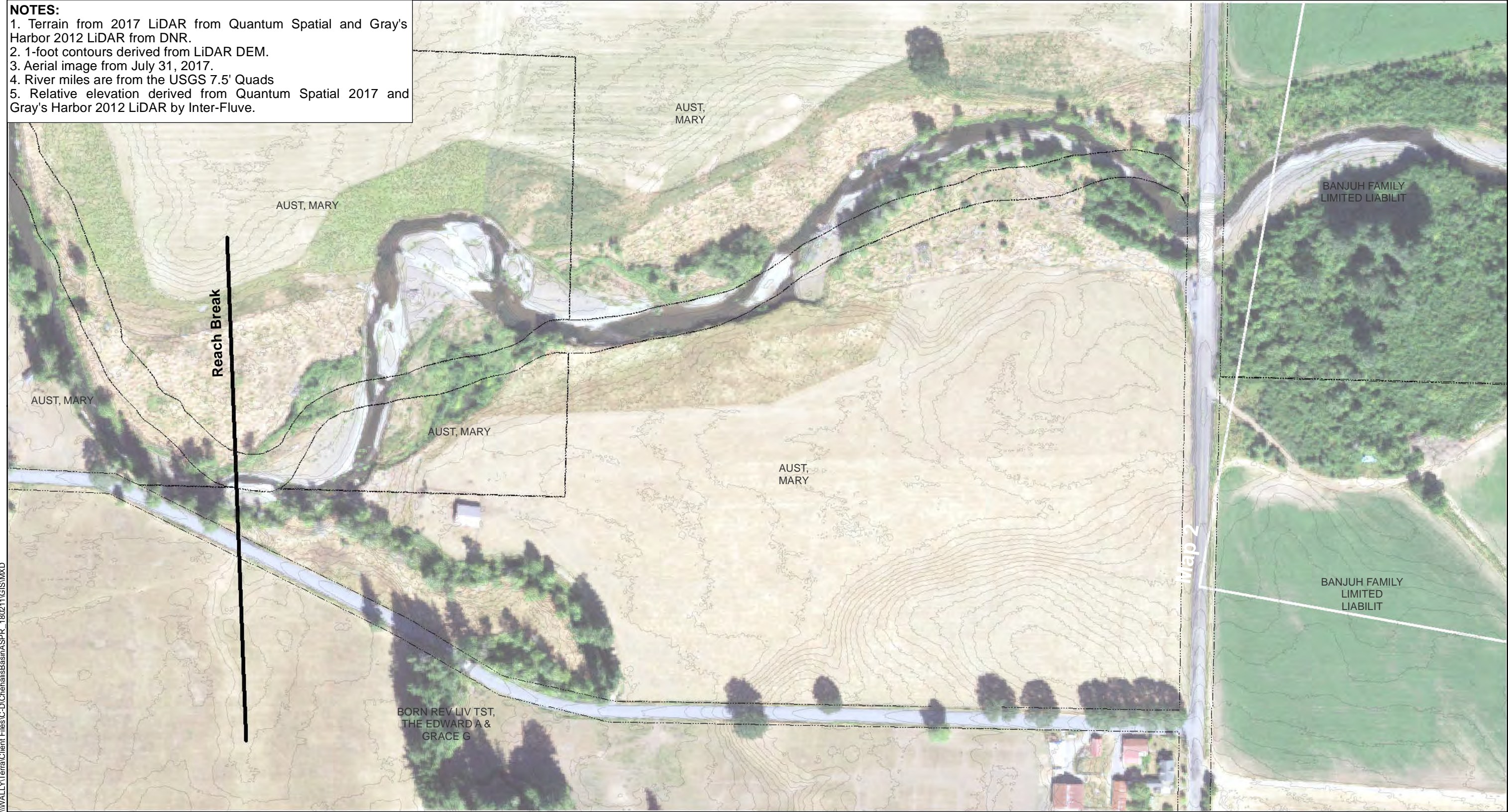


- Map Matchlines
- Parcels
- River Miles

River Survey - Full Reach

Early Action Reach RM: 0 to 2.5
Stillman Creek, WA
Chehalis Basin ASRP Design

- NOTES:**
1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial image from July 31, 2017.
 4. River miles are from the USGS 7.5' Quads
 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.



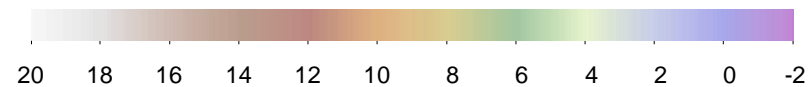
DRAFT



Projection: NAD 1983
State Plane Washington South FIPS 4602



Relative Elevation (feet)



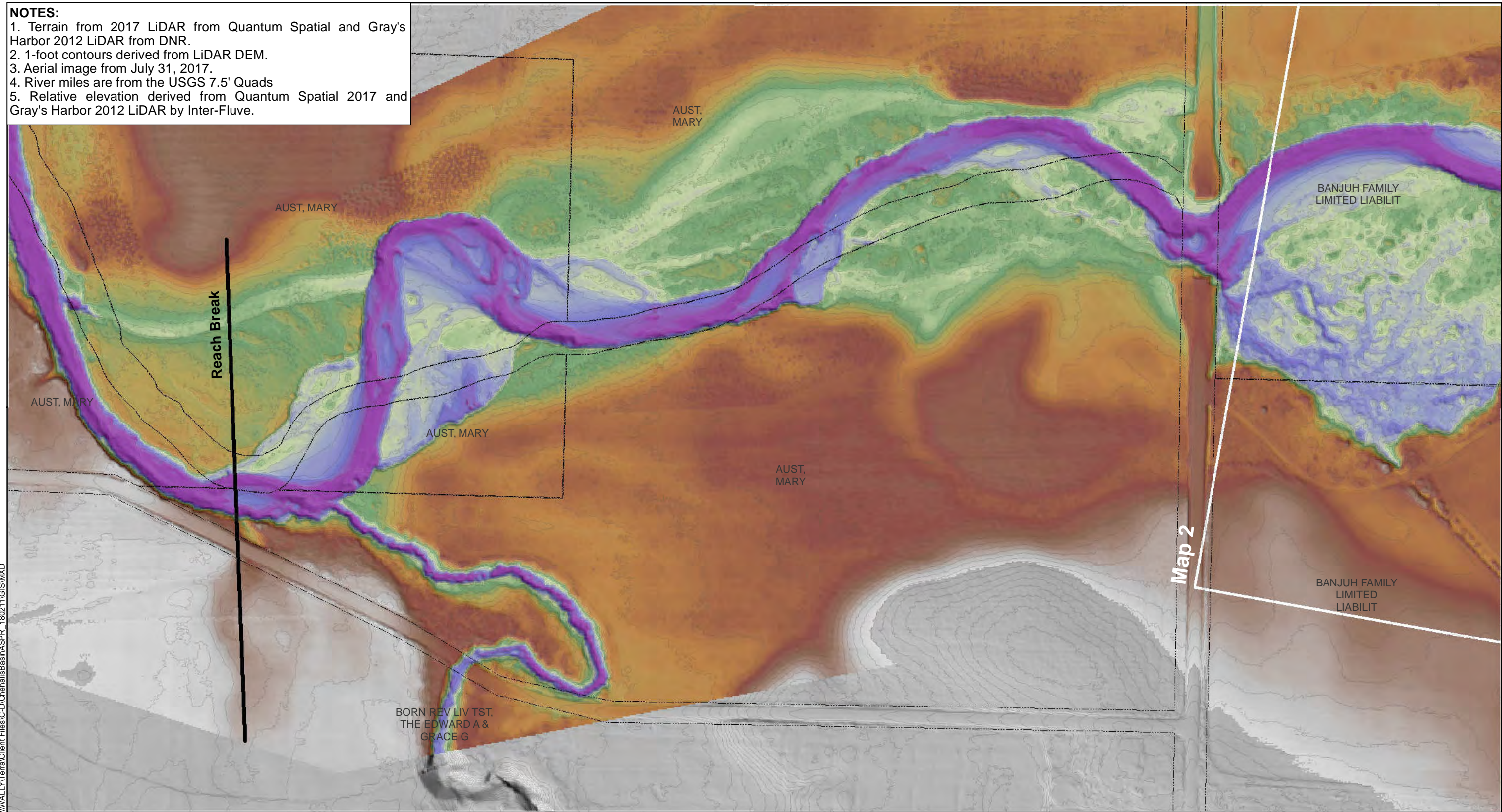
(82)

- Map Matchlines
- Parcels
- 4 River Miles

River Survey - Map 1 of 4

Early Action Reach RM: 0 to 2.5
Stillman Creek, WA
Chehalis Basin ASRP Design

- NOTES:**
1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial image from July 31, 2017.
 4. River miles are from the USGS 7.5' Quads
 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.



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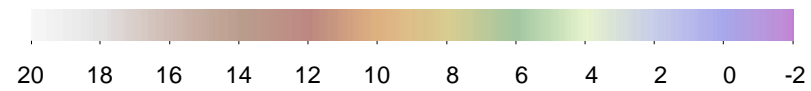
DRAFT



Projection: NAD 1983
State Plane Washington South FIPS 4602



Relative Elevation (feet)



(83)

- Map Matchlines
- Parcels
- 4 River Miles

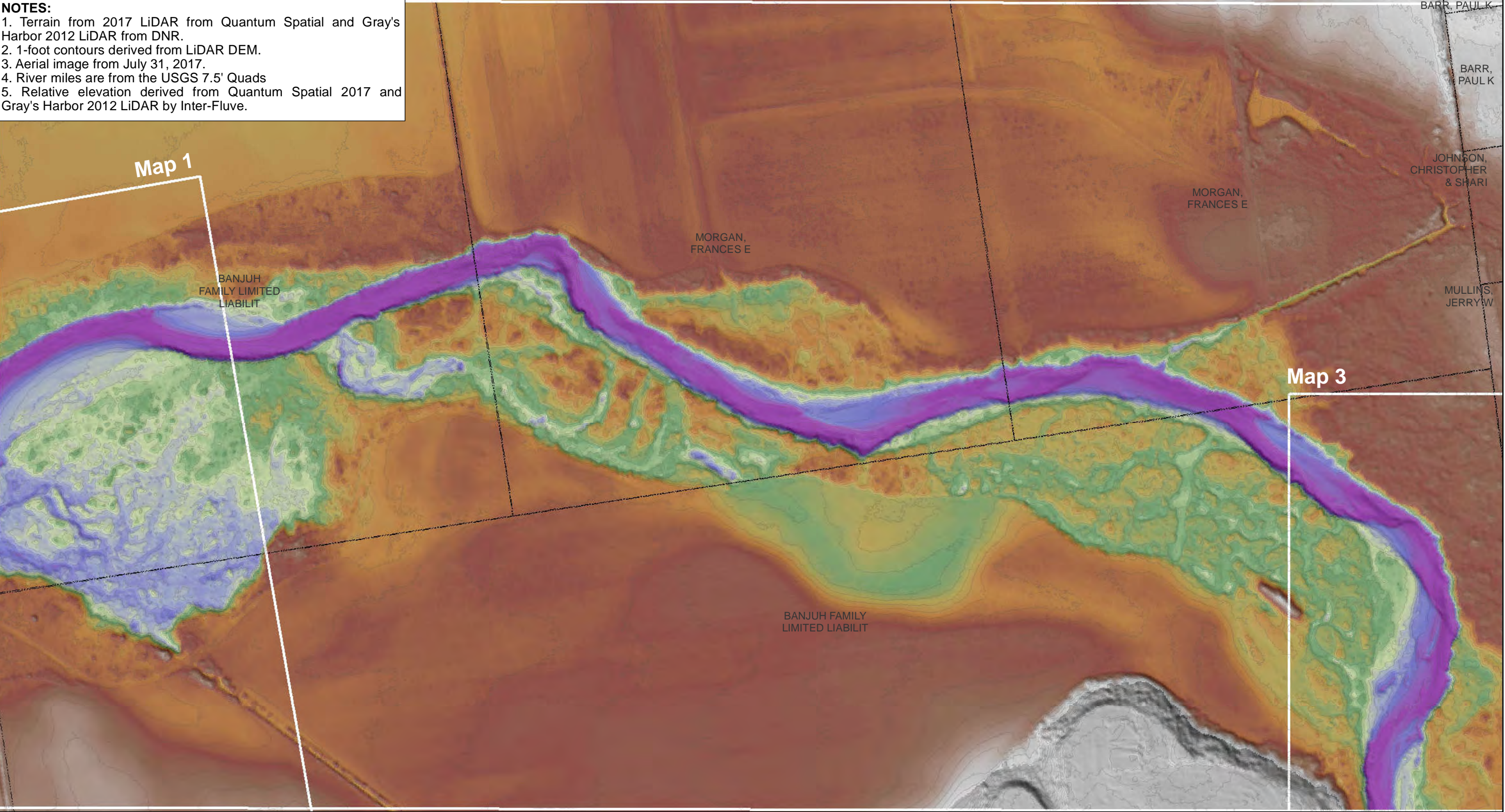
River Survey - Map 1 of 4

Early Action Reach RM: 0 to 2.5
Stillman Creek, WA
Chehalis Basin ASRP Design


- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.



- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.




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Projection: NAD 1983

State Plane Washington South FIPS 4602



0

200

400

Feet

Relative Elevation (feet)

20

18

16

14

12

10

8

6

4

2

0

-2

(85)

Map Matchlines

Parcels

4

River Miles

River Survey - Map 2 of 4

Early Action Reach RM: 0 to 2.5


Stillman Creek, WA

Chehalis Basin ASRP Design


- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.



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Projection: NAD 1983
State Plane Washington South FIPS 4602



0 200 400
Feet

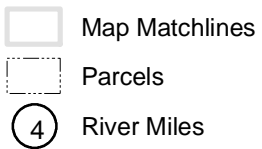
Relative Elevation (feet)



20 18 16 14 12 10 8 6 4 2 0 -2

(86)

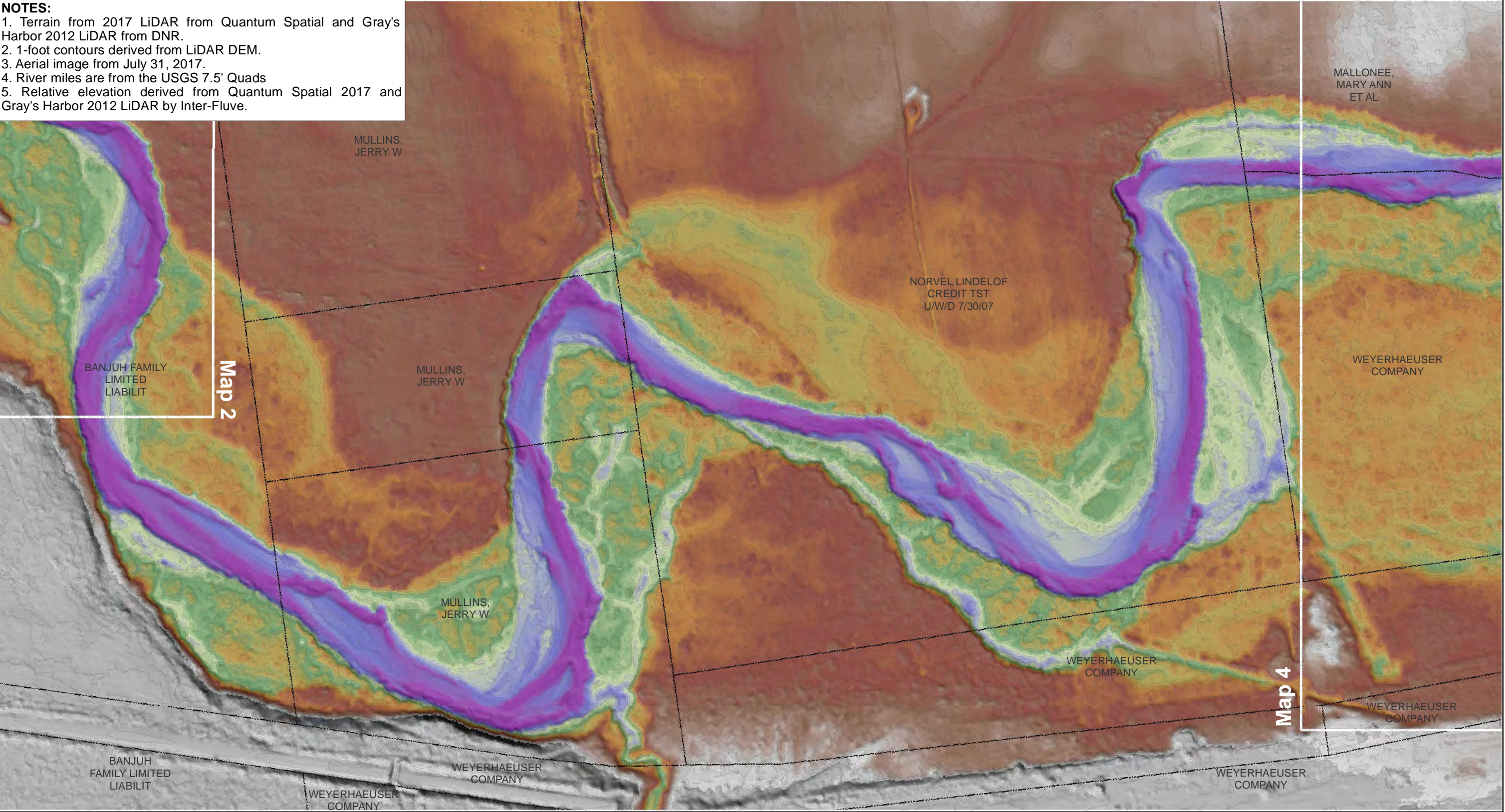
Map Matchlines
Parcels
River Miles




River Survey - Map 3 of 4

Early Action Reach RM: 0 to 2.5
Stillman Creek, WA
Chehalis Basin ASRP Design


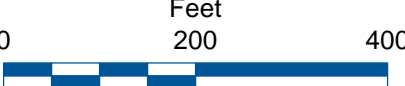
- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.



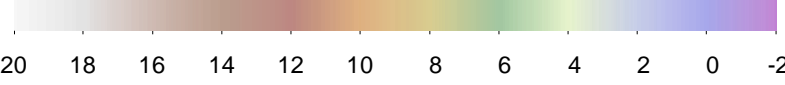
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Projection: NAD 1983
State Plane Washington South FIPS 4602

Relative Elevation (feet)



(87)



Map Matchlines
Parcels
River Miles

River Survey - Map 3 of 4

Early Action Reach RM: 0 to 2.5
Stillman Creek, WA
Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.



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Projection: NAD 1983
State Plane Washington South FIPS 4602

0 200 400
Feet

Relative Elevation (feet)

20 18 16 14 12 10 8 6 4 2 0 -2

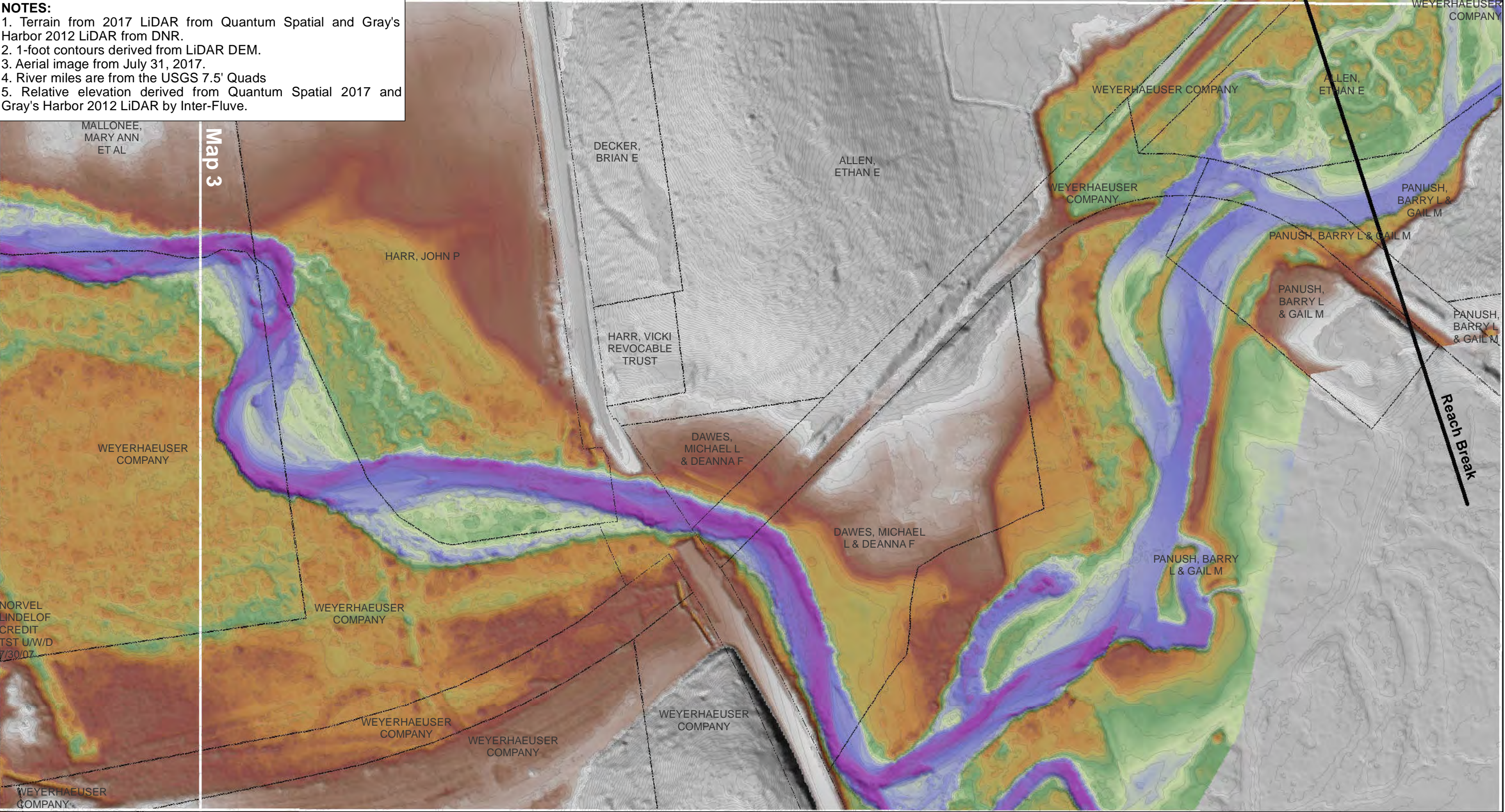
(88)

Map Matchlines
Parcels
River Miles


River Survey - Map 4 of 4

Early Action Reach RM: 0 to 2.5
Stillman Creek, WA
Chehalis Basin ASRP Design


- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial and Gray's Harbor 2012 LiDAR from DNR.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 and Gray's Harbor 2012 LiDAR by Inter-Fluve.



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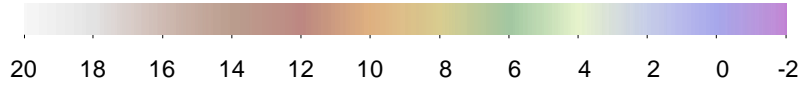


Projection: NAD 1983
State Plane Washington South FIPS 4602



0 200 400
Feet

Relative Elevation (feet)



20 18 16 14 12 10 8 6 4 2 0 -2

(89)

Map Matchlines
Parcels
River Miles

River Survey - Map 4 of 4

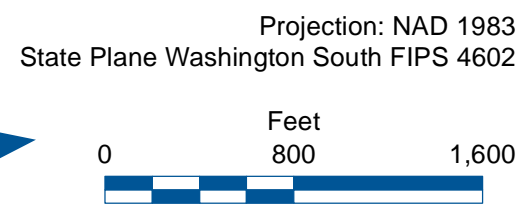
Early Action Reach RM: 0 to 2.5
Stillman Creek, WA
Chehalis Basin ASRP Design

NOTES:
 1. Terrain from SWWA Foothills 2017 and Gray's Harbor 2012 LiDAR from DNR.
 2. 1-foot contours derived from LiDAR DEM.
 3. Aerial photo from July 31st, 2017.
 4. River miles are from the USGS 7.5' Quads



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- Map Matchlines
- Parcels
- River Miles


River Survey - Full Reach

Early Action Reach RM: 10.9 to 13.0
 South Fork Newaukum River, WA
 Chehalis Basin ASRP Design

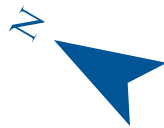
- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



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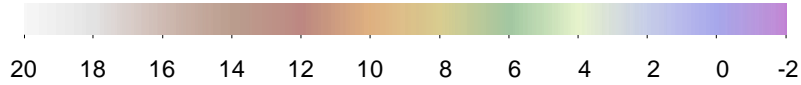


Projection: NAD 1983
State Plane Washington South FIPS 4602



0 200 400
Feet

Relative Elevation (feet)



20 18 16 14 12 10 8 6 4 2 0 -2

(91)

Map Matchlines

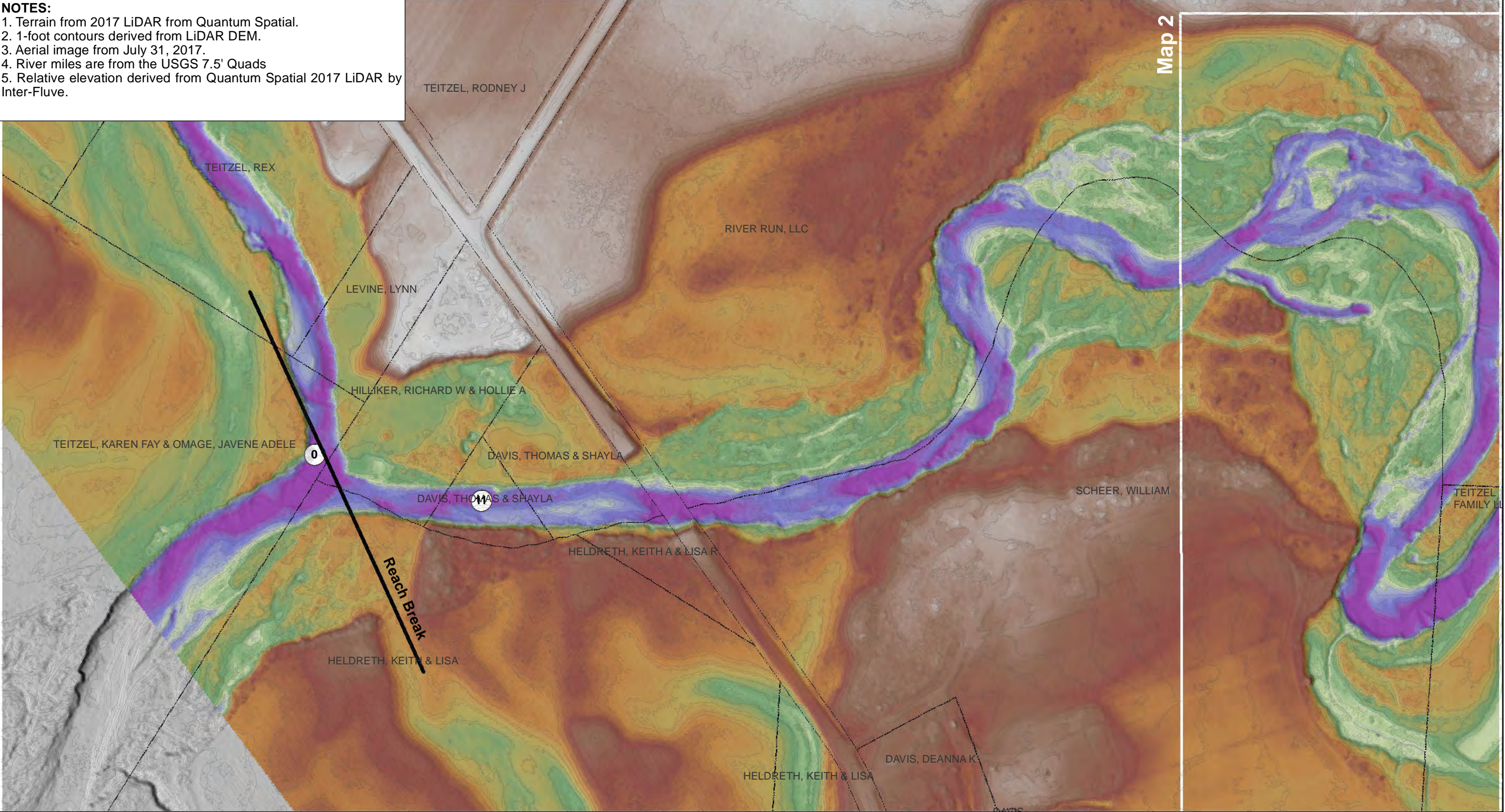
Parcels

4 River Miles


River Survey - Map 1 of 4

Early Action Reach RM: 10.9 to 13.0
South Fork Newaukum River, WA
Chehalis Basin ASRP Design

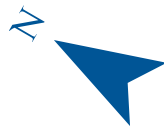
- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



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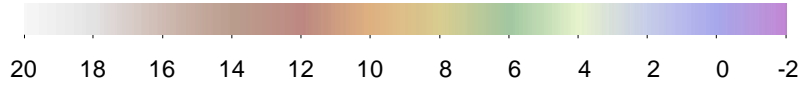


Projection: NAD 1983
State Plane Washington South FIPS 4602



0 200 400
Feet

Relative Elevation (feet)



20 18 16 14 12 10 8 6 4 2 0 -2

(92)

Map Matchlines
Parcels
River Miles


River Survey - Map 1 of 4

Early Action Reach RM: 10.9 to 13.0
South Fork Newaukum River, WA
Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.




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Projection: NAD 1983

State Plane Washington South FIPS 4602



0

200

400

Feet

Relative Elevation (feet)

20

18

16

14

12

10

8

6

4

2

0

-2

(93)

Map Matchlines

Parcels

4

River Miles

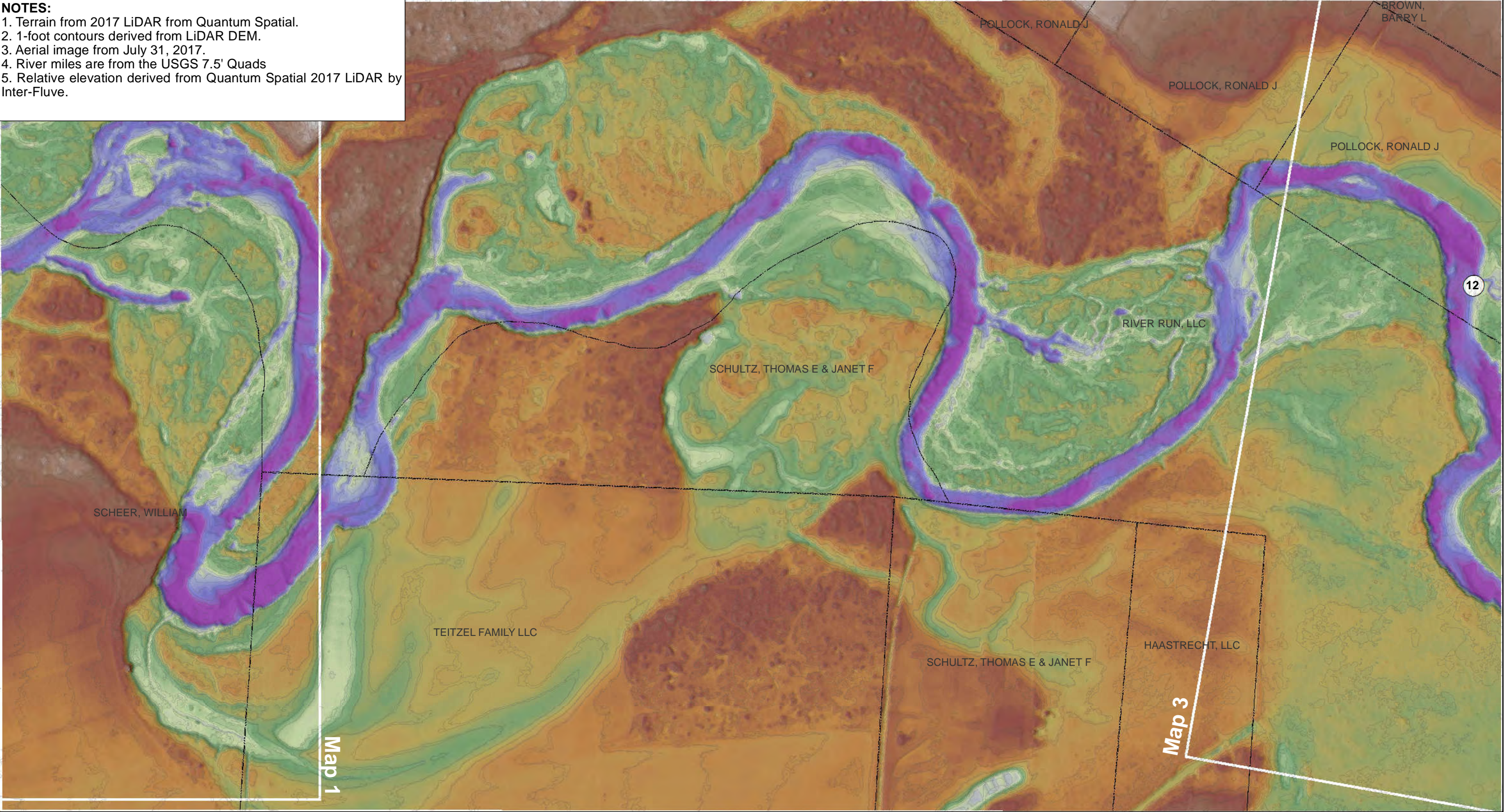
River Survey - Map 2 of 4

Early Action Reach RM: 10.9 to 13.0


South Fork Newaukum River, WA

Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



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Projection: NAD 1983

State Plane Washington South FIPS 4602

0

200

400

Feet

Relative Elevation (feet)

20

18

16

14

12

10

8

6

4

2

0

-2

(94)

Map Matchlines

Parcels

4

River Miles

River Survey - Map 2 of 4

Early Action Reach RM: 10.9 to 13.0


South Fork Newaukum River, WA

Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.




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Projection: NAD 1983

State Plane Washington South FIPS 4602



0

200

400

Feet

Relative Elevation (feet)

20

18

16

14

12

10

8

6

4

2

0

-2

(95)

Map Matchlines

Parcels

River Miles

4

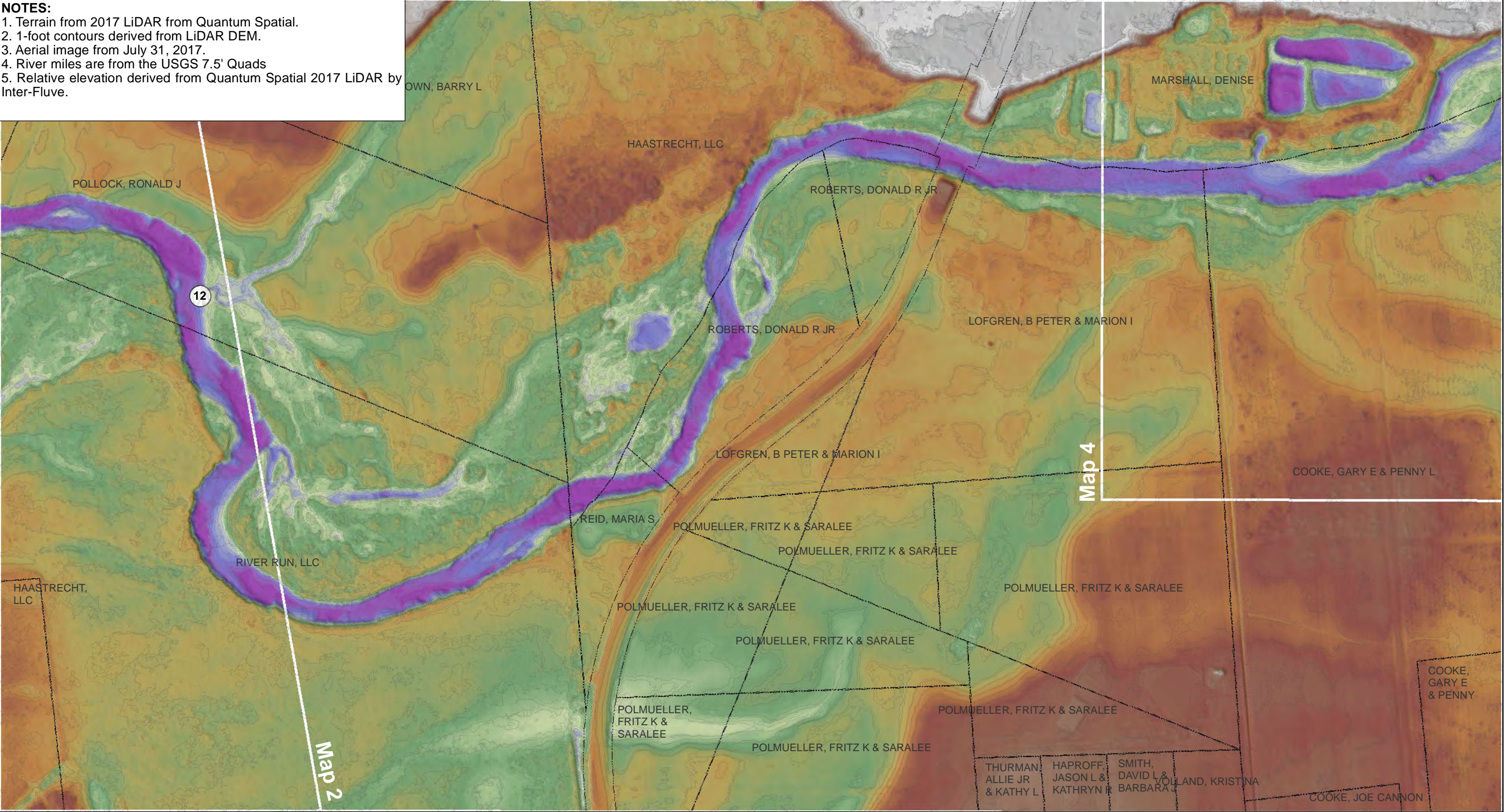
River Survey - Map 3 of 4

Early Action Reach RM: 10.9 to 13.0


South Fork Newaukum River, WA

Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.




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Projection: NAD 1983


State Plane Washington South FIPS 4602

N



Feet

0 200 400



Relative Elevation (feet)

20 18 16 14 12 10 8 6 4 2 0 -2

(96)

Map Matchlines

Parcels

4

River Miles

River Survey - Map 3 of 4

Early Action Reach RM: 10.9 to 13.0

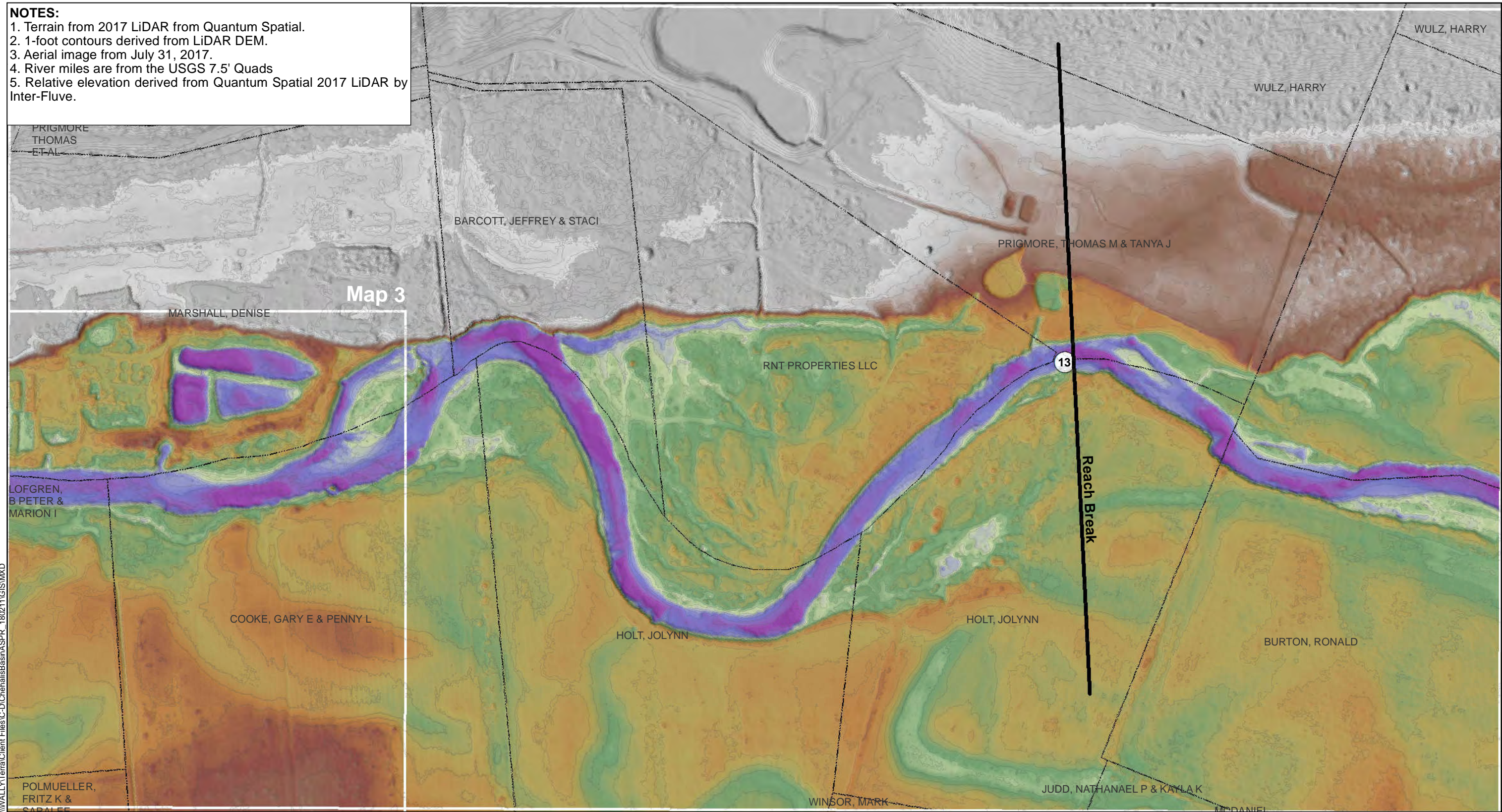
South Fork Newaukum River, WA

Chehalis Basin ASRP Design

- NOTES:**
- 1. Terrain from 2017 LiDAR from Quantum Spatial.
 - 2. 1-foot contours derived from LiDAR DEM.
 - 3. Aerial image from July 31, 2017.
 - 4. River miles are from the USGS 7.5' Quads
 - 5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



NOTES:
1. Terrain from 2017 LiDAR from Quantum Spatial.
2. 1-foot contours derived from LiDAR DEM.
3. Aerial image from July 31, 2017.
4. River miles are from the USGS 7.5' Quads
5. Relative elevation derived from Quantum Spatial 2017 LiDAR by Inter-Fluve.



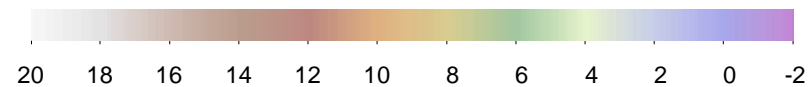
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Projection: NAD 1983
State Plane Washington South FIPS 4602



Relative Elevation (feet)



(98)

- Map Matchlines
- Parcels
- 4 River Miles

River Survey - Map 4 of 4

Early Action Reach RM: 10.9 to 13.0
South Fork Newaukum River, WA
Chehalis Basin ASRP Design